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The journal of an association of institutes and individuals concerned with housing, design and development in the built environment. The journal is an important forum for the exchange of viewpoints and ideas about the building process. It is the official organ of the Open House International Association, an international association of institutes and individuals concerned with the quality of built environment. The Open House International Association (OHIA) was founded in 1982 with the aim of promoting the study and practice of housing and planning in an international context. The OHIA organizes a number of activities which include the publication of a quarterly journal, and, in the near future, an international seminar and an annual competition. The Association has the more general aim of seeking to improve the quality of built environment through encouraging a greater sharing of decision-making by ordinary people and to help develop the necessary institutional frameworks which will support the local initiatives of people in the building process.

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Flash Card Set as Rehearse Tool for Architecture Students.
It is our pleasure to present this regular issue of Open House International. In this issue (Vol.44, No. 3, 2019), we selected 33 papers which have gone through several rounds of review and revision, and represent a cross-section of research in building management, construction management, house economics & management, urban planning areas that touch upon both building and housing issues. Open House International is only this outsourced issue supplier as the publisher. This editorial remark also indemnifies the Open House International from any responsibility for the content and presentation of this issue.

Especially, we want to have a brief introduction on some selected focus articles. In article “The Innovative Method of Music Visual Design in Modern Architectural Lighting Planning and Design” by Kun Sui and Hyung-Gi, Kim, the authors extracted the characteristic elements of waveform music by the use of the time-frequency domain analysis method. Meanwhile, they comb the development process of the live performances and other information of the performance types so that the public can have a clearer understanding of the live performances. In “The Change of Modern Urban Planning Thought Core and Theory from the Perspective of the United Front Thought of Foreign Exchange and Communication” by Peilin Zhang, in order to further optimize the methods of modern urban planning, the author analyzed the philosophical basis, planning theory, planning measures and practice, and made some discussions in connection with China’s planning practice. The research results show that the core of modern urban planning is constructed by traditional rationalism with classical physics as its core. In “Construction and Planning of Library Service Facilities System Based on Public Digital Culture Education in International Cultural Metropolis” by Guixia Li and Guiping Jiang, to study the construction and planning of the library service facility system based on public digital culture teaching in international cultural metropolises, the main body of resources construction, channels, selection criteria, construction standards, user service policies, service methods and service objects of the National Digital Library of Russia were analyzed. The construction foundation, policy support and digital resource construction of digital libraries in China and Russia were compared. The research has some enlightenment significance to the construction of digital library in metropolitan area of China. While in “Research on the Configuration of Public Sports Venues in China’s Counties under the Background of New Urbanization” by Li Li, the author studied the allocation of public stadiums in the county under the background of new urbanization. Interviews and literature research methods were adopted. The differences between the new urbanization and the traditional urbanization of the county’s public stadiums were discussed. Under the background of new urbanization, the status quo of the allocation of public stadiums in China’s counties was studied. Under the background of new urbanization, the problems and influencing factors of the allocation of public stadiums in China’s counties were analyzed. The corresponding proposal was put forward. The balance between supply and demand, the balance of urban and rural settings, the optimization of public sports venues, and the establishment of public stadiums under new urbanization are important. Moreover, in “Fuzzy Intelligent Comprehensive Evaluation of Urban Regional Innovation System Operation Based on Bayesian Discriminant” by Lin Liang et al., to comprehensively analyze the urban regional innovation system, the typical urban city was taken as an empirical sample to consider as an urban regional innovation system. The fuzzy comprehensive evaluation method was used to evaluate the operation of typical urban regional innovation system, combined the cluster analysis and Bayesian discrimination for the research and analysis. The proposed targeted innovation development strategy is conducive to grasp the advantages and disadvantages of the typical urban regional innovation system construction as a whole.

Lastly we wish to thank all our reviewers and the editorial board members who have been contributing to the release of this issue by their devoted engagement. We herewith also wish the readers of the journal can enjoy reading these papers as much as we enjoyed reviewing and editing this issue.

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PLANNING AND LAYOUT OF SHANGHAI YANGSHAN BONDED PORT AREA BASED ON THE PERSPECTIVE OF A FREE TRADE ZONE.

Wence Yu, Hao Chen, Liqiang Yang

Abstract
In order to alleviate China’s crisis of marginalization in international trade, combined with the development characteristics of the Shanghai Free Trade Zone, the development direction of the bonded cold chain business of Shanghai Yangshan Comprehensive Bonded Port Area was proposed. From a long-term perspective, a free trade zone integrating processing, logistics, finance, culture, and internal and external market trade was formed. By taking advantage of the huge consumption of imported food in the Yangtze river delta region, the policy advantages of Yangshan Port Area are exploited. Combined with the development of cross-border e-commerce, innovative experiences that could be replicated and promoted are formed. The results showed that the free trade zone is the development direction of the bonded port area. Therefore, the Shanghai Bonded Port Area should focus on the integration with the development of the free trade zone in the initial stage. This lays a solid foundation for the construction of the bonded port area as a comprehensive internal and external trade platform for ASEAN (the Association of Southeast Asian Nations) and the domestic market. Research on the planning and layout of trade zones can help plan the future development of trade zones and their direction. The trade zone is pre-controlled. The efficiency of future construction and upgrading of the bonded area is improved. It is of great practical significance to the current development and construction of the Shanghai Bonded Port Area.

Keywords: Free Trade Zone, Bonded Port Area, Planning and Layout.

1. Introduction
In the process of economic globalization, exchanges in the economic field have become more widespread. The flow of products is reflected in the globalization of trade. The flow of factors is manifested in the globalization of capital and the globalization of labor factors. Driven by the three major free trade negotiations (the China-US Bilateral Investment Agreement, the Trans-Pacific Partnership Agreement and the Transatlantic Trade and Investment Partnership Agreement), the rules of international trade investment are reshaping. Emerging market economies, including China, are highly likely to be driven to the brink of international trade.

The functional difference between China’s free trade zone and foreign free trade zone has always been the focus of academic discussion. However, the functional positioning of the bonded area is greatly affected by the location factor. The pursuit of functional transformation by merely releasing policy dividends does not fundamentally realize the transition from bonded areas to free trade zones. Since the establishment of China’s bonded area is a local government action, it should adjust measures to local conditions when studying the development of bonded area to international general free trade area. The common problems in the development of China’s bonded areas were analyzed. In addition, the bonded areas need to be analyzed for specific case.

Taking the cold chain business of Yangshan Port as the research object, the huge consumption of imported food in the Yangtze River Delta region was utilized. The policy advantages of Yangshan Port Area are fully utilized. Combined with the development of cross-border e-commerce, innovative experiences that can be replicated and promoted are further developed. The construction of the pilot free trade zone in Shanghai was pushed forward through the study of cold chain business. This provides a new development opportunity for Yangshan Bonded Port Area to enhance the industrial layout and trade service capabilities of shipping services.
the regions (Hong, Nan and He 2016). The location choice problem of the free trade zone and the welfare effect were analyzed. Importing goods through the free trade zone will have a certain impact on the reduction of state welfare (Fitzpatrick, Ling and Watts 2000). The function of China’s initial establishment of bonded areas is mainly the economic and trade functions of international trade, warehousing, export processing and bonded goods display (Barsien and Lovejoy 2000). The political, economic, and geographical environment of the region where the free trade zone is located determines its functional orientation. According to the functions, the free trade zone is divided into seven categories: free port type, transit type, trade type, import processing type, and bonded warehouse type (Bunton 2015). In accordance with international practices, it is an inevitable trend for the development of China’s bonded areas to integrate with internationally accepted free trade zones (Peretz 1968).

3. Methodology

3.1 Comparison between China’s Bonded Zones and Foreign Free Trade Zones

The free trade zone is considered to be “domestic outside customs”, that is, special economic zones outside the borders and customs supervision. Although China’s bonded area is a special customs supervision area and adopts a limited form of free trade, it also belongs to the category of free trade area. Therefore, it has some common features in addition to the basic connotations of foreign free trade zones. China’s bonded areas and foreign free trade zones have implemented free trade policies in the region. Because of the diversity of economic development levels, policy conditions, geographical conditions and foreign economic and trade relations between countries and regions, the degree of trade freedom of different countries is different. However, in the formulation of policies, all countries have adopted the principle of free trade and given various preferential policies in special areas of domestic customs, such as tax preferential policies and convenient customs clearance policies. Free trade area must have port condition. This port may be a port, an airport or a land port. Therefore, China’s bonded areas, like foreign free trade zones, mostly choose to be close to the seaport, or a convenient transportation hub for railways, highways and inland river transport. China’s bonded areas and foreign free trade zones are based on their own geographical conditions, location advantages and the development of domestic and foreign economies to develop an open economy and participate in international competition for the purpose of functional positioning. The central government has not set a unified port condition for China’s bonded areas, but only stipulates the basic business scope, that is, it has three basic functions: international trade, export processing, and international logistics.

3.2 Differences between China’s Bonded Zones and Foreign Free Trade Zones

The difference between China’s bonded areas and foreign free trade zones is mainly reflected in the management system and policy system. The management system can be further divided into a central management system and a local management system. The policy system is composed of institutional policies and operational policies. The relationship between management system and policy system is mutual influence and restriction. The biggest difference between China’s bonded areas and foreign free trade zones in actual operations is the difference in management systems. This is mainly due to the fact that the establishment of foreign free trade zones is a state act, and the establishment of China’s bonded zones is actually a local act. Therefore, the management system of foreign free trade zones has been characterized by streamlining and efficiency, while the management system of bonded areas in China is relatively complicated. The management system of a free trade zone can generally be divided into two levels: one is the central management system, and the other is the local management system. The former is a national-level management system responsible for macro decision-making, legislation, supervision, and coordination. The latter is a local organization system that organizes and coordinates activities such as the development, construction, and daily operations of the free trade zone.

3.3 The Enlightenment of Foreign Free Trade Zones on the Development of China’s Bonded Zones

The management system of the free trade zone determines the operational efficiency of the free trade zone. Most foreign free trade zones are newly established in the central government. It is responsible for management matters such as approval, decision-making, supervision and coordination of the national free trade zone. The advantage of this approach is clear responsibility, strong authority, efficient management, and facilitate communication and coordination between relevant departments. This independent management agency is not subject to the intervention of other functional departments, and is conducive to the central government’s unified planning and overall arrangement of free trade zones. From the central to the local, foreign free trade zones adopt a streamlined and efficient management organization structure. The management level is small and the division of labor is clear. Local operations are more characterized by liberalization. The foreign free trade zone management system is a relatively weak administrative management system. It mainly manages free trade zones by sound legal and regulatory systems and market economy leverage.

In contrast, China’s bonded area is the lack of an authoritative central agency for specialized macro management. The Free Trade Zone

![Table 1. The gap between China free trade zone and foreign free trade area.](image-url)
Management Committee is only a local government agency, and the management rights depend on the administrative level. Therefore, the authority is poor. At the same time, the specialized agencies set up by the central functional departments in the bonded areas also exercise management power over the bonded areas. In fact, at present, China’s bonded area is implemented at the intersection of local and central management. In terms of macro management, the overall layout lacks specialized agencies for overall coordination and vertical leadership of various functional departments. In micro-management, the administrative and management institutions are complex, the management system is disordered, and there is a certain degree of “multi-management” phenomenon. Therefore, China’s bonded areas should learn from the streamlined and efficient management system of foreign free trade zones, and promote the further development of bonded areas by improving management efficiency.

4. Result analysis and discussion

4.1. Integrated supervision mode of ports, customs and commodity inspection in Yangshan bonded port area

The premise of the development of the cold chain business of Yangshan Bonded Port Area is to intensify the port resources and realize the supervision function of “three ones” (one declaration, one inspection, one release). The intensive mode of port supervision can solve the problems of cold chain food chain scission, scattered inspection points of imported foods, and poor follow-up links in cold chain inspection. It can provide customers with quality services that reduce links, shorten time and reduce costs. This is not only the main means to enhance the comprehensive competitiveness of the cold chain business of Yangshan Bonded Port Area, but also one of the important measures to attract global traders to choose Yangshan Bonded Port Area as their international food transit center.

4.2. The cold chain business pattern with crossed functions and complementary advantages

In view of the disorderly competition of the existing cold chain business in Yangshan Bonded Port Area and nearby, it can be repositioned to guide the cold chain enterprises to exert their comparative advantages and avoid excessive competition. A hierarchical, differentiated, and competitive business landscape has been formed. For example, the cold chain enterprises located in the Yangshan Bonded Port Area are concentrated in serving the port supervision business, which is conducive to exerting more port functions. Enterprises outside the bonded port area use the management efficiency and low-cost advantages to expand the third-party cold chain business. For some similar businesses of the same nature, on the basis of business cooperation, the capital cooperation model of state-owned assets, private capital and foreign capital is adopted to achieve risk sharing and benefit sharing. Therefore, the development of a healthy cold chain business has been promoted.

4.3. Cross-border e-commerce cold chain logistics business

The cold chain enterprises in Yangshan Bonded Port Area need to further increase their investment in software and hardware. Imported food cross-border business was introduced. Low cost, high efficiency and personalized logistics services are provided. Support systems for customs supervision, inspection and quarantine, tax rebates, cross-border payments, logistics and distribution, which are compatible with cross-border e-commerce, were established. The e-commerce platform import and export service was innovated and an efficient operation mode was formed. Existing warehouse resources serve as a cross-border e-commerce public service warehouse. Well-known e-commerce and platform operators at home and abroad have been attracted to form a cluster of cross-border e-commerce related operations. The large-scale development of cross-border e-commerce service platform business in the Yangshan area was promoted.

4.4. The introduction of a new type of cold chain business

The imported foods involved in the port cold chain business have a wide range of business. Pledge, trading, auction, display and financing derived from food trade have a wider business space. The cold chain business of Yangshan Bonded Port Area can start from a certain country’s products or a certain type of food, and take the information advantage and financial advantages of the free trade zone to actively try different business models. The new development of the port cold chain business form was realized.

The trade volume of imported fruits in Yangshan bonded port keeps rising, and the traditional business forms involving fruits are also developing steadily. On this basis, the advantages of institutional innovation and functional breakthrough in the Pilot Free Trade Zone can be further relied upon. The breakthrough will be in the bonded display of high-grade imported fruits, cross-border e-commerce and other innovative business forms. Combined with comprehensive service functions such as electronic auction transactions, financing settlement, and high-end cold chain logistics, financial innovation businesses such as cross-border centralized payment and payment under the RMB current account have been expanded. In the future, it will not only be limited to the import of fruits, but also provide comprehensive business services such as trade, customs clearance, warehousing and cold chain logistics for more agricultural products. Agricultural trading centers were formed. The comprehensive trade service platform of international agricultural products has been built. From the existing foundation and future development space, the port cold chain business of Yangshan Bonded Port Area must play a greater role. It will be the first to become a model port public service platform. A leading integrated port cold chain business model was formed. Yangshan Bonded Port Area will use the combination of regional and port integration and tax rebates to promote the international cold chain trade agglomeration and expand the new international cold chain logistics business.

5. Conclusions

The port cold chain will become one of the important directions for Shanghai to develop international logistics. It is also an important part of making up the entire industrial chain of port logistics. It is expected that two professional port cold chain logistics centers will be formed in Shanghai’s Waigaoqiao Port and Yangshan Bonded Port Area. The two ports cold chain logistics...
centers can support each other. “Developing new formats and systems, expanding and upgrading international trade” is one of the key tasks of the Shanghai Pilot Free Trade Zone in Yangshan Bonded Port Area. As a new experimental field of China’s economy, Shanghai free trade zone aims to build itself into a free trade zone with international standards, such as convenient investment and trade, free currency exchange, efficient and convenient supervision, and standard legal environment. The Shanghai Free Trade Zone no longer emphasizes the introduction of tax incentives. Through policy innovation, measures such as administrative management system reform, laws and regulations reform, and regulatory system reform are adopted to promote trade liberalization, investment facilitation, and financial internationalization. Functionally, the international trade clearing center, the global maintenance testing business and financial leasing were promoted. The airport and district ports were integrated and the pilot program for bonded ships was expanded. The futures bonded delivery function is used to promote the agglomeration of the commodity industry. The Asia Pacific Operator Program was fully promoted. An international account with offshore features was established. As the latest practice of China in the field of foreign trade, the Shanghai pilot free trade zone has become a free trade zone with greatly relaxed policies, investment liberalization and trade facilitation, and highly integrated with the international standards. This shift is a historical inevitability. It is also the inevitable trend of the future development of China’s comprehensive bonded zone.

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In order to explore the theory of the spatial layout of urban sports facilities, starting with the analysis of theoretical knowledge, the current situation of public sports facilities in the central urban area of Jinan is analyzed, the various factors affecting the planning layout are discussed, and the strategies and methods of the layout planning of public sports facilities in Jinan are summarized. The results show that the layout planning of public sports facilities should follow the corresponding patterns and principles. The layout of public sports facilities at all levels should fully consider the factors of urban public transport, urban management system, urban public functions, and reasonable service radius of public sports facilities. It can be seen that excessive pursuit of efficiency will lead to excessive service radius and poor accessibility of urban public sports facilities; excessive pursuit of fairness will result in a small and scattered layout pattern, which easily leads to idle waste.

Abstract
In order to explore the theory of the spatial layout of urban sports facilities, starting with the analysis of theoretical knowledge, the current situation of public sports facilities in the central urban area of Jinan is analyzed, the various factors affecting the planning layout are discussed, and the strategies and methods of the layout planning of public sports facilities in Jinan are summarized. The results show that the layout planning of public sports facilities should follow the corresponding patterns and principles. The layout of public sports facilities at all levels should fully consider the factors of urban public transport, urban management system, urban public functions, and reasonable service radius of public sports facilities. It can be seen that excessive pursuit of efficiency will lead to excessive service radius and poor accessibility of urban public sports facilities; excessive pursuit of fairness will result in a small and scattered layout pattern, which easily leads to idle waste.

Keywords: Public Sports Facilities, Spatial Layout, Sports Industry, Countermeasures.

1. Introduction
Entering the 21st century, with the continuous improvement of China’s economy, Engel’s coefficient of urban residents has declined year by year, from 57.5% in 1978 to 44.5% in 1999, a decrease of 13 percentage points. This index shows that the living consumption of urban residents in China has reached a well-off level. While people are enjoying the prosperity of material wealth and the improvement of their living standards, they are also pursuing health and enjoying health. Under this new concept and situation, social sports are particularly important (Han, Kang and Sohn 2018). With the continuous improvement of material living standards and the in-depth development of national fitness campaign, people’s concept of life has changed greatly. The concept of “appropriate exercise = health” is deeply rooted in people’s hearts and people’s lifestyle is also changing greatly. Advocating healthy lifestyle makes sports an indispensable part of life (Iversen 2018). Of course, this is the necessity of social development and progress, and it also creates a good social foundation for further implementation of the national fitness program (Catherine and Olympia 2016).

Taking the public sports facilities in the central city of Jinan as the research object, through field investigation, resident visits, literature review and data analysis, starting with theoretical analysis, combining with the current situation of the layout planning of public sports facilities in the city, the classification, planning standards and layout planning methods of public sports facilities are studied and discussed.

The application of this method can better elaborate the spatial layout of public sports facilities in Jinan downtown area. On the basis of fully understanding the spatial layout of public sports facilities in the downtown area, some public sports facilities are selected and the residents participating in sports activities are visited. At the same time, the construction age, history, atmosphere and surrounding environment of these sports spaces are investigated.

2. State of the art
With the rapid development of social economy and science and technology, the construction of sports facilities in foreign countries has also developed rapidly. Large-scale sports facilities have been built in many cities, comprehensive and special sports events have been successfully held, and there are many successful cases. The Olympic Sports Park in Munich, Germany, and the Olympic Sports Center in Athens, Greece are typical of them (Eime et al. 2017).

In order to ensure the basic requirements of all kinds of events and spectators, the construction of new venues is also indispensable. These renovations and renovations are also newly built, and there is always a close relationship between the urban renewal and the construction of major infrastructure, which promotes the process of urban renewal and redevelopment (Jansen 2016).

In foreign countries, the formulation of construction measures and systems dates back to the 1950s, mainly reflected in the following aspects: community public sports centers, parks, various small outdoor playgrounds and children’s playgrounds (Deelen 2017). In the planning and construction of community public sports facilities, developed countries attach great importance to the organic combination of urban open space and human landscape, so as to achieve urban renewal. Many community public sports facilities and open spaces in the United States, such as community public parks, are well integrated. Sports facilities are a very important part of community public parks (Borgers et al. 2016). Based on the improvement of urban traffic system, it provides more conve-
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swimming, tennis and other activities, while middle-aged and old people over 55 tend to indoor sports rooms and quiet outdoor fitness venues. 42.7% of the residents feel “ordinary” about the existing sports facilities, 26.7% feel “satisfied”, 16.8% feel “unsatisfactory”, 9.8% feel “very satisfied”, and 4.1% feel “very unsatisfactory”. On the surface, most residents of Jinan City hold a “general to satisfactory” attitude towards the existing sports facilities, but this does not mean that the sports facilities provided are in place. In addition, the reasons for the “unsatisfactory” need to continue to investigate for correction. It can be seen that 47.1% of Jinan urban residents think that the layout of public sports facilities in their community is “general”, 25.5% of Jinan urban residents think that the layout of public sports facilities in their community is “reasonable”, 7.3% of the residents think that it is “very reasonable”. 17.1% of the residents think that the layout of public sports facilities in their community is “unsatisfactory”, and 2.6% of the residents think that it is “very unreasonable”. This shows that, compared with dissatisfaction, the residents of Jinan city are satisfied with the layout of public sports facilities in their community, but the residents who feel unreasonable still account for nearly 20%. It can be concluded that 41.2% of urban residents in Jinan feel that the community’s public surrounding sports fitness environment is “general”, 32.1% of urban residents in Jinan is “satisfied” with the community’s public surrounding sports fitness environment. 8.4% of the residents think that “very satisfied”, 16.6% of the residents feel that the community’s public sports fitness environment is “unsatisfactory”, and 1.7% of the residents feel “very unsatisfactory”. This is the same as the satisfaction of the planning and layout of community public sports venues and facilities. It shows that most urban residents in Jinan are more satisfied with the community public sports fitness environment than unsatisfactory. However, nearly 18% of the residents still feel unsatisfied.

Residents’ exercise time maintained in the period of “30 minutes to 60 minutes” had a higher proportion of choices, accounting for 39.8%, the proportion of “within 30 minutes” is 32.4%, the proportion of “1-2 hours” is 21.2%, and the proportion of “more than 2 hours” is 6.6%, respectively. It shows that the exercise time of the residents surveyed is generally maintained within 1 hour, and the relative exercise time is short.

“Outdoor fitness venue” is the most common sports venue near the residential area investigated, accounting for 31.1% of the total selection, followed by “outdoor fitness path”, accounting for 26.5%, and “school sports venue”, accounting for 13.0%. Most of the above are the outdoor venues and facilities provided free of charge to residents for fitness activities. The venues with small proportion are chosen, such as “indoor fitness club”, accounting for 9.4%; ball venues, accounting for 7.2%; chess and card venues, accounting for 6.4%; swimming venues, accounting for 4.7%. Most of these venues and facilities are sports venues that can be charged in daily life.

Community public sports venues are the main places for residents to develop community public sports facilities, and the vast majority of residents also affirm this point. However, people’s demand for fitness is increasing, but community public sports resources are relatively scarce, and the gap between the two is obvious. In the questionnaire survey, 37.54% were very unsatisfied and unsatisfied, and 4.78% were satisfied with the community public sports facilities, which indicated that most of them were unsatisfied with the community public sports facilities. In addition, in the column of “Types of Facilities Wanted to be Increased”, most residents choose ball games venues, indoor sports venues, and indoor swimming pools.

Moreover, the hope of increasing the types of facilities is closely related to the age. Middle-aged and young people aged 25-49 want to increase the facilities of badminton courts, basketball courts, football courts, swimming, tennis and other activities, while middle-aged and old people over 55 tend to indoor sports rooms and quiet outdoor fitness venues.

3. Methodology

3.1. Investigation and analysis of residents’ demand for public sports facilities in central district

In this questionnaire survey, 232 residents choose “not fixed, exercise when having time or thinking of it” weekly, accounting for 25.8% of the total. These people do not have a fixed time for physical exercise or a firm sense of physical exercise. The proportion of people who choose “5 times a week” and “3-4 times a week” is 24.3%, the proportion of people who choose “1-2 times a week” is 20.6%, and 5.0% chose “never exercise”.

Residents’ exercise time maintained in the period of “30 minutes to 60 minutes” had a higher proportion of choices, accounting for 39.8%, the proportion of “within 30 minutes” is 32.4%, the proportion of “1-2 hours” is 21.2%, and the proportion of “more than 2 hours” is 6.6%, respectively. It shows that the exercise time of the residents surveyed is generally maintained within 1 hour, and the relative exercise time is short.

The current situation of public sports facilities in Jinan is as follows: the systematic layout mode of city - district - community, the insufficiency of the total amount of public sports facilities at city-level and district-level, and the lack of them at district-level and residential district-level. Some large-scale public sports facilities have been built earlier, and 11 of them are located around Quancheng Square. In recent years, the speed of urban transformation has accelerated. The urban framework extends tens of kilometers to the East and West. There are a large number of residents outside the Second Ring Road. The service radius of the public sports facilities located in the center of the city cannot effectively cover the fringe urban areas. There are more schools at all levels and all kinds of schools in the city, serving students with more sports facilities. They cannot make efficient use of sports venues, and are basically not open during holidays. Public sports facilities and educational resources have not played a better coordination and collaboration effect, and the benefits of sports facilities within educational resources have not been maximized.

4. Result analysis and discussion

4.1. Ideas and principles of layout optimization

The combination of space factors is also an important reference factor for the layout of urban public sports facilities. It is necessary to pay attention to the interac-
tion between them. For urban residents, they can use public sports facilities more conveniently and enjoy a good environment, which can undoubtedly achieve the effect of improving the efficiency and quality of use, and is also beneficial to the value-added of the environment. Planning and layout of public sports facilities at different levels should take into account the business, green space and leisure and recreation around the city, and make full use of its gathering role in popularity, so as to promote the development of the surrounding areas, thus ensuring the formation of public activity centers.

The actual facilities should be set as centralized as possible to ensure the smooth formation of public sports facilities, while the planning and layout of district-level public sports facilities should be comprehensive settlement formation. The layout should be relatively centralized as far as possible, the establishment of community facilities should be balanced, and a reasonable network of layout shared by the whole people should be constructed. The situation of decentralized facilities and inefficient utilization needs to be gradually changed. Municipal sports centers and sports settlements at district and community levels should be built to meet the needs of citizens for multipurpose, group and long-term participation of public sports facilities. Further promote the development of sports undertakings, make efficient use of sports facilities, and make intensive use of urban land as far as possible, so as to create a typical symbolic urban form. The location of city-level public sports facilities also takes into account the convenience of citizens’ arrival. The layout of district-level public sports facilities should be within the jurisdiction of administrative management. Public sports facilities should rely on administrative management as far as possible to ensure the rationality of service radius and achieve comprehensive coverage and the balance of layout.

Close to the city main road is also the layout principle of city and district public sports. To ensure the service of public transport lines, and as far as possible to set the starting and ending public transport stations, it is also necessary to combine with the subway stations as far as possible. Being adjacent to the public space commercial, parks and service industries is also an important principle of the layout of public sports facilities, which is also an important guarantee to improve their efficiency and service level.

4.2. Layout optimization method
Whether the location of city-level sports center is appropriate or not is closely related to whether it can promote the development of the side and optimize and adjust the urban structure. The protection of ecological environment should be fully considered in the light of natural conditions, and the main roads and rail transit should be approached as close as possible to the city so as to combine with public transport lines. This is beneficial for people and vehicles to assemble and evacuate.

It is better to occupy the community-level land separately in sports facilities, but it is also feasible to dispose of the marginal and abandoned land and make use of it. However, these plans must be carried out within the allowable scope of relevant laws and regulations, and the acquisition of all land should conform to the procedures. Some unreformed old communities can also fully tap their potential, such as sewage treatment, waste gas treatment sites, buildings and some unused land that cannot be constructed. Contact with nature is an important purpose of sports activities, so when conditions permit, outdoor space should be guaranteed. It is also necessary to consider the combination of corresponding supporting facilities, such as culture and commerce. In the construction of facilities, it is necessary to integrate community administration, which is more beneficial to the later maintenance and management.

5. Conclusions
Starting from the analysis of theoretical knowledge, the current situation of public sports facilities in central urban area of Jinan City is analyzed, and various factors affecting the layout of public sports facilities are discussed. The strategies and methods of the layout planning of public sports facilities in Jinan City are summed up. Because of the different physical geographical environment, urban spatial structure and development trend, the specific layout models of public sports facilities at all levels are different in urban planning and construction, but the general principle is to give consideration to fairness and efficiency. Fairness and efficiency are two-edged swords, which should be referred to according to the actual situation. Excessive pursuit of efficiency will lead to excessive service radius and poor accessibility of urban public sports facilities; excessive pursuit of fairness will lead to small and scattered layout patterns, which will easily lead to idle waste.

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URBAN HISTORICAL LANDSCAPE CONSTRUCTION METHODS AND DESIGNS: THE CASE OF THE OLD TOWN OF JINGDEZHEN

Cui Dong

Abstract

With the rapid development of modern economy and the process of urbanization is faster, a large number of historical relics have been mercilessly destroyed in the urban reconstruction. In order to balance the contradiction between urban development and historical heritage and promote the harmonious development of new and old urban areas, it is necessary to research on the old urban areas from the perspective of historical landscape. Old urban area of Jingdezhen is taken as an example in this paper, the present situation of the reconstruction of the old city in Jingdezhen is analyzed. Then, by using the methodology of urban historical landscape, some specific methods for updating and designing the old urban area reconstruction of Jingdezhen is put forward, such as the elements of spatial form, urban texture, historical and cultural landscape elements, streets and alleys, the Changjiang River, public facilities and landscape sketches, and so on. A new design method of landscape transformation of old urban area is established. As the renewal method of respecting the urban history and cultural heritage is a very intelligent urban renewal model, it is found that the application of urban historical landscape in the old urban city is reasonable and effective, which is based on the development of the old urban area and pursues the coexistence of protection and development.

Keywords: Urban Historical Landscape, Urban Heritage, The Old Town, Landscape Design.

1. Introduction

With the development of global economy, many cities with long history and culture have demolished the old buildings and built a large number of high-rise buildings. Some modern architectural shapes and large building volumes are quite inconsistent with the surrounding traditional architectural styles, which have seriously damaged the original pattern and texture of city. In the process of urban renewal in full swing, some urban landscapes with special historical and humanistic values have posed new challenges to our landscape design concept.

Based on the study of urban historical landscape, the research takes Jingdezhen, the porcelain capital of China, as an example to propose a novel method of holistic protection for the renovation and renewal of the old city. This paper mainly uses field investigation and case study methods. Firstly, it starts with collecting relevant data, collates and analyses a large number of data, comb out the relevant theories of urban historical landscape and relevant practice cases at home and abroad. Secondly, it takes Jingdezhen as an example to study the ancient kiln sites and ancient buildings in the old urban area of Jingdezhen, China. From the perspective of urban historic landscape, this topic cognizes urban heritage from the perspective of landscape, breaks the previous design that the transformation of historic old urban areas concentrates on the physical level of ancient buildings, ancient streets or ancient folk houses, and puts forward a new idea of the integration of urban historic landscape and urban development, aiming at exploring a high-speed way. The way of sustainable development of urban historical and cultural heritage under the background of urbanization construction. Taking Jingdezhen as an example, it analyses the material elements in the existing elements of Jingdezhen’s historical landscape, including ancient residential buildings along the river, ancient buildings, lanes, public facilities, ancient wharfs, and analyses the problems existing in the transformation and protection of the old urban area of Jingdezhen. Then, from the perspective of urban historical landscape, the elements of ceramic historical landscape in the old urban area of Jingdezhen are deeply excavated, and the urban historical landscape is put forward. The methods of landscape design in Jingdezhen Old Town is discussed, which points out the direction for the reconstruction of old urban areas in historical cities in the future.

In the proposed technique, the old town conservation and renewal of the landscape should be on historical heritage of every stage in the laminated into consideration, and the old town of landscape design is based on the dynamic development of city, rather than curing in a certain historical stage. The research of historical landscape of city development, old city historical landscape elements, the design principle and design method of building is put forward.

2. State of the art

“Urban historical landscape” is a new theory that has been emerging gradually in the field of cultural heritage protection and urban planning in recent years. The theory is put forward and carried out by the UNESCO, which is a holistic approach that can be used to guide historical cities in the face of the contradiction between protection and development. The method of urban historical landscape is based on the
recognition of the dynamic development of the city. Therefore, it surpasses the previous concept of urban protection in many aspects, and mainly shows as follows: It breaks the boundary between the previously protected historical urban areas and other urban areas and regards all urban environmental unity resulting from historical accumulation as urban heritage. At the same time, in terms of means, the protection of urban heritage is no longer confined to the protection of historical urban areas and the surrounding buffer zones and is included in the broader framework of urban development.

In the Recommendation on Historic Urban Landscape, adopted by General Conference of the UNESCO on November 10, 2011, urban historical landscape was defined as: it is an urban area that has accumulated cultural and natural values and attributes in history, which goes beyond the concept of “historical center” or “administrative region”, including a wide range of urban context and the geographical environment. In May 2005, the term “urban historical landscape” was first introduced in the Vienna Memorandum. In November 2011, the term was formally proposed in the Recommendation on Urban Historical Landscape; In June 2013, the method of protecting the historic landscape of the new city was gradually recognized in New Life for Historic Urban Landscape — Specific Methods of Protection of Urban Historic Landscape. The three documents published successively by the UNESCO are the basic process documents for the study of the continuous construction and development of its theory for more than a decade. There are many practical cases abroad, such as the preservation of historical landscape architecture in Savannah, a small town in the United States, the palaces and parks in Potsdam, Germany, and the digital development of urban historic landscape in Balarat, Australia, and so on.

At present, the related studies in China mainly focus on the concept and connotation of historic urban landscape, and the related practice is gradually carried out. Domestic research results mainly focus on the introduction of the concept of historical landscape of international cities, as well as a summary of similar studies on the landscape evaluation, evolution and conservation planning of historical cities in the past. It is suggested that it should be used for reference and applied in the protection and management of famous historical and cultural cities in China. The innovative points of the concept of urban historical landscape should be excavated and summarized. Since 2013, the study of urban historical landscape in our country had put more emphasis on practicality. A large number of cases of historical city protection emerged with the theory of urban historical landscape to try to use theory to guide practice and make practice nurture theory. On the one hand, more researches on the urban historical landscape are theoretical, but only a few papers are specific to the transformation of the old town of Jingdezhen. For example, the paper of Preservation of Ancient Xiangyang City from the Perspective of Historical Landscape (Yalan and Pingle 2013), a study on Sustainable Overall Protection of Streets from the Perspective of Historic Urban Landscape: a Case Study of the Conservation Planning of Famous Cities in Jiaxing, A Study on the Historic Landscape Organization of Nanchang City in Ming and Qing Dynasties. The Riverfront Landscape Design Under the Historical Environment of the City: Taking the Riverside Landscape Design of the Central Ferry Crossing to the Capital of the Changjiang River in Jingdezhen as an Example, Study on the Historical Evolution and Causes of Urban Landscape System in Duijiangyan, research Progress on Ecological Effects of Urban Landscape and Its Patterns, and so on. On the other hand, the domestic practice cases focus more on the protection and renewal of the ancient buildings in the old urban areas, and are short of research on the historical old town from the perspective of urban historical landscape.

3. Analysis of the present situation and problems of the old town in Jingdezhen

Located in the south of the Yangtze River, known as “Xiong Town in Jiangnan”, Jingdezhen has a long history and splendid culture. In history, Jingdezhen as well as Foshan Guangdong, Hankou Hubei and Zhu Xian Town Henan and was called China’s four famous towns. It was announced by the State Council as the first batch of national historic and cultural city in Jingdezhen in 1982 that located in the middle of the Changjiang River. Historically, Jingdezhen porcelain exports reached more than 90% in dependence of the Changjiang water transport, through Poyang Lake to Juijiang, then to the world. Jingdezhen was a five-sided metropolis, people from all sides came to Jingdezhen to make a living, do business and settle down. Therefore, Jingdezhen had an appellation of “eighteen provinces”. Because of the different customs, the styles and tastes in the building were various. Cultural Relics of Jingdezhen 361 recorded various types of folk traditional buildings in the book, which were divided into three categories: ancient porcelain kilns, ancient kilns and ancient workshops. The ancient houses, porcelain houses, firewood shops, halls, temples, fence gates, docks and blocks, etc. formed the present old town. At present, the renovation of the old town is mainly carried out by radiation from the Imperial Kiln Factory. The government has protected and repaired the eastern side of Changjiang River, the north of Jingdong Avenue, 300 meters to the south of Zhejiang Road and the total urban area is 2.4 square kilometers. Relied on the scenery zone of Changjiang, the overall planning of the historical district builds the functional areas with Imperial Kiln as the core, with the characteristics of traditional culture, characteristic commerce, youth entrepreneurship. Nevertheless, there are still some problems in the overall renovation of Jingdezhen’s old town, which include the chaotic land functions and backward infrastructure, lack of environmental quality and historical continuity in construction and a large number of ancient buildings are out of repair and municipal facilities are not perfect.

4. Methodology

4.1 Protection of space form in old town

The old town of Jingdezhen is concentrated in North China Road, South China Road Zhongshan North Road, Zhongshan South Road along the east bank of Changjiang River, with a large number of houses, ancient workshops, and ancient kiln sites, Ming and Qing ancient buildings, and other rich ceramic historical and cultural relics. About the updating design of
Jingdezhen historical landscape, the first is to the protection of the space form of the old town. Urban spatial form refers to the spatial combination of various material elements on the overall level of the city. It includes the spatial layout, spatial form, spatial scale and other intuitive physical environment performance of the city itself.

There are typical characteristics in Jingdezhen, along with the development of ceramic handicraft industry. One is to build the kiln along the river and form the market along the kiln, which makes the wharf along the Changjiang River become an important zone. Second, the Imperial Kiln Factory has become the center of the old town; Third, the absolute dominant position of the porcelain industry in Jingdezhen makes the layout of the city not strict. For instance, the sophistication of kilns, blank houses, residential areas, porcelain shops, guild halls, and so on, forms a lot of hutongs. Firstly, with the respect for the traditional industrial layout characteristics of Jingdezhen, it is divided into three major thematic function areas to protect the space form of the old town, such as the section of combining production with life, the section of ceramic production exhibition area driven by the Imperial Kiln Factory and the section of combining production and commerce. The east side is based on the historical relics of kiln work of Ming and Qing dynasty and traditional kiln work of grape vines. The center relies on the Imperial Kiln Museum, forming a display section of ceramic production. The west side depends on the traditional commercial street of Zhongshan North Road. The characteristics of traditional shops are continued through the east-west traditional streets and lanes and series of traditional workshops, shops and other historical relics.

4.2. Analysis and inheritance design of landscape texture of the old town

In the landscape design of urban historical environment, the texture characteristics of the original section are repeated and inherited to a certain extent to extend the texture of the site. As a part of Jingdezhen city, the historic district of Jingdezhen is influenced by modern buildings and streets. However, there are still many historical information and historical relics in the historic urban area. The texture of the historic city and the texture of the modern urban area intersect and interact with each other. The urban structure changes with the road system and has an important impact on the formation of urban texture. Because of the demand for water in the porcelain industry and the demand for drinking water in people’s daily lives, the old town of Jingdezhen is built along the Changjiang River. Therefore, both sides show a narrow layout along the Changjiang River, and the road system is also dominated by the north and south longitudinally. The markets lay in the direction of east and west horizontally. The historical block around Mashi Alley, Dajia Alley, Zhongshan South Road and East Road along the river is about 300m wide, 600m deep and the total area is about 18ha. As a result of a single business model, most of the land is centrally distributed. From the point of view of urban texture, the urban texture of the western historical urban area has been formed and is closely related to the central people’s square of the city. The continuation of urban texture to the eastern modern urban area must pass through Pearl Mountain Central Road and People’s Square. Therefore, Pearl Mountain Central Road and People’s Square are important nodes for the continuation of the urban texture in the old town of Jingdezhen. The urban texture of the eastern modern urban area has developed rapidly. The historical landscape of the city should protect the old town. More importantly, it is necessary to link up with the central areas and to extend the historical urban areas.

4.3. Systematic design of historical and cultural landscape elements in old towns

The old town of Jingdezhen is different from other cities. It is closely connected with the ceramic industry and has many unique architectural forms related to the ceramic industry. It should be rehabilitated at the same time as it is restored, and the special history of Jingdezhen should be reshaped. To protect the overall landscape of the old town, the emphasis is on the protection and systematic planning of all kinds of landscape elements bearing historical information heritage and reflecting the landscape characteristics, including the road of alleys, spatial layout features, natural environment features, architectural group characteristics, building houses, roads, bridges, walls, retaining walls, yards, drains and the greening systems of ancient trees and famous woods, which should be carefully studied and redesigned in order to make the historical landscape continue. In addition, it is necessary to protect and utilize the historical and cultural connotations of the old town, such as the social structure, the lifestyle of residents, folk customs, traditional commerce and handicraft, and so on.

4.4. The revival design of the alley landscape in old town

The innumerable alleys along the river form the special urban layout in Jingdezhen’s old town, which also gives rise to a unique alley culture. Jingdezhen lanes is important historical and cultural heritages of Chinese ceramics (Jianguo and Zhipeng 2001). Most of the alleys have no shops, only have households. The real street contains the front street, back street, chinaware street, silk street, etc. Many alleys in Jingdezhen are named after their surnames, such as Bi Jia Alley, Jiang Jia Alley, Peng Jia Alley, Fang Jia Alley, Zhan Jia Alley and so on. The main types of buildings in old alley are houses, shops, clubs, porcelain workshops, kilns and so on, where are the products of the most local characteristics of porcelain capital, and are more special and abundant than other cities. The old alleys that witness the change of the porcelain capital for thousands of years are one of the essences of the culture and charm of the porcelain capital. The origin and architectural characteristics of the old alleys are closely related to the porcelain industry. To protect and make good use of the old alleys is conducive to the protection of ancient buildings, the inheritance of Jingdezhen characteristic architecture culture, the inheritance of millennia porcelain and historical folk culture, the promotion of porcelain capital regional characteristics, and the continuation of urban context. The main practice is focus on repair of some features. In order to make residents live in it better, we should renovate the basic facilities such as residential buildings, roads, water supply and sewerage and other infrastructures. Maintaining the life style of alley characteristics can achieve the purpose of inheriting the alley culture vigorously.
4.5. Construction of regional waterfront landscape design of Changjiang River
In the historical landscape protection, people habitually protect and transform the important ancient buildings, ancient ruins and ancient streets, and less protect their surrounding environment and natural landscape. The natural landscape is a part of the historical landscape of the city. Changjiang is the foundation for the production and trade of porcelain industry in Jingdezhen and the lifeblood of the porcelain capital for thousands of years, so it has the reputation of “thoroughfare of Changjiang”. The porcelain of Jingdezhen can be transported from Changjiang River to Poyang Lake, then to the north and south to the world. The advantageous transportation advantage of Changjiang ensures the splendor of Jingdezhen, a thousand years’ porcelain capital. Therefore, it is very important to design the waterfront landscape of Changjiang River.

The waterfront landscape design under the historical environment is different from the previous greening design of river course. The design should pay more attention to the analysis of the historical environment and the present condition, so as to continue its historical context and give full play to its urban function in the development of the modern city. For the landscape planning and design along the Changjiang River, we should make full use of the ancient buildings, historic wharves, ancient kilns and waterways to create scenery along the river, add some ceramic culture, reproduce the historical landscape effect of that year, and form the most dynamic open space. For example, the historical wharf “Li Shi Du” and Sanlu Temple, Yanbo Tower and West Estuary on the opposite bank of Changjiang River are used to reconstruct the historical landscape effect of Li Shi Du and form the landscape node of “two rivers view Yanbo at night” and “the West Estuary and Changjiang River converge at night”.

4.6. Create public facilities and landscape sketches with ceramic characteristics
Like many famous historical cities, the ancient age makes the basic public facilities backward in the old town of Jingdezhen. Some leisure public facilities and landscape sketches with ceramic characteristics are put in the old town in order to improve the landscape environment quality of the areas. The material that is small as a porcelain chip, a garbage can, or large as a landscape wall, can be the carrier to convey the city’s historical memory. It is of great significance to form the landscape with regional characteristics and inherit the ceramic civilization of Jingdezhen by integrating ceramic elements into public facilities and landscape sketches of the old town. For example, the lamps and lanterns, leisure seats, cultural walls and trash cans in the old town can be redesigned with ceramic elements, colors and shapes to embellish the ancient landscape environment of the old town and create a space atmosphere with traditional cultural characteristics.

5. Conclusion
The long historical and cultural connotation and the national individuality accumulated over thousands of years, which have formed a unique national life tone and style. The transformation of the old city all over the world has destroyed the historical relics, historic sites and overall historical features and other material heritage. Some traditional ways of life and communication have also been lost because of the loss of the living environment in this era. The urban historical landscape admits that the dynamic change of the city is not simply to prevent the development and refuse to develop, but to plan the direction of the development of the city actively. The changing speed, content and scale of the city are under control according to the characteristics and value of the city. At the same time, in addition to protection, the historical landscape of the city must be clear about the value of the existing urban landscape and must retain the important characteristics to formulate the direction of development. Therefore, on the basis of recognizing the dynamic development of the city, it is believed that the protection of urban heritage is no longer limited to the protection of historic urban areas and surrounding buffer zones, but to bring the protection of urban heritage into a broader framework of urban development. Combining with the theory and method of urban historical landscape, this paper studies the landscape design of the old urban area, and holds that the object of the transformation of the old urban area should be all the urban heritage, which is a feasible way to protect the urban heritage and to develop the city.

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INNOVATIVE METHODS IN PLANNING, DESIGN AND LIGHTING OF MUSIC VISUAL BUILDINGS IN MODERN ARCHITECTURAL.

Kun Sui, Hyung-Gi, Kim

Abstract

Based on the analysis of the data of the landscape live performances which have already been performed, this paper combs the development process of the live performances and other information of the performance types so that the public can have a clearer and clearer understanding of the live performances. Through time-frequency domain analysis method, the characteristic elements of waveform music are extracted and classified into sub-music segments in different rough emotional domains according to certain classification methods. And the application weights of the feature values of each music feature are defined in different emotion domains, which makes the input of the system more rational. For the output of the light action control data, this article has a certain interpretation of the DMX512 data, making the interpretation of the output more intuitive. The basic characteristics of music include speed, mode, beat, tone, volume, and the pitch, pitch, and length of notes. Therefore, in the future, the method of realizing music visualization in architectural lighting design and the method of realizing interaction with people will have more possibilities.

Keywords: Building, Music, Scale.

1. Introduction

Many architects of the Renaissance had multiple identities, such as Michelangelo, a sculptor, painter, and architect. He tends to think of architecture as a sculpture with internal space. We think that the design of the performing arts hall should reflect the strong cultural atmosphere of Hubei Normal University. As a kind of architectural lighting design originated from stage lighting design, it can also visualize the abstract music art through the change of lighting. In order to better render the atmosphere of the architectural space, give the building space new life and spirit. But this is not the cross-border design we’re talking about right now, it’s the “spillover” of the architect’s own hobbies or unconscious designs (El-fakdi, Cufí and Hurtós 2016). After the industrial revolution, people’s work demands increased, different types of work were refined, and intangible boundaries between industries were drawn. Everyone can design their own rules to decompose, analyze music, decompose and translate music scores (Mussone, Matteucci and Bassani 2013).

As early as the end of the 19th century and the beginning of the 20th century, the famous drama artist and stage artist Apia, who was active in Europe, once said that the rhythm and subtle changes in music can be expressed through the light. Light can transform music content into what visuals can feel (Shuang et al. 2013). Performing architecture, especially the cultural center of the concert hall and opera house, is often used as an iconic building in the city. The performance hall is the most important part of the performing arts architecture, not only to meet the visual requirements, but also to improve its acoustic function (Assayed, Chenoweth and Pedley 2014). Different design methods and rules can get different experimental results and results. This kind of experiment is pioneering and full of unknowns, and has no idea what kind of visual results will be obtained before the experiment is carried out.

Ancient Greek philosophers believed that vision was connected with reason and hearing with soul. Traditionally, music belongs to the ear and is the art of experiencing beauty through hearing. Visualization of music can open up new channels for appreciation of art (Ting et al. 2015). Therefore, both in the past and now, there are many artists and designers trying to visualize music in order to bring people more infectious works of art and design. Abstract art school can become the focus of art theory and aesthetic concern is derived from the development of modern art. Kandinsky, the founder of the theory and practice of modern abstract art, called the role of the “inner” factors in the works he experienced as “the soul of the artist” (Duvernoy 2015). By establishing mapping rules for music and lighting, it will help to achieve better consistency of sound and image changes. At the same time, the effect of the work can be quickly updated, and the aesthetic experience of the people can be improved while maintaining the freshness and vitality of the architectural space.

In this paper, we propose a new method of lighting planning and design based on modern architecture.

In summary, our contributions are as follow:

1). This method is a new method based on modern architectural lighting planning and design aiming at the innovative problems of music visual design method.

2). This method is widely applicable in the environ-
ments that continue to stabilize the sound.

perception and visual perception. Altintas 2014) believes that the aesthetic experience and cultural patterns. Wang J et al (Jianwu, Crawl tourist attractions come to promote their specific identity and change cultural forms. At the same time, the owners of products as the real experience. Wang G et al (Cheng et al. 2014) classifies song and dance performance tourism as the real experience. Wang G et al (Gaohui and Sherong 2014) mainly considers the cultural performances of some tourist attractions at home and abroad from the perspectives of anthropology and sociology, which is not only a way to integrate or mix cultural forms. At the same time, the owners of tourist attractions come to promote their specific identity and cultural patterns. Wang J et al (Jianwu, Crawl and Altintas 2014) believes that the aesthetic experience of human voice is the synergy between auditory perception and visual perception.

3. Pure visual form of modernist architecture

The compression of space and time will make people feel alienated. The meaning of human existence originates from the “depth” of history. Once this “depth” is planarized, people will have a sense of floating, and the meaning will be lost. Secondly, after visualizing the music, the visual graphics incorporate the relevant elements of the music, and the visual effects themselves will be more rhythmic and bitter. In the famous creed of the modernist master Le Corbusier, “Architecture is a skilled, precise and magnificent performance that assembles many body pieces under the light". This is an eye building.

Some Chinese instruments continue to stabilize the pitch of the pitch range, as shown in Table 1.

Musical art and lighting art are both abstract expressions, if we cannot establish a rational and regular relationship between the two abstract forms of artistic expression. Each round of visual music design process will mean a new artistic creation, the time cost and the design level of the designer is higher; do not have the possibility of rapid update. After all, no matter how good the design will cause people to experience aesthetic fatigue in the long-term repeated display process, thus reducing the attractiveness of the building space.

4. Building is solid music, music is a flowing building

Cross-border is composed of two different types of art, each with its own characteristics but with a certain connection inside. Designers and artists can switch between different fields, so that two or more kinds of art can be transplanted and collided. Fusion. It is relatively easy to cross the boundary between music and architecture because there is a roughly identical “structure” between them. Music is the framework of time. It is an art with continuity of time, rhythm and dynamic appreciation. In general, experiments are considered as preparatory activities for exploring some results and purposes. From the point of view of artistic creation, experiment is a kind of creation. It is an exploration under the premise of uncertain final shape of artistic products, or the formation of dimensional artistic views and ideas, but not before the exact exploration.

According to popular preferences, the partition weighting schemes of the musical feature elements used in this paper in different sentiment domains are shown in Table 2.

Wavelet transform belongs to the analysis method in time-frequency domain. This method solves the disadvantage of using uniform resolution for high and low frequency in FFT method. By determining the bandwidth of the bandpass filter and the center frequency of the parameters to meet the requirements of high and low frequency using different resolutions. The fast decomposition algorithm of Mallat is as follows: EQ1

<table>
<thead>
<tr>
<th>Musical instruments</th>
<th>Music number</th>
<th>Play the serial number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trance</td>
<td>62</td>
<td>30</td>
</tr>
<tr>
<td>Trumpet</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>Vibes</td>
<td>65</td>
<td>35</td>
</tr>
<tr>
<td>Guzheng</td>
<td>54</td>
<td>25</td>
</tr>
<tr>
<td>Guqin</td>
<td>47</td>
<td>22</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strength weight</th>
<th>Time weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flick</td>
<td>0.54</td>
</tr>
<tr>
<td>Cheerful</td>
<td>0.61</td>
</tr>
<tr>
<td>Castle</td>
<td>0.31</td>
</tr>
<tr>
<td>Low</td>
<td>0.21</td>
</tr>
</tbody>
</table>

Among them, BH and E represent the impulse response sequence of lowpass filter and high pass filter respectively.
The relationship between BH, n, and f and the key length is shown in Table 3.

The practical significance of music visual design activities is mainly reflected in two aspects, one is to improve the quality of life, and the other is to provide a more aesthetically pleasing environment. If the time cost of the music alone is huge, the vision is a spatial-based perception. Space expansion through continuity and repetition, reflecting the rhythm of the building, can also be virtual and solid, dense, high, and low, advance and retreat, interval, undulation, these modeling techniques. Just like the prelude, expansion, gradual strengthening, climax, repetition, and rest in music, it can give people a rhythm of resonance.

5. Conclusions
This exploratory concept design only designs the mapping relationship between several important features in music and architectural lighting, thus realizing the visual expression of music in architectural lighting design. When buildings lose their plasticity and are connected to human language and wisdom, they are isolated in the cold, distant visual realm. In order to bring the relationship between architecture and people closer, the designer makes the building no longer a hollow vessel, but the purpose of living a black box that can remember and preserve the time and space in which people live. This study only hopes to take this exploratory conceptual design as an example to explore the future thinking of researchers and designers in related fields, and to inspire their future research and design work. It is hoped that more researchers and designers will establish more scientific, rational, and creative mapping rules between architectural lighting and the basic characteristics of music in the future. It produces more and more interesting music visualizing works in architectural lighting design.

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1. Introduction

With the rapid development of economy, the cultural boundaries of different regions are gradually broken, making different cultures show the trend of integration (Bartosik and Wiak 2016). At the same time, the design based on regional culture is also changing, and the convergence of design styles is becoming more and more serious. Regional research of design has gradually become one of the main trends in the development of industrial design. Integrating cultural elements and connotations into the design to enrich the cultural temperament and regional characteristics of the design is the inevitable development of instrumental culture, and at the same time, it will also drive the renewal of conceptual culture and institutional culture (Xu, Wang and Grant-muller 2017).

In this study, according to the combination of cultural ontology research methods and regional design methods, through the overall induction and classification of Chongqing regional culture, the typical Chongqing elements are selected as the basis of operation. Then according to other regional characteristics, its superior resources in the design of rail vehicles are further explored, the elements are refined into new designs, and the appearance design and color matching that meet the current needs are completed in the harmony between traditional culture and the flavor of The Times (Moreno, Blessing and Yang 2016). The research methods used mainly include cultural ontology research methods, case study methods, regional design concepts and literature research methods.

The major innovation of this study is that it takes the regional cultural design of Chongqing city as the research object, combines the cultural ontology, semiotics and design techniques, and tries to summarize the cultural connotation through the overview of product attributes and general industrial products. Now, cultural connotation has become an important means to enhance the added value of products, and culture is one of the factors that designers must consider.

2. State of the art

From the perspective of foreign rail vehicle design, German’s high-speed train design is full of rational and pioneering traditional cultural elements. Indoor colors generally use the colors like bright yellow, bright orange, dark green, and bright blue, which are favored by citizens, emphasizing that individuality must serve commonness (Bykadorov, Kibalov and Kin 2017). The design of the tram in Marseille, France, can make people feel its local meaning clearly, and fully show the characteristics of the ancient seaport. The front is like the bow of a moving ship, and the interior seat design creates a sense of navigation. Based on the consideration of identification system, the head light of line T1 is green, line T2 is yellow, and line T3 is red (Burke 2016).

The interior environment design of China’s high-speed train cabin integrates a large number of traditional Chinese cultural elements, matches the same color in low purity and concentration with light color, and pays attention to cool colors, so as to create a simple, warm and transparent indoor environment. In the overall layout, it pays attention to the orderliness and symmetry, pursues the unity of partial decoration and overall style, creates a sense of natural harmony, and reveals a strong sense of traditional culture (Ferreira and Bricker 2016). In the design of side walls, floors and columns of Chengdu metro, each station has its own unique style. For example, the overall design of Jinjiang hotel station is mainly in red color, interspersed with various colorful lines, and “Sichuan figured satin”, “loom” and other elements...
Table 1. The “nine line” theme of track traffic in Chongqing.

<table>
<thead>
<tr>
<th>Line</th>
<th>Cultural theme</th>
<th>Present element</th>
<th>Theme color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Harmonious landscape</td>
<td>The cultural epitome of</td>
<td>Pomegranate red</td>
</tr>
<tr>
<td></td>
<td>local custom</td>
<td>Chongqing</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Bai Ye culture</td>
<td>The long history and</td>
<td>Forest green</td>
</tr>
<tr>
<td></td>
<td></td>
<td>culture of Chongqing</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Ordinary people</td>
<td>Civic culture</td>
<td>Gray blue</td>
</tr>
<tr>
<td>4</td>
<td>Society</td>
<td>Open and freely</td>
<td>Fresh orange</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chongqing</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Introduction of</td>
<td>The classic story of</td>
<td>Light green</td>
</tr>
<tr>
<td></td>
<td>Chongqing</td>
<td>Chongqing</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>The natural landscapes</td>
<td>The epitome of Chongqing</td>
<td>Dark green</td>
</tr>
<tr>
<td></td>
<td></td>
<td>landscape</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Gathering together</td>
<td>Representative historical</td>
<td>Sea blue</td>
</tr>
<tr>
<td></td>
<td></td>
<td>figures of Chongqing</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>The ancient town</td>
<td>Protection and change</td>
<td>Apple green</td>
</tr>
<tr>
<td></td>
<td></td>
<td>of ancient town</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Folk culture</td>
<td>Intangible culture of</td>
<td>Purple</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chongqing</td>
<td></td>
</tr>
<tr>
<td>Circle line</td>
<td>Chongqing memory</td>
<td>The historical penetration of old Chongqing</td>
<td>Lemon yellow</td>
</tr>
</tbody>
</table>

are integrated into the decoration design, reproducing the weaving process of ancient Sichuan figured satin. In the decoration design of the end wall and side wall of Hangzhou metro, a variety of Hangzhou landscapes, auspicious patterns and textures with local characteristics are used to fully show the characteristics of Jiangnan. In the design of armrests, flying rings, seats and visual identification system, the colors and shapes of flowers are integrated into the design, which reflects the intimate geographical and cultural sense of Hangzhou (Lin and Liao 2016).

3. Methodology

3.1. The application of Chongqing regional cultural elements in rail transit

Regional culture includes dialects, folk customs, beliefs, nationalities, immigrants, food and architecture, etc. Based on whether the historical origin, regional characteristics and cultural types are developable, typical regional cultural resources in Chongqing can be summarized as follows: three gorges culture, Ba culture, immigrant culture, anti-Japanese war culture, Hongyan culture, national culture, intangible cultural heritage, Natural and cultural landscape, food and hotpot culture. These regional cultural resources should be based on the preconditions of Chongqing regional cultural rail transit design research, so as to analyze the current situation and find the entry point of design.

As a historic city with a long history of culture, Chongqing has also integrated a variety of regional cultural elements in the construction of rail transit. “The nine lines and one ring” railway line in Chongqing follows the policy of “one line, one theme” and “one line, one scene”. Each line creates a cultural landscape line with prominent themes, which together present a complete impression of Chongqing, as detailed in the table 1.

For example, the indoor graffiti area of the tomb station of line 1 ranks first in China. The large-scale graffiti with a clear theme is also the first in the country, which expresses some specific natural elements from the side. Specific elements such as Gele mountain, dove, pine forest, eagle and kite fully express the cultural theme of “fly freely”.

3.2. The basic form of regional design

Regional design should not only find the appropriate entry point of design, but also consider whether the product is matched from the structure, function, material, color, shape, process and other aspects of the product. It should comprehensively consider regional factors, so that the rail vehicles based on Chongqing’s regional culture can meet the needs of regional consumer groups and estimate their application prospects.

Regional design has two fundamental tasks. One is to express regional characteristics, carry forward traditional culture, and fully explore and express the typical local cultural types and historical evolution. The second is to meet the needs of regional environment and service regional society based on the local regional characteristics, especially the local unique ecological environment. Its basic forms of expression are “going out” and “blending in”.

3.3. Matching of function, performance, color and shape

In terms of function and performance, it is to distinguish how the function matches the requirements. As a public service facility, rail transit must fully consider the needs of local people. The performance of the product is the same as the satisfaction degree of the requirements and the functional requirements of the product. In terms of performance, it must fully consider the local natural environment.

Color is the “coat” of rail transit. China’s rail transit has not been able to form a scientific and orderly contrast relationship. Color is an untapped target. The structure color, spatial visual color, modeling color and multifunctional use of rail transit are the necessary components of the image design of rail transit.

The matching in modeling is mainly based on the masses’ aesthetic orientation, living habits, thinking mode, value criteria, mental outlook and other psychological perspectives. In a specific living environment, the customs, cultural psychology and aesthetic concepts formed by people have a great impact on their hobbies and requirements for things, as well as the product style design. Take the interior decoration of the rail transit as an example, because Chongqing city has many mountains, bridges and tunnels, and the terrain fluctuates greatly, it is more suitable to choose the curved surface modeling and staggered undulating texture that fit the psychology of people in Chongqing.

4. Result analysis and discussion

4.1. Design concept

Combining the connotation of human culture and the characteristics of natural environment, the design elements are extracted from the historical, cultural relics and traditional decorations of Chongqing. The overall idea is: beautiful lines, square with circle, circle with straight line, elegant and graceful, full of life rhythm. Perceptual vocabulary of Chongqing city: leisure, ancient, fashion, mountain city.
Any single product conveys a certain meaning to people, and rail transit has the same function. However, the semantic meaning of Chongqing’s regional characteristics conveyed by one or two models of numerous rail transit vehicles is weak for the entire public facilities system, which can’t highlight the regional characteristics of Chongqing in the design of the entire subway station public facilities system. It can be imagined that the regional characteristics of Chongqing rail vehicle design should be completed by all the components of this system. It can not only highlight the regionalism of the design, but also highlight the regional culture, and the whole track system can make people more impressive, such as defining the impression perception of urban vocabulary, so as to enhance people’s cognition and emotion of the symbolic elements of Chongqing in the design. Rail transit vehicle design is different from general products. Although it can appear in front of people in a separate way, as an important part of the overall construction of rail transit, it should be a system that coordinates and unifies with regional culture. And this is precisely a shortcoming in the design of Chongqing rail vehicle design construction. Therefore, designers are obliged to make necessary research on the design and construction of Chongqing rail vehicles. Urban color is simply the overall color of urban architecture. To some extent, the urban color also reflects the historical context and its development. The dominant tone of Chongqing’s building is compound gray, and the overall tone is relatively light and gray, making people feel elegant and soft, just like the “light makeup” carefully painted by women. This kind of color collocation just tallies with the taste of historical famous city and also reflects the leisurely and calm urban character of Chongqing. The determination of urban tone is greatly affected by the local climate. It is precisely because Chongqing is located in the subtropical monsoon humid climate that the basic tone of folk dwellings in eastern Sichuan is gray and black.

4.2. Appearance design
The characteristics of traditional culture in Chongqing are summarized to find typical cultural symbols. Dazu stone carving is a religious rock carving in the late Tang and early Song dynasties and is an important part of China’s stone carving art. It is the world intangible cultural heritage and represents the extraordinary wisdom in that time. Combined with the Dazu stone carving and the natural landscape form of the mountain city, the characteristic line relationship of the Buddha statue and the form of the free interpenetration of the mountain city landscape are delineated. The symbolic shape is extracted for optimization, deformation, and redesign, so that it becomes a typical shape and line. Finally, the symbolic elements are applied to the locomotive design of Chongqing rail transit. It clearly conveys the heavy features and echoes the rich features of Chongqing’s mountainous architecture, re-shaping the design of rail vehicles with regional characteristics. Chongqing people are enthusiastic, hospitable and forthright. The intent source of the locomotive shape is transplanted into the interior space design of subway, demonstrating the regional cultural characteristics. The design image of the seat end baffle comes from the petals of Chongqing camellia, while the whole handrail shape is like the mountain road, with smooth and soft lines. The grey color of the baffle adds a modern and novel overall effect to the subway. Seats are designed to make passengers more comfortable and prevent them from sliding when the vehicle is started and braking. The seat installation position, the size and height of each handrailing are strictly in accordance with the Chinese man-machine size design and fully meet the requirements of ergonomics to ensure the comfort and safety of passengers in the subway. The safety problems caused by passenger congestion are considered. The floor covering uses an overall color scheme that highlights the atmosphere and is easy to clean.

5. Conclusions
According to the design method of rail vehicles oriented to regional culture, a comprehensive study and induction of the local culture of Chongqing is carried out. And the typical symbols that match the local characteristics are extracted to make it more regional. The typical regional elements such as Chongqing Dazu stone carving culture are extracted, and then the key modeling symbols are found from these typical cultural symbols, and then they are simplified, deformed and redesigned. Finally, these elements are applied to the design of Chongqing rail transit. The lines of the car body are continuously refined to create the form of Chongqing light rail with regional cultural characteristics. According to these elements, the exterior design and interior design are carried out to make it a part of the rail transit system with regional cultural characteristics of Chongqing.
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RESEARCH ON THE CONSTRUCTION LAYOUT OF URBAN SPORTS PARK BASED ON CONSTRAINT GRAPH MODEL

Bai Li

Abstract
To study the spatial layout of urban sports parks, the constraint graph model was used to quantitatively analyze the construction of urban sports parks in China. At the same time, theories on the construction and development of urban sports parks and urban renewal at home and abroad were reviewed. The construction status of urban sports parks in China was systematically studied. Foreign case cities were investigated. Finally, the case cities in our country were discussed. The results showed that in addition to the influence of certain policies and economic factors, the development of sports parks was affected by factors such as urban space development, population size and living distribution, urban culture, regional environmental characteristics and the layout of original sports resources. Therefore, the impact of the above factors should be considered in the development of sports parks and their spatial layout. The layout of the sports park should be balanced to meet the diverse needs of the residents.

Keywords: Urban Sports Park, Spatial Layout, Constraint Graph Model.

1. Introduction
More and more cities begin to build sports parks. However, the concept of sports park and its type, scale and characteristics are not yet known and familiar to people. With the continuous advancement of the market economic system, urban sports resources have been promoted (Feng 2015). In a certain sense, the study of the spatial layout of urban sports parks is also the spatial optimization and reorganization of urban sports resources, so that they can maximize their benefits in their respective regions. The overall utilization efficiency of urban sports resources has been improved to meet the sports needs of different residents.

Through abstraction and simplification, an approximate characterization of the system using mathematical language is provided so that people can more deeply understand the object. The mathematical model is not a simple simulation of the real system. It is a tool for people to understand the real system and solve practical problems (Han 2015). The mathematical model is the result of refining, analyzing, summarizing, and translating the information of the real object. It uses mathematical language to accurately express the intrinsic features of an object.

In addition to the influence of certain policies and economic factors, the development of sports parks is affected by factors such as urban space development, population size and living conditions, urban culture, regional environmental characteristics and the layout of original sports resources. Therefore, the impact of the above factors should be considered in the development of sports parks and their spatial layout. With the development of mass sports, sports parks, as the main carrier of urban residents’ fitness, are playing an increasingly important role in the city. Therefore, the layout of the sports park should be balanced to meet the diverse needs of the residents. At the same time, the duplication and underutilization in the construction of sports parks were avoided.

2. State of the art
Wang et al. used economic geography theory to explore the general rules and basic principles of the spatial layout of urban sports facilities. The construction of sports facilities should consider market principles, traffic principles and administrative principles. All levels of cities should conduct sufficient scientific arguments when investing in the construction of physical and mental facilities. The overall development strategy of the city is rationally planned to improve the utilization of sports facilities and meet the sports needs of the citizens (Wang, Li and Yan 2016).

Vermeulen et al. proposed the concept of urban sports circles. The urban sports circle refers to a large-scale urban sports circle including urban areas, suburbs, and surrounding towns and villages. On this basis, the development model of urban sports circles and the spatial layout of sports resources are studied. On the basis of considering several major factors affecting the development of urban sports circles, the development principles and planning framework of the sports circle are proposed. In addition, the spatial layout pattern of urban sports circles should be distributed in a ring. It should be composed of urban sports center area, urban sports circle and three circular sports belts in the suburbs, towns, villages and remote suburbs (Vermeulen, Knopf-Lenoir and Villon 2015).

Lyu et al. systematically studied the construction and operation management of urban community sports centers in developed countries and the construction and development of urban sports stadiums in China. A lot of models and experiences for various sports facilities in urban renewal and transformation are proposed (Lyu, Han and De vries 2017).

Abstract
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Keywords: Urban Sports Park, Spatial Layout, Constraint Graph Model.

1. Introduction
More and more cities begin to build sports parks. However, the concept of sports park and its type, scale and characteristics are not yet known and familiar to people. With the continuous advancement of the market economic system, urban sports resources have been promoted (Feng 2015). In a certain sense, the study of the spatial layout of urban sports parks is also the spatial optimization and reorganization of urban sports resources, so that they can maximize their benefits in their respective regions. The overall utilization efficiency of urban sports resources has been improved to meet the sports needs of different residents.

Through abstraction and simplification, an approximate characterization of the system using mathematical language is provided so that people can more deeply understand the object. The mathematical model is not a simple simulation of the real system. It is a tool for people to understand the real system and solve practical problems (Han 2015). The mathematical model is the result of refining, analyzing, summarizing, and translating the information of the real object. It uses mathematical language to accurately express the intrinsic features of an object.

In addition to the influence of certain policies and economic factors, the development of sports parks is affected by factors such as urban space development, population size and living conditions, urban culture, regional environmental characteristics and the layout of original sports resources. Therefore, the impact of the above factors should be considered in the development of sports parks and their spatial layout. With the development of mass sports, sports parks, as the main carrier of urban residents’ fitness, are playing an increasingly important role in the city. Therefore, the layout of the sports park should be balanced to meet the diverse needs of the residents. At the same time, the duplication and underutilization in the construction of sports parks were avoided.

2. State of the art
Wang et al. used economic geography theory to explore the general rules and basic principles of the spatial layout of urban sports facilities. The construction of sports facilities should consider market principles, traffic principles and administrative principles. All levels of cities should conduct sufficient scientific arguments when investing in the construction of physical and mental facilities. The overall development strategy of the city is rationally planned to improve the utilization of sports facilities and meet the sports needs of the citizens (Wang, Li and Yan 2016).

Vermeulen et al. proposed the concept of urban sports circles. The urban sports circle refers to a large-scale urban sports circle including urban areas, suburbs, and surrounding towns and villages. On this basis, the development model of urban sports circles and the spatial layout of sports resources are studied. On the basis of considering several major factors affecting the development of urban sports circles, the development principles and planning framework of the sports circle are proposed. In addition, the spatial layout pattern of urban sports circles should be distributed in a ring. It should be composed of urban sports center area, urban sports circle and three circular sports belts in the suburbs, towns, villages and remote suburbs (Vermeulen, Knopf-Lenoir and Villon 2015).

Lyu et al. systematically studied the construction and operation management of urban community sports centers in developed countries and the construction and development of urban sports stadiums in China. A lot of models and experiences for various sports facilities in urban renewal and transformation are proposed (Lyu, Han and De vries 2017).
Based on the theory of recreational behavior, and taking Jilin City as an example, Ye et al. proposed a spatial layout pattern of urban green space combining wave-like and radial distribution. Emphasis is placed on the combination of annular green space and wedge-shaped green land, and various types of hierarchical green spaces are combined with the recreation system. Furthermore, the construction of three green layers of urban green space, that is, the scatter-like green belt in the center of the city – the green belt of the urban suburbs – the continuous natural production of green belts around the city was proposed. On this basis, the regional differences in urban land use levels are analyzed. For the urban high-use areas, transformation and development areas, urban new areas and suburbs, their respective green space layout strategies are proposed (Ye, Sun and Kuang 2017).

3. Methodology
Constraint models mainly include tasks themselves such as time constraints and quality constraints, as well as constraints between tasks such as timing constraints and functional constraints. Functional constraints include enabling constraints and facilitating constraints.

3.1 Time constraints
Time constraints can be divided into unary constraints and multivariate constraints. Time constraints acting on a task point are called unary constraints. The unary constraint is mainly to limit the time range of a task point Ti. Specifically, a task Ti must be completed within a fixed time window \([ETime(Ti), LTime(Ti)]\). That is, the earliest starting time of the task point is \(ETime(Ti)\) and the latest starting time is \(LTime(Ti)\). Performing this task too early or too late may not be completed or will not achieve the desired results. The time constraint acting between two task points is called a binary constraint. The binary constraint defines the time interval between the time \(ETime(Ti)\) and \(LTime(Ti)\) of the two task points Ti and Tj to be within a certain range.

3.2 Timing constraints
Timing constraints define the execution time of one phase relative to another. The timing constraints of the target zone operations can be understood as the timing relationship between the start and end times of the combat links. If the tasks Ti and Tj must be synchronized or sequentially completed, there is a timing constraint between Ti and Tj. A set of tasks with timing constraints is called a sequence of timed tasks. The task before the Ti in the sequence is called the predecessor of Ti. The task after Ti is called the follow-up task of Ti. If Tj is followed by Ti, then Ti is called the immediate task of Tj, and Tj is called the tight task of Ti.

3.3 Promoting constraints
If the completion of the task Ti contributes to the implementation of the Tj, the time to complete the Tj can be shortened, the cost of completing the Tj can be reduced, or the quality of the completed Tj can be improved. However, if Ti is not completed, it will not affect the final implementation of Tj, which means that Ti has a promotion constraint on Tj. It is described as Facilitate \((Ti, Tj)\). Tasks with facilitative constraints on Tj constitute a set.

4. Result analysis and discussion
4.1 Classification of sports parks
Currently, sports parks have been promoted in many countries. There are many types of parks. Some parks are specifically designed for a certain sport (such as tennis, swimming). Some parks are used by certain age groups (such as children, youth). The park has different functions, such as training, sports performances, and medical care. The multi-functional comprehensive sports park can not only provide tourists with leisure and recreation, but also carry out various physical exercises.

4.2 Layout pattern of Olympic Park
The Olympic park is a collection of stadiums and gymnasia which are mainly built for hosting the Olympic Games with the park as the main external characteristic. Since the 1960 Rome Olympic Games, most of the host cities have established Olympic parks in preparation for and hosting the Olympic Games. The Olympic park is in the form of an industrial park. The agglomeration of large stadiums and attached facilities is an important feature. Sports, tourism, entertainment, education, and commerce are integrated. The Olympic Park, where the world’s largest stadiums are concentrated, is the Sydney Olympic Park.

The Sydney Olympic Park is a typical centralized construction model. The Sydney Olympic park covers an area of more than 200 hectares on henbush bay, 17 miles from downtown Sydney. The main sports facilities of the Sydney Olympic Park include: Australian Stadium, Sydney Grand Crest Stadium,
At present, the largest area in the world is the Beijing Olympic Park. The Beijing Olympic Park is north to Qinghe, south to Tucheng North Road, and west to Baimiao Village Road, including the Chinese National Park, National Olympic Sports Center and Yuandadu Heritage Park. The planned total land area is about 1135 hectares, including about 680 hectares in forest parks and about 315 hectares in central areas. The central area of the Olympic Park covers the north to Xindiancun Road, south to the North Fourth Ring Road, west to Baimiao Road, Beichen West Road, and east to Beichen East Road. The rest is the National Olympic Center south of the Fourth Ring Road and its reserved land in the south.

4.3 The layout pattern of sports industry park

The sports industrial park refers to a comprehensive industrial park constructed with the aim of developing sports industry and combining sports stadium construction and other industrial facilities construction. A very big difference between sports industrial parks and other sports venues is that the clustering of sports industrial parks is not entirely the clustering of sports venues, but the clustering of sports venues and other functional facilities. One agglomeration way is the agglomeration of sports venues and other facilities of non-sports industry, such as large shopping malls, digital buildings and convention and exhibition centers in sports industrial parks. This layout mode is mainly to use sports venues as a gathering tool to attract other industries to form clustering economies of scale. The more typical cases are Manchester East Sports City and Beijing Longtan Lake Sports Industry Park.

4.4 Theoretical analysis of spatial distribution of large sports parks

The social and economic activities of cities are always under the influence of two forces. The gathering power comes from economic benefits. Agglomeration economic benefits refer to the benefits of regional economic concentration in a particular region. Agglomeration economic benefits include the internal agglomeration economy and the external agglomeration economy. The internal agglomeration economy is the economic benefit of the expansion of the city. The external agglomeration economy is the economic benefit of the coordinated development of different cities. Diffusion refers to the full use of regional public resources, energy, water, public transportation, post and telecommunications and other social service facilities. In a certain geographical range, spatial diffusion can achieve the purpose of low investment, shortening circulation distance and obtaining economic benefits of diffusion. The diffusion force is derived from the economic benefits of such diffusion. The agglomeration and diffusion effects of cities also play an important role in exploring the configuration of large sports parks:

First, the theory of economic benefits can be generated based on the proper concentration of urban agglomeration. Large-scale urban sports parks should be built appropriately and centrally. The concentration of stadiums can effectively reduce the cost of investment and improve the value of land use. Land is the most important scarce resource in urban development, and the centralized construction of large stadiums can save land resources effectively. Through the integration of resources, the sports park can obtain greater economic and social benefits. The Olympic Park is a model for the concentration of large stadiums.

Second, large-scale sports parks should be constructed and developed in cooperation with other industries. The agglomeration effect of the urban economy is the result of the concentration of large stadiums themselves. More importantly, the construction of large-scale sports stadiums is jointly built and developed in conjunction with other industries, especially other tertiary industries, in order to achieve aggregate scale benefits. The construction and development of large stadiums and other industries, especially the tertiary industry, is a successful experience in developed countries. An important construction goal of the Sydney Olympic Park is to build the Olympic Park into a competition city, a cultural, artistic, food and entertainment center, a learning community, an information community, and a healthy community. The above facts fully demonstrate that the development and construction mode of large-scale sports venues should consider the mutual agglomeration with other industries as much as possible, and strive to exchange and cooperate with each other to form a scale-scale benefit. For a long time, the construction of large-scale sports stadiums in China has paid little attention to integration with other industries, and this situation should be changed.

Third, urban agglomeration is affected by economic phenomena on the construction and layout of sports venues. The phenomenon of urban agglomeration uneconomical is particularly evident in the construction and layout of large-scale sports venues. An important factor affecting the layout and construction of large stadiums in the city is the volumetric power of the city. The capacity of a city is the ability to accommodate and bear the objective economic and social life. A city's carrying capacity is not infinite. If a city's political, economic and cultural activities exceed its carrying capacity, the city will be disorganized and the carrier's service function will be destroyed.

5. Conclusions

The sports park conforms to the actual needs of urbanites. Green landscapes and sporty fun are effectively combined. In the green environment, a sports activity area with outstanding personality, complete facilities, complete functions and beautiful environment was created to guide residents to participate in fitness activities. At the same time, the green lung function is outstanding for protecting people's health. It is in line with people's advocating nature and paying attention to life, which is indispensable for improving the quality of life in the city. Urban sports parks will have greater development in China.
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1. Introduction

A general survey of the macroeconomic fluctuations and corresponding macro-control measures since China’s reform and opening up reveals that some of the macro-control measures introduced by the central government are often distorted, formalized or even refused to be implemented due to the obstacles of local governments. Although the central government has issued corresponding regulatory measures, it is still unable to completely and effectively control the excessive investment impulse behavior of local governments, resulting in far less effect of macro-control than expected, and the credibility of the government is increasingly questioned by the public.

Why the investment desire of local government is so strong, how can this desire to harm the overall interests be realized, what kind of macro-economic fluctuation and failure of macro-control policy resulted from the investment impulse behavior of local government, and how to improve the macro-control effect, the efficiency of macro-control, the government’s ability to regulate and control the economy, the performance of macro-control, and promote stable and healthy economic development are the important issues that China needs to solve in building a socialist market economy.

The reason that leads to the impulsive investment behavior of local governments in China at the present stage is not only the economic system, but actually the product of the joint action of the economic foundation, economic system, political system, social development, external environment and other aspects. Therefore, in order to deeply analyze the deep reasons for the investment impulse behavior of local governments at the present stage, multi-disciplinary studies such as economics, political science, sociology and psychology are needed. In this study, the rationality standard of investment behavior of local government is restricted by subject characteristics and technical conditions, so it can’t be accurately quantified.

2. State of the art

The investment behavior of local government and its influence on macro-economy have attracted extensive attention of domestic scholars. He believed that the central government allocated the remaining rights of sharing and control of the economy to the local government. Under the incentive of fiscal decentralization, due to the failure of the property rights of local resources and the constraints of the public choice system, the strong impulse of local governments to expand their individual control rights horizontally in order to satisfy local officials’ groups was the root cause of “China’s local government-led market economy characterized by strong investment impulse” (Das 2015). Qian believed that the competition to promote China’s economic growth was not carried out by enterprises, and enterprises didn’t become the real subject of market competition. Instead, it was the competition among regions that make the relations among provinces, cities and counties gradually marketized and promote the transition from planned economy to market economy. The resources and functions of local governments were greatly expanded, so their role in economic operation was obviously different from that of mature market economy countries (Gliksberg 2016). Ou believed that China’s economic development strategy and economic decentralization system led to the leading role of local governments in local economic development and form loose local interest groups with special functions in local economic devel-
development, thus exerting an important influence on China’s macroeconomic regulation and control (Ganelli and Tervala 2016). Xia et al. believed that China’s economy has been overheated in recent years, largely due to the overheated investment led by local governments (Du et al. 2014). Huang et al. believed that local government investment behaviors had the phenomenon of continuous expansion of scale, arbitrary intervention of corporate investment and distortion of investment structure (Cantore et al. 2015). Guo and Jia also established a stage sequential game model to analyze the impact of local government behavior on macroeconomic stability. It showed that local governments, under the dual incentives of financial interests and political promotion, were always in favor of the strong motivation of illegal preferential policies to attract investment, thus triggering the investment impulse of enterprises, leading to the investment overheating, and having a huge impact on macroeconomic stability (Li and Yan 2016).

3. Methodology

3.1. Theoretical analysis method
Whether the investment behavior of local government is reasonable can refer to the following standards. If the investment behavior of local government deviates from these standards, it shows that it doesn’t meet the requirements of the scientific development view and is an unreasonable investment behavior. The standards include the following aspects: whether the investment behavior of local governments goes beyond the scope of government functions to excessively intervene in the market investment behavior, whether the investment behavior of local government causes the investment within the jurisdiction to exceed the reasonable investment scale, whether the investment behavior of local governments promote the optimization of the investment structure in the jurisdiction, and whether the investment behavior of local governments leads to the excessive debt of the local government.

Local government investment impulsive behavior refers to the tendency of local governments to have a particularly strong expansion of investment in the jurisdiction due to certain interests or other reasons, and to achieve the purpose of expanding investment in the jurisdiction by actively adopting the generalized local government investment behavior. According to the above standards, the appearance of impulsive investment behavior of local governments mainly includes the following aspects: it is characterized by hunger and thirst in investment demand; blindness in investment direction; sectionalism in investment policy; and soft constraint in investment budget. Because the investment impulse behavior of local government is one kind of behavior which is caused by the strong internal psychological tendency, therefore the local government doesn’t hesitate to use whatever means they can use to achieve the goal. These measures are included in the broad scope of local government investment behavior.

3.2. Empirical analysis method
Judging from the situation in the whole country, the absolute amount of fixed assets in the whole society is constantly rising. Although the growth rate has declined in recent years, it still maintains a strong growth momentum around the year. In recent years, China’s economic growth rate has been maintained at around 8-10%, and the growth rate of investment should be maintained at around 12%-15%, while the actual growth rate is obviously much higher than this level.

It is quite common for local governments to borrow money for construction projects. Some local governments bundle loans with various investment and financing companies and borrow heavily from banks, which are guaranteed by the government or even local people’s congresses. These loans are large in number and long in term, and current leaders are not worried about whether they will be able to repay in the future. Therefore, the debt situation of local government is largely caused by the investment impulse of local government. Although China’s current laws strictly prohibit local finance deficit and local government borrowing, but in fact, all regions and all levels of local governments in our country mostly borrow to survive or operate in debt to varying degrees, and the kinds of debt they bear are various. In recent years, comrades in the theoretical and practical departments have done a lot of research on local government debt problems. But so far there are no pub-

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Table 2. National and local fixed asset investment data in 1978-2005 (unit: billions of yuan).
lished authoritative statistics on the size of local government debt, only rough estimates from different sources, which are based on different methods.

3.3. Factor analysis of behavior
Surrounding the logical main line and the branch line, two aspects of the question are answered. First, what are the causes of local government’s investment impulse? Second, why is investment still weak in some places despite the prevailing investment impulse among local governments. In this section, from the four aspects of administrative system, investment system, fiscal and taxation system and financial system, the deep institutional reasons for the investment impulsive behavior of local government in China are comprehensively analyzed. In addition, the impact of central regional strategies and policies on the strength and weakness of regional investment is also examined to explain why there is a huge inter-regional investment gap or even the weakness of investment.

4. Factor analysis of investment behavior of local government in China
4.1. Data processing, statistical description and hypothesis
The method adopted in this study is empirical analysis method, taking the transfer of industrial land as the research object. The changing trend of local industrial land transfer over time indicates that it may be related to the macroeconomic policy cycle, which becomes the entry point to verify the impact of “political constraints” on land transfer. In the period from 2007 to 2016, the central economic core policy has two very obvious keynotes. Affected by the subprime crisis, the insufficient internal and external demand led to the decline of China’s economy in 2008. It can also be concluded from the statistical description that there was a significant decline in land transfer amounts in 2008. Starting in 2009, the central government unveiled stimulus package that was later widely known as the “four trillion yuan”. In the “four trillion yuan” plan, increasing local investment was an important means of economic recovery. To attract more investment, local governments had followed a variety of policies, including cheap land use, preferential interest rates, government-guaranteed debt and direct economic subsidies. The effects of this stimulus package were clear and clearly reflected in land transfer. However, the stimulus package and its leverage inflates the overall macro economy, quickly creating problems of duplication of investment and overcapacity. In response to this situation, on October 15, 2013, the state council issued the “Guiding Opinions of the State Council on Resolving the Contradictions of Seriously Overcapacity” (No. 41, State Council). It pointed out that the steel, cement, electrolytic lead, plate glass, ship and other industries had serious overcapacity, and these industries with serious overcapacity still had a number of projects under construction or to be built, and overcapacity is increasing. If measures were not taken in a timely manner to solve the problem, it was bound to intensify the vicious competition in the market, resulting in the expansion of industry losses, unemployment of enterprise employees, the aggravation of energy and resource bottlenecks, the deterioration of the ecological environment and other problems, directly endangering the healthy development of the industry, and even affecting the overall improvement of people’s life and social stability. The issuance of this document marks the arrival of a new era of structural adjustment of China’s economy, and China’s economy has officially entered the cycle of capacity reduction. Therefore, the ten years from 2007 to 2016 are divided into two overlapping periods, that is, from 2007 to 2012 and from 2010 to 2016. In these two time periods, it estimates the impact of the central core economic policies on the transfer of local industrial land.

4.2. Empirical study preparation and benchmark regression
Per capita disposable income has a significant positive correlation with the number of industrial land transfers, while has no correlation or negative correlation with the proportion of agreed land, indicating that relatively wealthy cities have more investment opportunities and higher investment quality. Therefore, the investment impulse of local government is not easy to realize. The population density of municipal districts has a significant positive correlation with the number of industrial land transfers, while it has no correlation with the proportion of agreed land, indicating that population may positively promote the scale of urban investment, but it has nothing to do with the quality. In addition, the urbanization rate has a significant negative correlation with the number of land transfers and the area of land transfers, which is also expected. Cities with a higher urbanization rate have better infrastructure conditions and higher degree of industrialization. Compared with cities with a lower urbanization rate, there are more investment opportunities in the future. However, the regression results of the indicators of investment impulse are significantly positive, which is unexpected. One possible explanation is that cities with rapid urbanization may have more long-term agreements between the government and local enterprises, and many low-quality investment decisions are not made in the current period, instead, they have been made long before.

Local governments take more active measures in the face of central expansionary economic policies, while they tend to do nothing when dealing with tightening policies. As a result, local economic cycles tend to expand quickly and contract slowly. Regional demand factors significantly affect the investment impulse under the impact of different policies of local governments. When macro policies are in an expansion cycle, only those regions with strong demand can realize their investment impulses; while in a tightening cycle, local governments in regions with weak demand show a stronger impulse to invest.

4.3. The empirical test according to the classification of city level
According to the size of cities, the first-tier and second-tier cities are classified into one category, and the third-tier and fourth-tier cities are classified into one category. Double difference and triple difference model including demand factors are adopted for estimation. It can be concluded that without considering the demand factor, there is no significant difference between cities of different levels. But after taking demand factor into account, there are some differences between first-tier, second-tier, third-tier, and fourth-tier cities. This shows that when the economy is in the expansion cycle, the change of investment impulse in third-tier and fourth-tier cities is more
affected by demand factors. There is no difference between first-tier, second-tier, third-tier, and fourth-tier cities. This means that the difference in conditions between cities is not significant during the tightening cycle.

4.4. Empirical test by region
Facing the impact of expansionary economic policies, coastal cities are more sensitive to demand factors than non-coastal cities; while in the face of contractionary policies, there is no difference between coastal and non-coastal cities. The investment impulse in cities of different levels and different regions is affected by the central core economic policies, and there is difference only in the expansionary cycle of macro policies, but no difference in the contractionary cycle. In the expansionary cycle, the degree of investment impulse of third-tier and fourth-tier cities and coastal cities is more significantly affected by regional demand factors than that of first-tier and second-tier cities and non-coastal cities.

5. Conclusions
The land micro data used in this study has a strong mining value. It can give people very specific and very accurate statistical judgment, in addition, because of its great economic significance, it can easily and effectively connect with other databases reflecting local economic development, so as to explore more propositions. Local governments tend to be more proactive in the face of expansionary central economic policies and less reactive in the face of contractionary policies. Therefore, the local economy will show the unbalance between the expansion cycle and the contraction cycle. Regional demand factors significantly affect the investment impulse under the impact of different policies of local governments. When macro policies are in an expansion cycle, only those regions with strong demand can realize their investment impulses; while in a tightening cycle, local governments in regions with weak demand show a stronger impulse to invest. The investment impulse in cities of different levels and regions is affected by the central core economic policies, and there is a difference only in the expansionary cycle of macro policies, while there is no difference in the contractionary cycle. In the expansionary cycle, the degree of investment impulse of third-tier and fourth-tier cities and coastal cities is more significantly affected by regional demand factors than that of first-tier and second-tier cities and non-coastal cities.

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Table 3. Comparison of central and local projects for urban fixed assets investment.
THE ECONOMIC DEVELOPMENT OF URBAN PLANNING IN CHINA.

Wu He

Abstract
To study the enlightenment of development economics on the economic development of urban planning, firstly, the research background and significance of the enlightenment of development economics on the economic development of urban planning are introduced. Secondly, through the main method of literature review, social investigation method, theoretical model analysis method and so on, combined with relevant theory of economics and related data analysis, it is found that economic theory can effectively explain the problems existing in the urban planning, avoid possible problems in urban planning, and provide effective theory basis for the development of the city. In this study, the theoretical value of the sub-optimal theoretical model, the supply and demand analysis model and the marginal analysis model under the pareto optimal state in the economic development of urban planning is mainly studied. A large number of theories and research results confirm that to do a good job in urban planning must be guided by relevant economic theories, which will make the progress of urban planning more rapid.

Keywords: Urban Planning, Theory of the Second Best, Supply-Demand Analysis, Marginal Analysis.

1. Introduction
Since the last 20 years of the 20th century, the economic system of planned economy countries has been transformed into the market economic system one after another after a long, complex and repeated competition process. The reform and opening up of developing countries are mutually compatible, and a new economic order has been gradually established through micro and macro control. As a result, the world economic development has become politically multipolar, the gap between the north and the south has widened, and the Matthew effect has intensified (Li et al. 2017). The marginalization of developing countries, market failure and deepening of the gap between microeconomics and macroeconomics have seriously affected urban construction and development. Nowadays, urban expansion, rapid urbanization, the concentration of rural population in large cities and the rapid expansion of megalopolis have become the main problems that need to be solved urgently in contemporary urban planning (Cheng 2015).

In today’s economic globalization and regional integration, the traditional urban planning thoughts, which focus on the study of spatial pattern layout, are not enough to cope with the risks and challenges caused by the rapid development of cities (Jinzhu 2017). In this study, the sub-optimal theoretical model, supply and demand analysis model, marginal analysis model and other related theories under Pareto optimal state in economics are used to understand and solve problems in urban planning. The use of economic theories to promote the development of cities has been recognized by scholars in the field of urban research, and the research results have obtained certain economic value in the actual implementation of urban planning.

To sum up, it is mainly the research and analysis of the economic theory of urban planning, aiming at the organic integration of urban planning and economic theory (Fazeng and Jingyu 2007). Through the regulation and guidance of the government on economic development, the purpose of rationally allocating urban resources, improving the level and efficiency of urban industrial and economic development, and exploring the rational distribution of production and living space in the process of urbanization can be achieved, so as to provide theoretical basis and support for the government to formulate economic and efficient planning methods and improve the long-term decision-making mechanism (Cooke 2018).

2. State of the art
The outbreak of the industrial revolution started the wave of urbanization that western countries took the lead in (Bakir et al. 2018). After decades or hundreds of years of continuous development, countries gradually began to leapfrog to the modern society dominated by industry and cities (Musa et al. 2018). With the discussion and practice of urbanization theories by urbanization researchers in western developed countries, the morphological features of metropolitan areas, satellite cities, multi-centers and suburbanization have become the mainstream trend of urban evolution in western countries (Li, Sun and Fang 2018,). In 1949, when the People’s Republic of China was founded, China’s urbanization level was only 10.64%, the urbanization level of the whole world reached 29%, and the urbanization level of some developed countries reached 50%, which showed that China’s urbanization process was carried out on a low basis (Li 2017). The rapid urbanization since the reform and opening up has greatly increased the proportion of
China’s urban population, which has increased by more than 500 million (Jokinen 2018). The population growth rate in China’s urbanization process is relatively fast, but the urbanization rate is slower than that of South Korea and Japan at the same stage of development.

3. Methodology
3.1. Urban new economic growth theory
In the middle of the 20th century, the “Harrod-Domar model” and the “Solow-Swan Model” promoted a major breakthrough in urban economic growth theory. In the 1980s, after a relatively stagnant theoretical window period, some new theoretical research results emerged, which were collectively referred to as the urban new economic growth theory. Helpman and Grossman (1991) used the theories of general equilibrium, imperfect competition and dynamic analysis to study the relationship between technological innovation, commercial activities and economic growth in the context of global economic integration. Barrow and Salaymartin (1995) sorted out all the economic growth theories and models in their book “Economic Growth” and analyzed the practical application of the breakthrough progress of new economic growth theory in various countries. Jones (1998) comprehensively compared and evaluated the substantive contents of traditional economic growth theory and new economic growth theory and proposed that technological innovation and invention were the engines of economic growth.

3.2. Urban economic base theory
Economic base theory is the theoretical research tool of urban development mechanism and process, which can interpret the reasons of urban economic growth and summarize the process of urban development theoretically. In 1939, Homer Hoyt, an American economist, proposed the Urban Economic Base Theory on the basis of classical geographical theories. He explained the driving force which promoted the urban economic growth according to the view of export comparative benefits, and he believed that urban economic growth was achieved by meeting basic and non-basic departments or services needed within and outside the region, so as to facilitate the flow of capital into cities. The traditional urban economic basic theory holds that the increase of the frequency of urban basic social and economic activities promotes the growth of urban population. And the derived demand generated by the agglomeration effect of urban activities and urban population will promote the growth of urban non-basic activities, so as to promote the development of urban economy in a cyclical manner.

3.3. Optimal city size theory
At the end of the 19th century, Ebenezer Howard, the father of modern urban planning theory, proposed the concept of “Garden Cities” with both urban and rural advantages in his book “Garden City of Tomorrow”, which opened up extensive academic discussion on Optimal City Size. Howard believed that the Garden Cities were designed to arrange healthy life and production in the future, and its scale should meet all kinds of social life and not be too large. The city was made up of a series of concentric circles, with parks and public buildings in the center, surrounded by permanent farmland, and the urban land was owned by the public.

3.4. Urban smart growth theory
In the middle and late 20th century, American urban environmentalists and planners proposed the theory of “Smart Growth” based on the European concept of “compact development”. It aimed to control urban sprawl by adopting smart growth measures such as land mixed utilization, zoning guidance, open space layout, old city renewal and redevelopment, so as to protect urban ecological environment and improve the utilization rate of urban resources. After long-term practice and summary, the core content of urban smart growth theory can be summarized as follows: make full use of urban construction land to reduce sprawl; strengthen the renewal and redevelopment of urban stock land; urban construction projects are concentrated in layout to avoid “pendulum” transportation; protect open space such as urban ecological farmland and green space; rationally carry out community layout and restore the vitality of the neighborhood unit.

4. Result analysis and discussion
4.1. Pareto efficiency theory model
The Pareto efficiency theory is based on the premise of not harming the interests of others and is regarded by the economics as the best state of social resource allo-
cation and redistribution, fully embodying the concept of liberalism fairness and efficiency. The meaning of “suboptimal theory” is that it is necessary to satisfy ten assumptions when the Pareto optimal state is reached. If at least one of these conditions cannot be satisfied, then the suboptimal state obtained by satisfying all the remaining nine conditions is not necessarily closer to the Pareto optimal state satisfied by ten conditions. Because the ideal Pareto optimal state can’t be realized, the optimal result after some conditions are destroyed is called “suboptimal”. An important policy implication of this theory is that when Pareto optimization can’t be realized due to certain constraints, the “suboptimal” point obtained doesn’t have to be the most efficient point. It can be concluded from the “suboptimal theory” that urban planning is one of the main forms of government intervention in the market. In the process of the government seeking the suboptimal state of resource allocation, the core role of urban planning should be to guarantee a certain level of social welfare. The “suboptimal” point of urban space resource allocation is not necessarily the most efficient point, but it must be the relatively high level of social welfare.

4.2. Supply and demand analysis model

Supply and demand analysis method is an economic analysis tool. It is usually used to determine market equilibrium prices and equilibrium production. Both the demand and supply in the model belong to the basic concepts of economics. The blue curve on the upper right is the supply curve, which represents the quantity of products sold by the manufacturer at the corresponding price level; and the red curve on the lower right is the demand curve, which represents the purchase amount of the consumer at the corresponding price level; and the intersection of the two curves is the equilibrium price and output.

4.3. Marginal analysis model

Marginal analysis is one of the basic research methods in economics. In the analysis process, the additional expenditure is compared with the additional income, and when the two are equal, the critical point of maximum profit is reached. As a variable analysis method, it is usually used in the early stage analysis of decision-maker’s additional investment share budget in the process of project construction. For urban planning, comprehensive and in-depth marginal analysis is con-
ducive to planners and decision-makers to clearly understand the risks and benefits of increasing economic input and compare the additional costs and additional benefits caused by the adjusted plan, so as to make the optimal choice.

5. Conclusions

Urban planning can guide the urban economic activity space, promote the development of urban economic, reshape the urban development rules, formulate and implement economic policies and other economic characteristics. The main research objectives of urban planning economics are to improve the theory of urban planning, assist in the selection, formulation and management of urban planning, and embody the core values of “people-oriented” urban planning, so that the development of urbanization in the country can better adapt to the trend of economic globalization, and the level of urbanization in the country and people’s quality of life can be improved. With the development of the modern urban planning discipline for one hundred years, the accumulation of economic theories for thousands of years, and the inheritance of Chinese philosophy for five thousand years, it is not comprehensive to understand urban planning only from the limited economic theories of urban planning. In order to apply the relevant theories of urban planning in economics to practice, it is necessary to absorb a large number of philosophical thoughts and more research theories and practical experience for comprehensive analysis and guidance of urban planning. Therefore, in the future work and study, it should make more efforts to study relevant theories of urban planning economics and make its own contribution to the research of urban planning theory in China by combining the advanced theoretical research results of developed countries. Here, it also hopes that China’s urban planning and development is more and more smooth.

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VIRTUAL DESIGN METHOD OF INTERIOR LANDSCAPE BASED ON 3D VISION.

Liang Zhang

Abstract
To achieve the most intuitive display of interior design effect, the concept, characteristics, expression mode, application scope and basic types of virtual reality display design are expounded from the perspective of three dimension (3d) virtual reality technology, and the advantages and disadvantages of 3d modeling speed and panoramic visualization display are analyzed. The results show that through this research and practice, a series of 3d production techniques for interior design space, such as mapping technology, lighting technology, modeling technology, etc., are summarized. These technologies can effectively make use of ordinary computer to make and operate virtual reality and makes an exploratory attempt for the promotion of 3d technology in interior design industry in the future. In this study, it provides a design fulcrum for the development of indoor furniture display under the new economic conditions, which is of great practical significance for the healthy and sustainable development of interior design industry.

Keywords: Three-Dimension Technique (3d Technology), Interior Design, Visualization.

1. Introduction
The interior design is the design of the interior space of the building, its main contents include: architectural graphic design and spatial organization, treatment of the inner surface of the envelop enclosure, the use of natural light and lighting, and the selection and arrangement of indoor furniture, lamps and lanterns and furnishings (Portman, Natapov and Fisher-gewirtzman 2015). In addition, it also includes the configuration of plant, decoration and appliance.

In this study, three-dimensional design technology is mainly used to build the model of the interior engineering to show the real effect of the space. Various ways of constructing interior design display system are analyzed and the advantages and disadvantages of each method are compared. The three-dimensional design software mainly includes UTO-CAD, PKPM, 3D max, Maya, Cinema 4D, Photoshop and other technologies.

Nowadays, with the continuous development of computer hardware and software technology, three-dimensional computer technology is used to achieve the display of indoor space effect. On the one hand, the operation of the design software has become increasingly mature, which is fast, simple and convenient. On the other hand, the simulation of three-dimensional technology on the light, material and texture of space can almost achieve the real effect. It can accurately and intuitively represent the real space, view the three-dimensional model of space from multiple angles, and simultaneously launch a variety of schemes in a short time. Therefore, the application of in the field of interior design has a broad prospect.

2. State of the art
The rapid development of information technology began in the 1980s. As the birthplace of 3d technology, the research level of the United States basically represents the international level of 3d development. The Massachusetts Institute of Technology (MIT) is a pioneer in the study of artificial intelligence, robotics and computer graphics and animation, all of which are the basis of virtual technology (Dai et al. 2017). The human-computer interface technology lab (liiLab) at the university of Washington technology center in University of Washington has introduced computer 3d technology research into areas such as education, design and manufacturing. At present, the basic research of 3d technology in the United States mainly focuses on perception, user interface, background software and hardware. In the 21st century, the development of design technology in China has received corresponding attention. During the 11th five-year plan period, the ministry of science and technology of China listed BIM as an important project in the national science and technology program. BIM is the standard system and the building information model of the whole life cycle in the informatization of the construction industry. It is a key project supported by the ministry of science and technology during the 11th five-year plan period. And it mainly studies the development direction of international design technology of building information model in the aspects of collaborative design and management of architectural design software and integrated application software (Sra et al. 2018; Santana et al. 2017). An engineering data model that can greatly reduce the risk of the entire architectural design and construction engineering and form a virtuous cycle of sustainable development has been paid attention to and started in foreign architectural design. This kind of engineering data model integrates the relevant information of various aspects of the construction project. The technical basis is the research on 3d building technology to support the integrated management environment of the construc-
The interior design process is divided into two stages: hard decoration and soft decoration design. The application of computer-aided design software involves three processes: modeling, visualization and enriching aesthetics. Among them, the modeling is divided into hard outfit modeling and soft outfit modeling. Therefore, the workflow of interior design is summarized into four steps:

- **Hard installation modeling**: input room, door, window, column, beam, etc.
- **Soft decoration modeling**: import furniture, electrical appliances, sanitary ware, etc. and arrange them. Visual design: material, texture, lighting and rendering.
- **Enrich aesthetics**: observe, analyze, adjust the overall effect, adjust materials and lighting, and make entourage, etc.
- The requirements, shapes and functions achieved in different decoration stages are the same, as shown in Table 1.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Essential stage</th>
<th>Requirement</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard decoration stage</td>
<td>Cuboid or cylinder</td>
<td>Proportion of the size</td>
<td>潘对视图和模型函数</td>
</tr>
<tr>
<td>Soft decoration stage</td>
<td>Complex and changeable</td>
<td>Simplicity</td>
<td>Collect, organize, and search</td>
</tr>
</tbody>
</table>

Table 1. Decoration stage.

The PolygonalMesh representation can be used to display soft furnishings such as furniture, lamps, fixtures and cabinets during the soft decoration design phase. On the one hand, the real-time visualization of BREP shape also needs to be transformed into the data structure that this graphics hardware is most well at. It can make full use of the parallel computing advantage of graphics processing unit (GPU) to achieve real-time ray tracing rendering with high sense of reality and achieve smooth frames per second. On the other hand, it is not easy to implement a perfectly modeling tool repeatedly. Modeling and modification of complex shapes can be done with the help of mature tools. For example, a large number of existing 3D Max model files in the market can be exported through the 3D Max plug-in or directly converted to the 3D file format for import and use, and the 3D file is the data in Mesh format. In order to improve the feedback speed of the software system in interactive design, a
wireframe model is used to quickly display the object contour and surface shape, which is a very good scheme and especially useful for the selection of objects in complex scenes.

3.4. Mesh generation algorithm
The BREP model is not suitable for rendering directly by OpenGL/DirectX and graphics hardware. It is necessary to convert complex parametric surfaces into mesh data that the 3D API is good at. Unstructured mesh generation algorithms can be divided into three categories: Octree, Delaunay and AdvaneingFront. The Delaunay triangulation is a special kind of triangulation. In the triangulation that may be formed by the scatter set, the minimum angle of the triangle formed by the Delaunay triangulation is the largest. In this sense, the Delaunay triangulation network is the closest to the regularized triangulation network. Specifically, it refers to the diagonal line of the convex quadrilateral formed by two adjacent triangles. After mutual exchange, the minimum angle of the six interior angles will no longer increase. The Delaunay triangulation is unique (any four points can’t be concyclic). There are no other points in the circumscribed circle of any triangle in the Delaunay triangulation network. A special case is the three-point concyclic, that is, the empty circle characteristic.

4. Result analysis and discussion
4.1. Indoor effect display
Panoramic interior design exhibition hall can display 360 degrees of real scene, visitors can click the mouse to browse the area. The example of this study is just to use the simplest method to make cylindrical panorama. If the sky and earth are to be shown, it is also necessary to use fish-eye lens to shoot and make it in another panorama software, such as SGIP Scape. The virtual reality furniture display design based on panorama technology is a real photo, so it has a strong sense of reality and realistic performance effect of photographic photos. In addition, it has low hardware requirements, short development cycle and low cost. It can be seamlessly combined with flash technology, and the small amount of data is suitable for network transmission. At present, almost all panoramic displays don’t need to download additional plug-ins. However, the main defect of the image-based 3D technology lies in the poor interactivity. Consumers can only rely on the imagination of whether the furniture can meet the needs of their home design. In the current e-commerce application chain, personalized customization has become a very important link. The lack of interaction means that custom functionality can’t be supported. Therefore, the application of panorama technology in indoor exhibition is limited to the exhibition effect of the exhibition hall.

Interior design exhibition based on 3D technology such as VR technology and panoramic technology can greatly improve customers’ consumption experience. Unlike the original simple face of a pile of construction drawings, designers have to rely on verbal explanations, customers can not try in advance like other products. Home engineering involves hundreds of materials, construction technology and industry quality standards, the customer is a weak party, due to the lack of professional knowledge, the partial design flaws are inevitable. But 3D virtual technology allows customers to experience in advance and subvert the traditional consumption patterns.

4.2. Furniture effect display
After the indoor furniture product model is established and imported into the 3D display and roaming system, the virtual home decoration software in various home websites is presented to users. Through the processing of the background database, and link it to the Internet, users can click on the relevant home website address, browse and download the relevant virtual home improvement software, and carry out DIY home design. During the design process, the user calls the furniture in the model library for placement. The user can intuitively experience whether the appearance of the furniture in the room conforms to the decoration style of the entire home.

As this kind of software is developed by each home website, after 3D max modeling is completed, it obtained its own file format, that is, *.max file, but OSG does not support *.max file. Therefore, when using 3D max model, the *.max file must be converted to file format supported by OSG.

In this case, the furniture virtual software based on the virtual display of furniture on the OSG platform is adopted. Its most important function is that the furniture can be placed interactively in the virtual house type. The data format conversion function provided by OSG is used to convert the model into an obj file and generate an Intl file. Among them, information such as model vertices and facets are saved in obj file, while material maps are saved in mtl file. Then the obj file is converted to iYe file format. At this time, obj and Intl files are required to be stored in the same path. And iYe file contains all information such as vertices, faces and texture maps.

After entering the virtual software interface, the first step is to draw the room type according to the suggested operation process. After creating the room, the furniture module can be dragged into the room. Users can match the furniture according to their needs. The product information contained in the background database is very large, various brands of furniture or other products can be placed in the product catalog. In the case of complete data, the price of the product placed in the same room can also be budgeted. In addition, if the user wants to use the online version to place and preview the furniture, it also needs to add a rendering engine to browse.

The design and production of indoor furniture display based on 3D modeling usually require computer modeling software (3D max software) to design and produce 3D virtual scenes or objects. Because of its small amount of data, it is more interactive. However, due to the limitations of the software (most of the plugins need to download the rendering engine) and the limitations of the network data flow, it is difficult to provide the realistic photo effect similar to the image-based method. This is also a reason for the existence of a furniture display solution based on the panoramic image method. Virtual display design based on 3D modeling has strong three-dimensional sense, spatial sense and interactive ability, and because its virtual environment can be unrealistic, it gives designers more creative space and degree of freedom.

5. Conclusions
For furniture display, virtual reality technology based on 3D modeling has more development prospects. In this way, home designers can break away from the heavy modeling work and directly call the materials in the database to carry out home design according to
their own design ideas. And individual users can also use ready-made virtual home software for DIY design. Everyone is a designer. This is not only an ideal goal, but also has the practical significance in terms of reduced economic costs and efficient innovation works.

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Abstract

In order to further optimize the methods of modern urban planning, the philosophical basis, planning theory, planning measures and practice are analyzed, and some discussions are made in connection with China's planning practice. The research results show that the core of modern urban planning is constructed by traditional rationalism with classical physics as its core. Urban planning is both a technology and a social science. Whether it is traditional or modern urban planning, it has been closely linked with the legal system since its birth. It is an important direction to promote the development of urban planning discipline. The most influential rational ideas of city planning are instrumental rationality, bounded rationality and communicative rationality. Instrumental rationality derives from rational comprehensive planning, systematic planning and procedural planning; the separation-gradualism and hybrid inspection model are developed under the influence of bounded rationality and are amendments to instrumental rationality; communication planning, collaborative planning and consultative planning are developed on the basis of communicative rationality, which is one of the important development directions at present.

Keywords: Urban Planning Theory, United Front, Instrumental Rationality, Communication Rationality.

1. Introduction

To explore the effectiveness of government in urban development is to clarify the role of government in urban development in China. Broadly speaking, it covers all aspects of urban construction, including not only the problem of raising funds and land management guided by it in the process of rapid urbanization, but also the macro-policy, the transformation of government functions, industrial policy, science and technology policy, urban planning and so on, which are characterized by industrialization in the process of steady urbanization. Therefore, government effectiveness is a very broad concept.

First, multidisciplinary basic theories are combined. Based on the latest research achievements of industrial economy theory, system economy theory, urban economy theory, regional economic theory and institutional economics theory by domestic and foreign scholars, the theory and practice of urban management in China is reflected on, and a normative research is conducted on the functional structure of urban government in the future. Secondly, the qualitative analysis is combined with quantitative analysis. On the basis of evaluating the level of urban development, in addition to adopting qualitative analysis method, a large number of data will be collected and descriptive statistics will be made with the first-hand data of the questionnaire survey, so that the conclusion of the paper has both high theoretical value and strong practical persuasion (Barnett 2016).

The development practice of China’s urban economic development is comprehensively evaluated, and the fundamental contradiction of the government’s effectiveness in urban development is revealed by means of dynamic theoretical model. Combined with urban development practice, a result-based evaluation index system for urban development is constructed, and the level of China’s urban development is evaluated and scored (Lindberg et al. 2016). Based on the investigation and case studies, econometric model is applied to verify and refine the main factors that restrict the effectiveness of urban government in China, and strategic measures for the effectiveness of urban government in China are put forward.

2. State of the art

The development of rational thought in the West can be roughly divided into four stages. Since modern times, rational thought has developed into three branches. Its main schools (the middle one) examine whether the subject’s own behavior is logical and constitute the concept of formal rationality/instrumental rationality. This concept of rationality is combined with pragmatism and game theory, respectively, resulting in practical rationality and strategic rationality. The disadvantage of this school is that it only pays attention to the rationality of the behavior of the subjects (individual or group), but cannot be effectively integrated with reality. In view of this, two schools have been developed to revise it. One is bounded rationality, which is relative to the concept of infinite rationality or complete rationality. Considering the degree of rationality, it has always been the focus of economic and social disciplines. The second is communicative rationality, which is established based on critical theory and argumentation theory, and explores the rationality of statement and communication between subjects.

Since the birth of modern urban planning in the late 19th and early 20th centuries, its ideological core has been closely linked with the development of rationalism, in which instrumental rationality, bounded
rationality and communicative rationality all have an important impact on planning theory.

3. Methodology
At the beginning of the 20th century, Max Weber, a German sociologist and thinker, made a thorough analysis of the principle of modernity. He regards the rational process as the core of the modernization process, and divides rationality into formal rationality and substantive rationality with great originality. The former considers methods and utility, while the latter considers results and evaluation. Weber holds that the source of value judgment is unscientific and is the product of culture, tradition, social status and personal hobbies. In the process of modernization, the calculating behavior which only seeks to maximize benefits, namely instrumental rationality, overwhelms the behavior which pursues the goals of morality, purpose and value, i.e. value rationality.

Rational comprehensive planning embodies rational thinking in two levels: first, "rational" means rational behavior, that is, logical and mathematical methods associated with deductive methods, which has always been the characteristic of instrumental rationality; second, "comprehensive" means the integrity and totality of planning (Arku et al. 2016). This theory is embodied in the structure plan of the British Planning Act of 1968. The focus of the structure plan is the setting of planning objectives and various alternatives to achieve them.

Systematic approach of planning holds that cities and regions are a combination of various interrelated and constantly changing parts, which include geography, society, politics, economy and culture. Planning itself should also be dynamic. It should be formulated or revised at appropriate intervals (e.g. five years) to form a "trajectory" linked by states, so as to monitor, analyze and intervene in the development process (Zhongxue and Mengtao 2017). It can be seen that the system approach of planning is a step ahead of the rational comprehensive planning in the recognition of the city, and the planning method has also changed from static to dynamic. However, both theories regard urban planning as a process of social management (Gstach and Kirschbaum 2016) and their guiding ideology is not separated from the stereotype of instrumental rationality. In the 1960s in Britain, traffic planning dealing with the problems caused by the sharp increase in car ownership as well as sub-regional planning under the pressure of population growth and decentralization highlighted the idea of system approach of planning (Leznicki and Lewandowska 2016).

Andreas Faludi, an advocate of procedural planning theory, argues that planning is the best way to generate results, and that the core of rational planning is optimization. Planners need to find the best model or procedure with rational criteria in a large amount of information and opinions (Moreno-minguez, Martinez-fernandez and Carrasco-campos 2016). From the perspective of instrumental rationality, planning becomes a high-level decision-making process, which is "a set of methods designed to provide information in some way to make decision more rational" (Giunta, Pericoli and Pierucci 2016). As a measure of its utility, it is the benefit-cost analysis in planning and the balance sheet of planning (Rigolon, Browning and Jennings 2018). The Netherlands completed the transition from form planning to procedure planning in the 1970s, and after the 1990s, procedure planning changed to a more macro strategic planning.

The planning of instrumental rationality is beneficial to quantitative research, and has strong analytical, evaluative and operational characteristics. Therefore, it has been widely used after World War II. However, this rational planning method often relies too much on technical tools and economic data (such as regional GDP), blindly pursues the optimization of a single measurement standard, and is used as a panacea to solve all problems, which leads to abuse and self-expansion. In view of this, in the heyday of rational planning development, there have been several planning models which have been partially revised. The main ideological basis of these models is bounded rationality.

4. Result analysis and discussion
4.1. Dynamic system
Bounded rationality holds that people are constrained by realistic conditions, such as insufficient knowledge of information and insufficient time to collect and process information, and cannot have complete and sufficient rationality. Based on the idea of bounded rationality, the decision-making behavior, planning operation and the realization of planning objectives are focused on under realistic constraints, and a disjointed incrementalism and a mixed-scanning model are developed. Disjointed incrementalism is a revision of the rational comprehensive model, while the mixed-scanning model is regarded as the “third way” between them. The details of the two models are shown in Table 1.

4.2. LLE Results
Communication planning is the result of the application of communicative rationality in the field of planning. Patsy Healey, a British planning scholar, believes that it comes from three sources: first, Habermas’

<table>
<thead>
<tr>
<th>Model</th>
<th>Present Theoretical Source</th>
<th>Question vs. rational planning</th>
<th>Amendments to rational planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disjunctive</td>
<td>Luhmann</td>
<td>Although rational, comprehensive method is needed for rational decision making, it is impossible to achieve complete rationality, because time is limited and not all information can be collected or processed.</td>
<td></td>
</tr>
<tr>
<td>Incremental</td>
<td>Popper's scientific method</td>
<td>Necessary for rational decision making, it is impossible to achieve complete rationality, because time is limited and not all information can be collected or processed.</td>
<td></td>
</tr>
<tr>
<td>Integrative</td>
<td>Habermas</td>
<td>The rational planning process information in some way to make decision more rational.</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Planning models modifying the rational planning
Communicative theory; second, Foucault’s theory of discourse and power; and third, Giddens’ and institutionalist school’s viewpoints. Fainstein believes that John Dewey’s pragmatism and Habermas’ theory constitute the philosophical basis of this planning theory. Communication planning theory not only regards planners as arbitrators of different interest groups, but more importantly, it also regards planning as a process of multi-party communication and consultation. Therefore, the status of planner is no longer only an independent and systematic thinker, but also a communicator. This brand-new role orientation embodies the idea of a complete break with the planner’s connotation, which has been recognized by experts, customers, the public and society in the past.

In the past, the planning concept based on instrumental rationality neglected the value orientation and ideology of planning, and exposed the tendency of exaggerating instrumental rationality and despising value rationality. The so-called “objective and impartial” benefit-cost analysis tool is actually a reflection of the planners’ subjective value judgment. Communication planning theory based on communicative rationality has been criticized and changed. Because of its critical essence and philosophical origin, it is sometimes called critical theory in planning theory circles, from which many concepts and models of planning with the same origin have been derived (Table 2).

However, academics still have some doubts about the operability of various application models of communicative rationality in practice. They believe that the following shortcomings will affect its implementation: first, the neglect of power in communication planning; second, the gap between perfect theory and action; and third, the time-consuming process of participating in discussions. In view of the above shortcomings, Flyvbjerg and Richardson proposed to supplement and amend communication planning with Foucault’s power analysis theory. By facing up to social conflicts, planning methods are transformed from a perfect state to a realistic state. This method may be able to break the magic of “ignoring power” once various planning theories and methodologies are put forward. Pennington, on the other hand, sought support from Hayek’s liberalism theory, believing that objective and self-controlled market mechanism should be used to improve and promote the process of mutual learning between subjects. This may make communication rationality less abstract and add a layer of pragmatism insurance. It can be seen that the emergence of communication planning theory and various methodologies is a reflection of the development of rational principles from modern to post-modern. It is also the result of questioning, rebellion, abandonment and transcendence of material planning model and rational-comprehensive planning model, which have been dominant since the middle of the 20th century.

5. Conclusions

China’s planning community is trying to absorb the concept of bounded rationality and communicative rationality. However, it should be noted that communication planning cannot simply be equated with public participation, and it has a deeper philosophical connotation. Firstly, it requires all parties in the planning to cooperate on the same platform (so it is neither top-down nor bottom-up), so the key is to build a communication platform that can embed all kinds of values and ways of thinking. Secondly, it requires communication to follow the principles of understandable, sincere, sincere and reasonable communication rationality. How to ensure it in the existing planning mechanism is a problem that needs to be solved in the future reform of planning system. At the same time, it also requires planners to change their traditional identity and intervene in planning activities in a more flexible and socialized way, which will bring great challenges to the status of planners as technical experts.

Not only can the theoretical study of urban planning be divided into the study of cities and the process of planning behavior, but also can the practice of urban planning be divided into professional practice and vocational practice. It can be further found that there is not a complete correspondence between the academic research field of urban planning and the social activities of urban planning. The understanding and clarification of this issue is directly related to the theme of the paper – to what extent can urban planning become not only an important part of the professional knowledge system, but also the key content of professional practice.

To sum up, the purpose of discussion on urban planning politics is to build a concrete and historical understanding between urban planning theory and practice: that is, to pay continuous attention to public interests, democratic processes and procedures in the process of urban planning, and to attach importance to how urban planning organizations can operate in favor of a democratic society.
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LEGAL AND ILLEGAL PROCESSES OF BUILDING DISPOSAL UNDER THE VISION OF URBAN PLANNING.

Haitao Sun

Abstract
To solve the problem of illegal buildings, laws were used to control illegal buildings from the perspective of urban planning. Illegal buildings were legalized by reissuing relevant procedures. Illegal buildings were confiscated and auctioned. Illegal buildings that endanger public safety were completely removed. Illegal buildings that meet the safety standards were transformed into citizens’ affordable housing and other disposal modes. The results showed that China’s current laws on the lack of identification of illegal buildings, legal lag, legislative dispersion and many of the problems involved in illegal construction were cross-types. There were both frontier subject issues and ubiquitous issues. Regardless of the extent of the aspects involved, the legal issues of studying illegal building governance have always been the main line and the main tone of social development. Therefore, by perfecting laws and regulations on illegal building management, the administrative enforcement mechanism for illegal buildings is improved and publicity efforts are strengthened. The legal consciousness of the people is enhanced.

Keywords: Urban Planning, Illegal Construction, Disposal, Law.

1. Introduction
Due to the limited, scarce and non-renewable nature of land resources, in recent years, with the advancement of China’s new urbanization, urban land and real estate appreciate rapidly, resulting in the unauthorized occupation of land, random construction and expansion. The situation of additional construction and illegal construction is very prominent, and illegal construction has become a major issue in the management of the local governments (Biase and Losco 2017; Agyeman, Abeka and Assiamah 2016). The fight against rectification of illegal construction and the reality of optimism form a mutual game. The government has fulfilled its relevant duties and increased the governance of illegal buildings, which has led to better control of the illegal construction of the building.

The legislation on illegal buildings is not perfect. The law enforcement is weak, resulting in repeated violations of illegal buildings. This has been a problem that has plagued city managers and scholars. Therefore, it is necessary to find a way to dispose of illegal buildings. From the legal practice of law, a variety of problems can be found. Illegal construction has become the focus of social contradictions, and the public interest is still being challenged. Thus, the disposal of illegal construction of research is important. For illegal construction, the perfection and evaluation of laws and regulations are emphasized. It is particularly urgent to explore its legal governance approach. Governing illegal buildings is very important for promoting urban development and social harmony.

In summary, the legal aspects of illegal construction were studied. Some legal provisions and rules and regulations of illegal buildings in China were analyze to solve the problem of illegal construction in law. Issues related to illegal construction in terms of administrative law enforcement were explored. The management and governance of the illegal building of relevant administrative shortcomings and difficulties in law enforcement were analyzed to find appropriate solutions to governance and regulation of illegal construction. Through the study of illegal construction issues, China’s current laws on illegal construction are understood. From the source, the solution to the problem was found. This is conducive to the supervision and governance of illegal construction. The development of illegal buildings has been curbed. The pace of urban construction is more stable, and the environment and planning are more scientific, thus protecting the interests of the people.

2. State of the art
Domestic and foreign research on illegal buildings is highly valued. Many books on illegal construction have analyzed the difficulties of illegal construction in urban development from different research directions. Mataj summarizes the definition of illegal construction, and analyzes the different types of illegal construction and the principles of management. In his opinion, law enforcement should not be blind. Demolition of illegal buildings cannot be compared with demolition, resulting in infringement of the legitimate interests of citizens (Mataj 2016). Cao and Mannoni pointed out that because China’s legal definition of illegal construction is not perfect, and local law enforcement standards are not uniform, it is not particularly ideal for the governance of illegal buildings. He believes that illegal construction must be defined from various aspects, such as procedural law, substantive law, etc. to better manage illegal buildings (Cao and Mannoni 2017). Take Shenzhen city as an example, the current situation and experience of local governance are introduced in detail. The idea of collaborative governance
is put forward. The management of illegal buildings needs the coordinated management of the government. In many aspects such as social management, public service and economic regulation, the governance of illegal buildings has been realized (Yuan 2017). In his article, Malalgoda et al. introduced the status quo of the illegal construction of the building. He believed that the illegal construction was caused by various reasons. This phenomenon was the product of urbanization construction, which caused by poor supervision and interest driving. At the same time, Malalgoda believes that illegal construction leads to serious waste of land, damages the ecological environment, affects the construction of the city, and has serious safety hazards (Malalgoda, Amaratunga and Haigh 2016).

3. Methodology

3.1. City planning

In 2013, WHO launched a questionnaire survey of health urban planning issues related to members of the health network of European cities. It found that the concerns of healthy urban planning vary from country to country due to different national conditions. The four aspects of general planning and urban form, green space/recreation/physical activity, transportation, and accessibility, urban design and environmental quality are the focus of common concern of member states. Modern urban planning follows the people-oriented concept and is committed to building a home suitable for human habitation. Therefore, the relevant theories of urban planning are enough to constitute the theoretical support for healthy urban planning. All aspects of urban planning have the potential to promote public health. However, to ensure the priority of key objectives of healthy urban planning, the main content and scope of healthy urban planning should be limited (Sallis, Bull and Burdett 2016; Yamamura, Fan and Suzuki 2017).

3.2. Illegal building

Accurate definition is the premise of governing illegal buildings. By accurately understanding the meaning of illegal buildings, illegal buildings are accurately located and distinguished to solve the problem. Therefore, it is very important to make an accurate and specific definition of illegal buildings. China’s laws and regulations do not have a relatively accurate definition of illegal buildings, and there are different views in the academic and practical circles. After a review of that information on illegal construction, the following view regarding illegal construction is found: Illegal build-
4.2. Principles for disposal of illegal buildings

For all kinds of problems in law enforcement of illegal buildings, the law enforcement personnel are not strict enough, which leads to many illegal buildings cannot be dealt with in time. Therefore, the lawbreakers are beyond the arm of the law. Law enforcement is the last link and the most crucial part of solving the problem of illegal construction. Only by strictly enforcing the last level of law enforcement can the number of illegal buildings be effectively controlled, thus accelerating the progress of illegal construction.

In the demolition work of illegal buildings, the combination of self-demolition and forced demolition is adopted. The demolition of illegal buildings by the offenders themselves will save law enforcement costs and government financial expenditure. At the same time, violators can reuse the building materials of illegal buildings to reduce losses. This is a win-win model. If the unauthorized constructor does not agree to demolish illegal buildings or is unwilling to dismantle them by themselves, this can be a method of demolitions, but forced demolitions may intensify contradictions. Therefore, it should pay attention to the way of demolitions. People’s education work and comfort work have been strengthened to try to make the demolition work accepted by the public. In this way, unnecessary disputes can be avoided, the demolition of illegal buildings can be accelerated, and the growth of illegal buildings can be controlled.

4.3. Disposal mode of illegal buildings

Illegal buildings are of different types. The treatment of illegal buildings should be tailored to the specific conditions to achieve good results. Therefore, the mode of classified disposal should be adopted for illegal buildings. There are many types of illegal buildings. The demolition of illegal buildings will be a serious waste of social resources. Some illegal buildings that have undergone quality audits and planning audits will turn illegal buildings into treasures through methods such as reissuing procedures, auctions, and conversion to citizens’ affordable housing. This is a benign transformation of social resources. The first is to legalize illegal construction by completing relevant procedures. The second is to take over and auction illegal buildings. The third is to completely dismantle illegal buildings that endanger public safety. The fourth is to convert illegal buildings that meet safety standards into citizens’ affordable housing.

4.4. Specific countermeasures for illegal building disposal

There are many laws on illegal buildings in China, but there is no accurate and scientific definition of illegal buildings. As a result, law enforcement agencies do not have an accurate judgment on the types of illegal buildings. The type of illegal building needs to be accurately defined by the law. In the past, illegal building was only defined by whether it had corresponding approval procedures. This classification is very broad and even random, which makes it difficult for law enforcement. The definition of illegal buildings cannot be kept at a standard. It is necessary to define whether the illegal buildings violate urban planning, whether it is harmful to the people’s personal and property rights, and whether it can legalize illegal buildings by reissuing relevant procedures, these define the ways and means to be reflected in the law. Through judicial interpretation and legislative interpretation, the boundary is clearer and more specific.

The most common disposal method in the legal provisions on illegal buildings is forced removal. In the process of controlling illegal buildings, the most common method is forced removal. Although forced demolition is the most powerful response to illegal construction, due to the variety of illegal buildings, in the actual law enforcement process, forced removal measures may not be suitable for all illegal buildings. For the illegal construction of some simple architecture, it can be easily removed. However, some demolition of illegal buildings on high-rise buildings is more difficult. The demolition of high-altitude buildings may cause great damage to buildings, vehicles and pedestrians on the ground.

The demolition of a large number of illegal buildings will seriously waste resources. To avoid waste, different approaches are required for different types of illegal buildings. Through legislative interpretation and judicial interpretation, the law can be made more flexible, so that the law enforcement process can be more standardized. As a result, the illegal buildings can be better governed.

The legal system for illegal buildings is complex. There is a certain degree of conflict between laws. The laws and regulations of local illegal buildings may conflict with the superior law. Local laws and regulations must obey the superior law of the state. At the same time, there are non-uniform provisions between different departmental laws on illegal construction. Law enforcement officers are confused when choosing the legal basis, which makes it more difficult for law enforcement.

5. Conclusions

The current legal identification of illegal construction in China is still insufficient. The law lags behind, the legislation is scattered and there are conflicts between departments and laws. At the same time, China’s law enforcement work on illegal buildings is not perfect. Law enforcement departments also have a series of problems such as chaotic distribution of duties, low efficiency of law enforcement, and single law enforcement. Law enforcement is the last link in the management of illegal buildings, and it is also the most important link. By establishing and improving the supervision and evaluation mechanism, the administrative law enforcement methods are changed. A platform for reporting and consulting on illegal construction is set up. The law enforcement activities will be more professional and efficient. The last link of illegal building management is emphasized. In addition to the investment of law enforcement agencies, the illegal construction of buildings requires the participation of the people. Due to the large number of illegal buildings and the strong concealment, it is difficult for law enforcement agencies to investigate and deal with these illegal buildings. Regarding the report information of illegal buildings, law enforcement agencies can quickly find illegal buildings that exist in the streets and lanes, making law enforcement work more efficient and convenient. The cost of law enforcement is greatly reduced.
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INTERPRETATION OF AESTHETICS LANDSCAPE DESIGN UNDER THE LITERARY ARTISTIC CONCEPTION OF "DAGUANYUAN"

Abstract

In order to find a way to create the artistic conception of modern landscape space, the spatial analysis of Daguanyuan is carried out from the perspective of literature in order to find out the method of creating the artistic conception of modern landscape space. Adopting the method of general to special, from theory to practice, the argument with special significance is analyzed from the most common phenomena, and this argument is applied to the method of practical cases. The results show that Daguanyuan space in literature needs the audience's ability to understand words, the perception of space in film and television needs the audience's strong memory and imaginative thinking, while the perception of Daguanyuan space in garden art needs only basic discrimination ability. After analyzing the effect of Daguanyuan space construction from the literary perspective, it is believed that the writing techniques of starting point - development - climax - ending, wanting to carry forward first and restraining first, and reserving foreshadows in literature can be used for reference in modern landscape design.

Keywords: Daguanyuan, Space, Literature.

1. Introduction

As a classical novel, A Dream of Red Mansions first impressed the world by describing simple life scenes in words; since the 1920s, Mei Lanfang's opera "Daiyu Funeral Flowers" was brought to the screen, A Dream of Red Mansions has begun a new growth space in the film and television industry, especially the 1987 CCTV series "A Dream of Red Mansions", which can be regarded as a classic through the space of film art. In the 1980s, Shanghai and Beijing established the Daguanyuan successively. In 1980, Qingpu County of Shanghai established the Daguanyuan by Dianshan Lake, providing people with the opportunity to really appreciate the Daguanyuan and find the traces of Jia Baoyu and Lin Daiyu's life.

The research method is, from general to special, from theory to practice, to analyze arguments with special significance from the most common phenomena, and apply this argument to practical cases. Specific methods are as follows: theoretical research: for ancient and modern literature and Internet information materials, adopt research-based reading methods to obtain relevant theories, learn from predecessors' excellent methods and theories of literature film and television and landscape art, and improve them to form the theoretical system of the content of this study, and to guide the practical application. On-the-spot investigation: the success or failure of gardening space construction needs to be inspected on-the-spot, so that the space created can be perceived by the user's identity. Only by in-depth investigation can the advantages and disadvantages of the space construction of the Daguanyuan in the real scene, which space construction is successful and impressive, and which space construction is deficient and inadequate be clear.

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A Dream of Red Mansions is a classic ancient literary work and an excellent film and television theme. The Daguanyuan is an excellent garden which gathers the essence of classical gardens. The literature film and television, landscape art space performance elements, expressions and performance techniques are analyzed, the space of the Daguanyuan from three perspectives is studied, and the inspiration of literature film and television for modern landscape design is analyzed. The elements and modes of expression of space under three perspectives are discussed. Literature creates space through the elements of expression of space-words by various descriptive techniques. Films and televisions show space through the elements of expression of space-pictures, sounds and words by lens and editing. Landscape art shows space through the elements of gardening-plants, water bodies, rocks and gardening buildings. It is skillful to create a space atmosphere by means of gardening techniques.

2. State of the art

The layout study of Daguanyuan was studied when the book A Dream of Red Mansions was written. This man was Zhiyanzhai who was the first one to do this research. He made many comments on the construction and layout of Daguanyuan, such as the annotations in the seventeenth to eighteenth chapters of his manuscript: / This is an outline, which has to be written in detail, especially the annotations (Yu and Xu 2018). Since then, there have been successive studies on the layout of the Daguanyuan, such as Ge Zhen’s Study on the Plane Map of the Daguanyuan, Jin Qizong’s Preliminary Study on the Layout of the Daguanyuan, Zhou Shanyi’s Ten Comments on the Daguanyuan, and so on.

In the 22nd year of Jiaqing, Fan Kai’s “Rong Guofu and Daguanyuan” attached to his “Dream of an Idiot” is the earliest known plan of the Daguanyuan.
Daguanyuan. The Daguanyuan Picture collected in the Chinese History Museum cannot be examined. It is only known that the author was a folk painter in Jiaqing and Daoguang years. The picture is mainly composed of peony pavilion, Hengwu Courtyard, Shaofoengxuan and concave crystal hall, totaling 173 people, which depicts banquets, poem clubs and other scenes (Jiang and Xu 2016; Zhu 2017). Up to now, the important layout maps of Daguanyuan include: Baoqi’s Daguanyuan Map, Hu Wenwei’s Daguanyuan Map of A Dream of Red Mansions, Song Hongwen’s Jiafu Courtyard Map of Daguanyuan, Ge Zhen’s Daguanyuan Map of Plane Layout, Dai Zhiang’s Daguanyuan Map of Bird’s View of A Dream of Red Mansions, Zeng Baoquan’s Daguanyuan Map, Zhaogang’s Daguanyuan Plane Imagination Map, Xu Gongshi’s Plane Schematic Map of Daguanyuan, Yang Naji’s Plane Map of Daguanyuan, Jin Qizong’s Layout of Daguanyuan, Luo Buzhen’s New Map of Daguanyuan, Zhou Shanzi/Rong Guofu’s Daguanyuan’s Restoration Map, Guan Huashan’s Daguanyuan’s Configuration Map, Zang Lianggao’s Red Mansion Dream Daguanyuan Craftsman’s Restoration Map, and Daguanyuan of Beijing Vegetable Garden, Daguanyuan Plane Schematic Map of Dianshan Lake in Shanghai, etc. (Chien 2017; Costelloe 2014).

3. Methodology

3.1. Expressive elements of space from the perspective of literature

The artistic space that the audience can feel is virtual space. The reason why the novel mentioned here can bring the space feeling to people is that the audience can read the text of the novel and absorb all kinds of information conducive to space perception. Thus, writing is the expressive element of novel space. However, if the text is further refined, the specific elements covered by the text include the description of social content, regional content, scenery content, and character content. The social content described by the characters refers to many social factors such as the characteristics of the times, customs, and interpersonal relationships in the specific areas mentioned in the contents of the novel. It is an important social background factor in the novel and an important support for the characterization and story development of the novel. Regional content is the geographical foothold of the story occurrence in the novel, that is, the occurrence of the story and the field carrying the characters’ activities. It defines the space scope of story occurrence and character activity, and is the specific space where story occurs. Scenery content is the further refinement and visualization of the place where novel stories occur, including natural scenes and man-made scenes. It is the visualization of social content and regional content, and it is often displayed in descriptive sentences. Character content is the description of characters’ psychology, appearance and behavior mentioned in novel content, and it is the assistant factor of space display. It is the visual projection and concentrated reflection of characters through environmental factors, projecting space and giving space character.

3.2. Narrator’s descriptive space

Narrator’s descriptive space is to use the narrator’s omniscient perspective to show space. It is the main way of describing space in the whole novel and also the most basic way of describing space, which is also the most important part of the novel. It is often described directly in large text, so that the image of space is in place. This description method is often used to concentrate on describing the characters’ appearance, natural scenery and other spatial descriptions, which can not only reflect the nature of the characters in the novel, but also introduce the social content and regional content of the novel. Through a large number of stylized sentences, the social content, regional content and part of the character content of the novel can be displayed simply and comprehensively to give the audience the overall impression of the novel space. Audiences interpret the words of front, back, left and right directions and the description of scenery to form a specific image of space in their minds.

3.3. One-sided description of space through characters

This method is a way to use the limited perspective of characters to show space, not to show space in an all-round way, but to show part of space selectively through the eyes of the characters in the novel. It has certain limitations, but it can show space more profoundly. The way of describing space unilaterally mainly appears when describing the environment of a character’s activities and the characters in detail. The characters’ senses such as hearing and vision are used as the lead to draw out what they see, hear and feel, and show the space in their eyes and ears. At the same time, the space with the characters’ likes and dislikes is presented because the description incorporates the characters’ own likes and dislikes. Foster the space atmosphere, achieve the sublimation of the situation, and make the space more vivid.

3.4. Narrator and character combined to display space

The combination of narrator and character shows space in a way that combines narrator’s omniscient perspective and character’s limited perspective. It is a more flexible way to show space by flexible transformation of the two perspectives. Narrator’s display space does not present the space directly and completely, but shows part of the space where the characters appear, and then uses the limited perspective of the characters to show the remaining space. After the end of the characters’ activities, the whole space will be perceived by the audience. Obviously, this way is a way to show space with the activities of the characters, and the emergence of omniscient perspective and limited perspective does not have time succession, but only a reasonable sequence of space display. This way closely follows the characters’ activities, guides the audience with their words and deeds, gradually displays the space, highlights the narrative main line of the novel, dilutes its background content, promotes the individualized display of space, makes the space flexible, vivid and full of charm, and can arouse the sympathy of the audience, and achieves the artistic effect that the first two ways fail to achieve.

4. Result analysis and discussion

4.1. Restoring the location of Daguanyuan

In A Dream of Red Mansions, there are many articles about the Daguanyuan, which refers to the specific location of the Daguanyuan, that is, the sixteenth visit to Jia Fu, after knowing the return of the Lantern
Xuan Wang

In the sixteenth round, Jia Rong informed Jia Lian about the site selection. From the East side, he started the garden in Dongfu to the north, and measured a total of three and a half miles. And the so-called Dongfu, according to the third time Daiyu entered the mansion, there was a plaque on the front door, writing “Save Ningguo Mansion” five big characters. Daiyu thought: This must be the grandfather’s house. Thinking about it, she moves toward west. Not too far, but also three gates, that is, the Rongguo Palace. It is seen that the so-called Dongfu refers to the Ningguo Palace. The location of the Daguanyuan is between the Ningguo Palace and the Rongguo Palace. It starts from the Ningguofu Garden in the East and stops at the Rongguo Palace in the west.

The sixteenth round, after the site of the construction of the Daguanyuan was determined, Jia Lian began to plan for the construction. The shining craftsman dismantled the walls and pavilions of Huifang Garden in Ningfu and went directly into the East Courtyard of the Rongfu. Although there was no clear boundary between the two halls, the lane was also a private land, not an official road, so it could be connected. The Daguanyuan occupied a lane. The Ningguo Garden in the East was the specific location of Huifang Garden. The Huifang Garden is a living spring brought from the north corner wall and when the 13th Central Qin Kejing came to life, the gate of Huifang Garden opened and the drum hall swirled on both sides. Two classes of Qingyi played music on time. Huifang Garden runs through the whole Ningguo Palace from South to north, with its south gate facing the street and the main entrance of Ningguo and Rongfu is on the same line; the north wall is also facing the street, belonging to the northern wall of Ningguo.

4.2. Analysis based on the eighteenth chapter

In the eighteenth chapter, Lin Daiyu cut the sachet bag by mistake and Jia Yunchun returned to congratulate yuanxiao. That chapter mainly selected the part of Yuanfei returned to the province to extract the words about space and walking route, and analyzed the visiting route of Daguanyuan. This review focuses on the narrative of events, but the description of the story environment is very few. However, from the analysis of the sequence of tours, after Yuanfei entered the Daguanyuan, she went around the eastern side of the overlooking mountains to the main hall, and there was a large pool between the overlooking mountains and the main hall. From the previous analysis, it can be inferred that the pool is the convergence of Qinfang Spring. It can reach the main hall through the Qinfang Bridge on the back of the overlapping hill or the boat boarding on the east side of the overlapping hill. It can reach the main hall through the ancestral villa archway. It can preliminarily guess the flow direction of Qinfang Spring and further determine the location of the main hall, and the blue part is the water body part.

4.3. Analysis of the spatial layout of Daguanyuan based on other reviews

The description of Daguanyuan space in A Dream of Red Mansions also has a simple description in the fortieth, forty-first and seventy-fourth chapters. The analysis of Grandma Liu’s path to visit Daguanyuan can supplement the above analysis. Grandma Liu’s path to Daguanyuan is as follows: Qinfangling, Xiaoxiang Hall (toward Jushu, Xiling Chau), Fengjie, Jia Baoyu’s mother, etc. by boat, Qiushuangzhai, Shulu Port, stone ladder, Hengyuan, Zhuijin Pavilion (under the trees in front of the hill), Longcui Pavilion, and Yiyingyan.

Dongfu, When Jia Baoyu’s mother and others visited Qiushuangzhai on the fortieth round, Jia Baoyu’s mother mentioned that it was near the street and heard the sound of drum music from the street. It is clear that Qiushuangzhai is near the street, and the sound of playing music actually comes from Lixiangyuan. Qiushuangzhai is close to Lixiangyuan, so Qiushuangzhai is located in the western part of Daguanyuan. There are two ways between Xiaoxiang Hall and Qiushuangzhai: water and land. The land route is faster and the water route is relatively circuitous. Qiushuangzhai is located in the northeast of Xiaoxiang Hall. According to the eighteenth chapter, when Yuanfei renamed Daguanyuan, it was mentioned that the eastern flying tower was called “Zhuijin Pavilion” that is the attic of the main hall. People listened to the opera in Pavilion separately from water. Hengwu Courtyard had a high terrain, and Longcui Pavilion should be located on the flat ground or at the foot of the main mountain. After Jia’s mother left Longcui Pavilion, she went directly to Daoxiang Village to rest, namely, Longcui Pavilion is not far from Daoxiang Village; and Ruoyu Zhu and Huashuluo Port are all boat rides and scenic spots along Qinfang Spring.

On the seventy-fourth round, Fengjie led people to inspect the Daguanyuan. The paths were as follows: the Yihongyang (one way out), the Xiaoxiang Hall, Qiushuangzhai (past to the Nuan xiangwu), the Daoxiang Village, the Ouxiangxie and Ziling Chau. From the Qiushuangzhai, it is direct to the Daoxiang Village, the Qiushuangzhai is in the same line with the Nuanxianggwu and the Daoxiang Village. It can be assumed that the Qiushuangzhai is in one place with the Nuanxianggwu; the Daoxiang Village is close to the Ouxiangxie, and the Ouxiangxie and the Ziling Chau are also close, that is, the Ouxiangxie and the Ziling Chau are in one place, located at the foot of the western part of the main mountain.

5. Conclusions

From the perspective of literature, the same analysis method is used to collect detailed spatial information and logically analyze the spatial layout of the Daguanyuan. It is concluded that the spatial integrity of the Daguanyuan of garden art is the highest, while that of film and television is the lowest. The results are closely related to the characteristics of the Daguanyuan space from different perspectives. The spatial integrity of the Daguanyuan has a great influence on the audience’s perception of the Daguanyuan space, which needs to be further explored.
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Abstract

To protect industrial cultural heritage, the methods of overall protection and utilization of industrial heritage were put forward in the transformation and development of resource-based cities. Taking Chongqing, a famous old industrial city in China, as the research object, from the cultural heritage, history, architecture, urban planning and other disciplines, the construction of Chongqing industrial heritage protection theory and practice methods were explored to guide the protection and utilization of Chongqing industrial heritage. A progressive evaluation method from the whole to the local was established. Industrial cities, typical corporate and architectural heritage were evaluated. The overall characteristics of urban industrial development were reflected. The renewal of old industrial areas and the protection of industrial heritage were elaborated through the overall co-ordination of urban design and detailed planning. The results showed that it was the key to integrate the protection elements and requirements into the detailed urban control planning. Therefore, special planning plays an important role in protecting industrial heritage.

Keywords: Industrial Heritage, Value Evaluation, Conservation Planning, Urban Revitalization

1. Introduction

Today, the world is moving rapidly into the post-industrial era. Urban traditional industrial categories are gradually being replaced by emerging industries. In the 1970s, European and American countries were affected by globalization, and traditional manufacturing industries shifted to developing countries. A large number of industrial land and industrial buildings are idle, which has caused environmental degradation, economic recession, unemployment and poverty and other social problems (Pickard 2016). The 19th Congress of the International Association of Barcelona (UIA) proposed an initiative to protect, manage and regenerate abandoned sites such as industrial and terminal sites (Blagojević and Tufegžić 2016). The International Federation of Industrial Heritage Protection (TIICIH) has developed and promulgated the Lower Tajir Charter on the Protection of Industrial Heritage (Fernandes, Figueira and Salvador 2018). It officially clarifies that industrial heritage is one of the important contents of the city’s historical and cultural heritage. This document is considered a milestone in the protection of the world’s industrial heritage.

Typology and analytical induction are combined. The comparative analysis method and the analytic hierarchy process are used to construct the value evaluation system of industrial remains. Industrial heritage was selected. Layered, classified, graded and staged protective measures have been formulated (Andreotti, Franzoni and Degli 2018). On the whole, the industrial heritage of Chongqing is studied. Based on the classical theories of architecture and urban planning, the viewpoint and method of overall protection of industrial heritage are put forward.

In summary, China is still exploring ways to protect and reuse industrial heritage. A unified theoretical system has not yet been established. In particular, the research on industrial heritage protection in western China is still very backward. The state has issued a notice requiring local governments to actively explore ideas and methods for the protection of industrial heritage in the region. Taking the industrial city Chongqing as the research object, the characteristics of the industrialization of mountainous cities and the theoretical methods of the protection of industrial heritage are studied. It is typical in the field of industrial heritage research in China.

2. State of the art

Industrial cities refer to cities that have historically been developed due to industrial development, or cities that have existed for a long time, but the rise of industry has further promoted its prosperous (Andreotti, Franzoni and Degli 2018). Due to the decline of traditional industries or the adjustment of industrial structure, the industrial legacy and industrial culture left in the city have become a symbol of urban characteristics and history. It is a unique cultural resource left by the history to the city and a characteristic not found in other types of cities (Endere and Colombato 2017). For example, Chongqing is an industrialized city. Although there are many cultural connotations such as the Bayu culture, immigrant culture and Hongyan spirit, which have a long history of nearly 3,000 years, it has pushed the city from the agricultural feudal small town to the emerging modern industrial town to the new period national center city and the economic center of the upper reaches of the Yangtze river. The rapid development was driven by industrialization. Especially during the Anti-Japanese War, Chongqing has grown from a small inland town in the southwest to an internationally renowned metropolis. It became the Chinese capital of the war,
the Far East Command Center of the Allied Forces, and the Chinese Theater Command of the Allied Region. This is unique in the history of Chinese urban development. Chongqing industry is the episode of the national industry in wartime, known as the "China’s industrial capital". War is a contest between the levels of industrialization between countries, and Chongqing industry has made tremendous contributions to the victory of the war of resistance. Before the war, many industrially developed cities such as Shanghai and Wuhan were in a state of stagnation, and only Chongqing’s industry achieved leapfrog development. Therefore, the industrial heritage of Chongqing, which carries the industrialization during the Anti-Japanese War, has unique and important historical value of industrial development in the country. It is the prosperity of industrial civilization that promotes Chongqing’s economic and social development and enhances Chongqing’s position in the country. Therefore, industrial civilization created today’s Chongqing. Chongqing began to step into the post-industrial era. As the material evidence of industrial civilization, industrial heritage should be one of the most important historical and cultural heritage in Chongqing (Zhu 2017).

3. Methodology

3.1. Main content of the third-front movement

During the third-front movement, the main development industries of Chongqing industry were weapons, ships, electronics, aerospace, metallurgy, chemical industry and machinery manufacturing. Among them, the weapons manufacturing industry was the mainstay. During the period of “third-line construction”, 118 industrial enterprises were newly built and expanded. More than 30 were military enterprises and 88 were supporting civil industrial enterprises (Wu, Wang and Feng 2017). The production technology level of large national factory enterprises in Chongqing area is at the leading level in China and even in the world. The representative factory enterprises are shown in Table 1.

3.2. Characteristics of industrial heritage types

The main industrial nature of industrial heritage reflects the characteristics of urban industrialization. The industrial nature of Chongqing at the beginning of its modern opening was dominated by light industries such as matches, cotton spinning and silk reeling, which had a certain impact throughout the country. With the intensification of the melee of the modern Sichuan warlords, the development of the weapons manufacturing industry for gun production was promoted. The 20th Group Army Gun Factory (converted from the Bronze Bureau) and the Chongqing Electric Steel Plant and other military enterprises were established. During the Anti-Japanese War, the military industry developed rapidly and laid the strategic position of Chongqing’s military capital. After liberation, the proportion of light and heavy industries will be appropriately adjusted, and the ratio will be more reasonable. With the beginning of the country’s “Third-Front Movement”, Chongqing has become a national defense strategic base of heavy industry such as military industry, shipbuilding, chemical industry and equipment manufacturing. It can be seen that the industrial development of Chongqing is characterized by the nature of heavy industry, and the industrial heritage has the characteristics of a distinct heavy industry.

It can be seen from the statistics of the pillar industry structure in Chongqing (Table 2) that heavy industry, mainly metallurgy, chemical industry and large-scale machine manufacturing, is the main category of Chongqing industry, which is determined by Chongqing as a national defense and large-scale equipment base. At the same time, Chongqing is a comprehensive industrial base. Although it is based on the heritage of heavy industry, the only remaining industrial heritage of light industry is rarer. The light industrial heritage should be protected. The characteristics of heavy industry cannot be overemphasized. The integrity of the type of industrial heritage is achieved. For example, when the only remaining expert guest house of Chongqing cannery is developed on the site, protection requirements should be put forward. The basement and stair ruins of the Chongqing Cigarette Factory should be retained as an important cultural heritage when planning the construction of the Nanjing Road Liangjiang Square. This has become a window for the public to understand the industrial development of Chongqing. Although Lijiatun’s heavy cotton factory has closed, the factory area is still intact. The Lijiatun area was once a cotton and wool textile base during the war of resistance. The old factory building should be used as an industrial museum of the textile industry to display the history and achievements of the Chongqing textile industry.
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and environmental protection. the production equipment and reuse have the significance of energy saving and produce greater economic value. moreover, the protection and utilization of industrial heritage can promote the adjustment and optimization of urban industrial structure, creative industry will effectively promote the adjustment and optimization of urban industrial structure, and the protective reuse of industrial heritage can produce greater economic value. Moreover, the protection and reuse have the significance of energy saving and environmental protection. The production equip-

4. Result analysis and discussion
4.1. Characteristics of industrial heritage values
The economic potential of industrial heritage reuse is enormous. From the perspective of urban location and land value, the old industrial area is now mostly located in the center of the city with good location conditions. In addition, it is an ideal place to develop modern cultural and creative industries with high added value and high-tech industries. These industrial zones are now one of the fastest-growing parts of Europe’s economy. The successful practice of some cities in China also proves that combining the development of tertiary industry such as modern service industry and creative industry will effectively promote the adjustment and optimization of urban industrial structure, and the protective reuse of industrial heritage can produce greater economic value. Moreover, the protection and reuse have the significance of energy saving and environmental protection. The production equip-

4.2. The unique value of industrial heritage
The history of modern industrial development in Chongqing is early, and it is the earliest industrial city in the western region of China. During the War of Resistance Against Japanese Aggression, it became the largest comprehensive industrial base in the Kuomintang area. After the founding of the People’s Republic of China, after three years of national economic recovery, two adjustments, “The Third-Front Movement” and the implementation of six five-year plans, Chongqing has become a comprehensive industrial base of China’s strategic rear with light industry and heavy industry. In the history of China’s industrial development, Chongqing’s industry has the most complete history. It has experienced continuous historical stages such as the Westernization Movement, the Anti-Japanese War, the early stage of the founding of the People’s Republic, and the construction of the third-line. Some developed industrial cities along the coast lacked the historical development stage of the war of resistance and the third-front movement. Therefore, from the history of China’s industrial technology development, the history of Chongqing’s industrial development is a complete portrayal of the history of China’s industrial development, which represents the entire process of China’s modern industrial development.

4.3. Improvement of industrial heritage protection system
International protection of historic buildings is divided into the designate system and the register system. The designated system refers to the cultural heritage protection system that is included in the statutory protection, such as the protection system of the cultural protection unit. The registration system is a pre-protection system for cultural heritage. At present, China’s designated system is the main protection system, while European and American countries adopt a dual protection system of both the designated system and the registration system coexist. The registration system expands the concept and scope of cultural heritage protection, and promotes a single designated protection to a comprehensive protection of multiple types of historical heritage. Since the registration system can fully integrate urban cultural heritage into the protection vision, the registration system has become an important supplementary means for the current history and culture to develop a protection system.

4.4. Construction of industrial heritage protection legal system
Legislative protection is a fundamental guarantee. Legislation to protect urban cultural heritage has
become a consensus, and its importance and necessity are self-evident. In the designation system of cultural heritage, “Cultural Relics Protection Law” is a method for protecting cultural relics protection units, but it has been unable to adapt to the requirements of the times. When the Cultural Relics Protection Law was promulgated, industrial heritage protection has not yet been proposed. Moreover, the requirements for the protection of cultural relics and the protection requirements of historical and cultural blocks, towns and villages and industrial heritage are not the same. Many cultural heritages need to be preserved in a living state, rather than in a static museum like cultural relics. Therefore, the Cultural Relics Protection Law is not applicable to all types of urban cultural heritage. It is necessary to formulate corresponding protection laws for many new types of heritage. This is the need to keep pace with the times.

5. Conclusions
Industrial heritage at different stages of development should be protected. The complete social development track is preserved. The theory of industrial heritage protection needs to be improved. At present, people-oriented and sustainable development has become the consensus of the whole society. Industrial cultural heritage has promoted a new cultural industry. The industrial structure was optimized and upgraded to enhance the cultural connotation and individuality of the city. This is the concrete embodiment of the scientific development concept in urban planning.

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Abstract
To explore the landscape planning of the comprehensive sports stadium and the football field, the similarities and differences between the comprehensive sports stadium and the football field landscape design and the general park design were analyzed by GIS technology. Special factors were discussed in the design of the complex sports stadium and football field. The treatment methods and principles of these special factors were analyzed. The results showed that their characteristics were created while meeting the functional requirements of each space. The local history and cultural scene left a deep impression on the viewers. Therefore, the design of sports facilities is consistent with the overall landscape effect. During the transformation of the base, the relationship between the original landform protection and development of the base is emphasized. This provides information and assistance for the comprehensive sports stadium and football field landscape design.

Keywords: Stadium, Football Field Landscape, GIS Technology.
Table 1: Level of spatial information

<table>
<thead>
<tr>
<th>Land type</th>
<th>Space dimensionality</th>
<th>Measure content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural geo-objects</td>
<td>0 dimension</td>
<td>Coordinate</td>
</tr>
<tr>
<td>Linear features</td>
<td>1 dimension</td>
<td>Length, curvature, direction</td>
</tr>
<tr>
<td>Planar features</td>
<td>2 dimensions</td>
<td>Perimeter, area, shape, curvature, etc.</td>
</tr>
<tr>
<td>Body shape features</td>
<td>3 dimensions</td>
<td>Volume, surface area, etc.</td>
</tr>
</tbody>
</table>

includes geometric calculation, centroid calculation and shape measurement. Different points, lines, and surface objects have different meanings. General geographic information system software has the function of geometric quantity calculation of points, lines and planar features. This is spatial data for vector data structures and raster data structures. As a spatial science, Geographical Information System (GIS) is characterized by its distinctive spatial thinking and perspectives (Nordbø, Nordh and Raanaas 2018). Level of spatial information is shown in Table 1.

General geographic information system software has the function of geometric computation for points, lines and planar features, or for vector data structures or spatial data for raster data structures.

3.2. Spatial statistical analysis
Statistical analysis of parameters such as mean, sum, variance, frequency, and kurtosis coefficients of the data set is completed. The results of statistical analysis can be divided into name data, grade data, interval data, and ratio data.

3.3. Spatial buffer analysis
Spatial buffer analysis is for the point, line, and surface entities, and automatically creates a buffer polygon within a certain width range around it. Buffer analysis usually has three cases: one is a buffer based on point features. This is usually a circle with a point as a center and a radius at a certain distance. The second is a buffer based on line features. This is usually a parallel strip polygon that is at a distance from the central axis along the central axis. The third is a buffer based on feature polygons. By extending a certain distance outward or inward, a new polygon is created.

3.4. Spatial overlay analysis
Spatial overlay analysis is the operation of overlaying two or more layers of feature maps to create a new feature layer. As a result, the original elements are segmented to generate new elements, and the new elements combine the attributes of the original two or more layers. This kind of analysis is to calculate and analyze the attributes of new elements according to a certain mathematical model to produce the results required by users or answer the questions raised by users. There are many forms of spatial overlay analysis in practical applications. For example, the results of spatial overlay analysis are used to establish the spatio-temporal structural differentiation model and spatial measurement model of urban land use. In addition, fundamentally, it can be divided into three types: polygon overlay, point and polygon overlay, and line and polygon overlay.

3.5. Spatial pattern analysis
The spatial pattern analysis mainly has three meanings: The first is the type of spatial entity in the study area (landscape). The second is the spatial layout of the spatial entity type. The third is the quantitative structure of spatial entities, that is, it is determined by the type, quantity, shape, spatial distribution and spatial combination of spatial entities. The plagues of different spatial entities exhibit different graphical features due to different formation mechanisms. Therefore, in the study of the spatial pattern status and mechanism of spatial entities, emphasis is placed on the quantitative analysis and description from the perspective of the shape of a single solid spatial plaque and the spatial distribution of plagues. Generally, the indicator systems used in spatial pattern analysis mainly include perimeter, area, quantity, average area, shape index, fractal dimension, fragmentation index, diversity index, uniformity index, and dominance index.

3.6. Spatial autocorrelation analysis
Spatial autocorrelation analysis is the most commonly used method to understand spatial distribution characteristics and select appropriate spatial scales to complete spatial information analysis. The so-called spatial autocorrelation refers to the correlation of the same variable at different spatial positions to test the relationship between the value of the spatial variable and the value of the variable in the adjacent space. Currently, the commonly used indicator for spatial autocorrelation analysis is the Moran index, which ranges from -1 to 1. The calculation of this value is based on the spatial autocorrelation statistic. That is, the conventional statistical method is used to test the interdependence between adjacent locations in the spatial distribution, and hypothesis testing can be performed. Because many geographical phenomena are often affected by continuous processes in geographical distribution, they are spatially autocorrelated.

4. Result analysis and discussion
Landscape is an important factor in determining the framework of a comprehensive stadium and football field. It can be roughly divided into two categories: one is natural landscapes and the other is artificial landscapes. Artificial landscapes and natural landscapes play an important role in the comprehensive sports stadium and football field. Its role includes: The first is to increase the natural beauty and rich landscape of the landscape architecture itself. The second is to make the park rich in creativity in construction. The third is that natural landscapes can effectively connect sports facilities, thus reducing the cumbersome feeling of large-scale sports design. The fourth is that the construction of artificial landscapes can achieve a balance of earthwork from an engineering perspective.

The location of the integrated sports stadium and football field can affect the form of the venue. In general, the geographical conditions required for sports facilities and sports venues and football stadiums should be met. However, this is not absolute. In the following cases, it can be seen that the comprehensive stadium and the football field and the sur-
The comprehensive sports stadium and football field landscape design must first consider the holding of major international sports events. For example, the Olympic Games and the World Cup will have a huge impact on the economic benefits of the host country. In addition, while promoting economic benefits, it can also enhance the international credibility of the host country. Secondly, a grand international competition is not only a physical competition, but also a grand gathering of athletes and spectators from all over the world. People of all countries can take this opportunity to exchange feelings, enhance mutual understanding and promote friendship. For host countries, social stability is promoted and citizens’ sense of national honor is enhanced. Moreover, the environmental benefits have been improved. The design and construction of large stadiums often need to take into account the impact on the surrounding environment during the construction process and after the competition. Ecological principles should be implemented in the process of site selection, planning, design and construction. For example, the base of the World Cup park in Seoul is a landfill, which was once a place that disgusted the people around. However, after reasonable planning and design, it became a beautiful World Cup sports park and became a favorite park. In addition, the surrounding environment of the World Cup Park has also improved the environment around the area. This is one of the successful examples of the restoration of the ecological environment of abandoned land in human history.

5. Conclusions
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1. Introduction

With the development of urbanization, various cities have lost the historical features of the Chinese nation. What remains are mainly discontinuous streets and buildings, most of which exist as historical and cultural reserves (Liu 2018). For the cities of the Qing Dynasty, the change of modern cities will have a great impact on the traditional cities. The old city of the Qing Dynasty is declining and its vitality is falling. With people’s pursuit of history and culture, the revival of old cities has become a problem that must be faced. At present, there are many historical and cultural reserves in the Qing Dynasty in China, covering a large area (Zhao et al. 2017). In the planning, the common closed protection and management methods should be avoided to meet the needs of the general public to continue the historical landscape. Among the many remaining Qing Dynasty architectures, Beijing architecture is the most typical. In the central area of the old city, Shichahai is a typical inner city water area in the north. It has water space and open space engineering and generates a space with the characteristics of heritage protection and tourism. In the traditional buildings of the Qing Dynasty, various residential areas are intertwined to form different open spaces. The typical ones are land temples, small markets, etc. (Tan, Wang and Wang 2011). Modern architecture does not reflect this, and it is impossible to create the demand for open space in the transformation of traditional neighborhoods. For example, the form of sewing needles is used in the vicinity of Beijing city. There are a lot of dense buildings and a lack of public space (Suling, Zhang and Stancanelli 2016). Although the improvement is carried out on the basis of maintaining original urban texture and the living space is created, it is far from meeting the demand of the people.

China is a country with a long history, rich culture and abundant territory. In the long course of five thousand years in China, each dynasty’s change, development to prosperity and decline will create a unique culture. Buildings in different periods also formed different styles, mainly reflected in the plane layout, elevation form, construction methods and so on. Since becoming a party to the UN Convention on the Protection of the World Cultural and Natural Heritage and a member of the International Council of Monuments and Sites, it has become one of the important tasks of the Chinese government to protect cultural heritage and make it last forever. People’s understanding of the importance of the surrounding environment of cultural relics and ancient buildings is gradually improving. It is becoming a consensus that the ancient cultural relics and the surrounding environment are regarded as a whole system, and the concept of unified protection planning is becoming a consensus.

To this day, most of the research on the ancient architecture of wood construction is based on the overall timber frame, and the research is still in the exploration stage. There is relatively little research content on the brawling components, especially the research on the ancient wooden structures and their fighting in Sichuan Province. Due to the erosion of wind and rain and the impact of natural disasters and factors, the existing wooden structures of ancient
wooden buildings have been damaged to varying degrees, and Sichuan is a region with frequent earthquakes. At present, the definition method used in practice has many limitations, which either leads to the blind expansion of the scope of protection of cultural relics and ancient buildings, beyond the actual protection capacity, and ultimately it is difficult to achieve protection. Otherwise, the lack of awareness of the surrounding environment of cultural relics and ancient buildings can not fully protect the integrity and uniqueness of the ancient buildings, so that the cultural relics and ancient buildings lose the soil for survival and the air for breathing. Therefore, it is of great significance to study the protection scope delimitation in the protection planning of cultural relics and ancient buildings.

In this paper, we propose a model for planning and construction of ancient buildings. This algorithm is a new model for planning of ancient buildings. In conclusion, our contributions are as follows:

(1) This paper presents a new model for material management in the planning and construction of ancient buildings.

(2) The model is widely used in the construction of ancient architectural planning projects, and has high applicability for most of the ancient architectural planning projects.

(3) The new model proposed in this paper has higher accuracy, higher computational efficiency and wider applicability.

2. Laws and regulations on material management in the Qing dynasty project

The Qing Dynasty project is a broad concept, covering the walls, Mausoleum, water conservancy and so on. From the analysis of construction activities and related legislation, there is still no separation from handicraft industry. Many existing construction legislation began during the Kangxi period, and many famous buildings, such as the Palace Museum, the Old Summer Palace, Chengde Summer Resort and so on, have been preserved. The legislation of the Qing Dynasty has been relatively systematized, such as Qing Dynasty Record and Qing Dynasty Case Record. These regulations are mandatory. Once violated, the responsible person shall bear corresponding responsibilities (Riquelme et al. 2012). Under the centralization of centralized power, the state occupies an absolute advantage in the distribution of social resources. For example, the inscription of the Qing Dynasty stipulates that the provinces producing timber need a certain amount of colored boards every year, and there are certain differences among different provinces (Jia, Zhou and Shen 2013). The "Regulations of the Imperial Ministry of Works" is very detailed, which not only divides the grades, but also has corresponding standards for different grades, and even divides by size. In terms of material management, several management departments with special storage areas are set up by the Ministry of Work (Kai et al. 2012). Fujita Xiang et al. took a wooden ancient building Dougong as an example, made three kinds of test models of simple structure Dougong (no trough and no trough lifter, no trough lifter, three trough) and carried out horizontal low-cycle repeated load test and shaking table test. Fujita et al. analyzed the effects of different structures on the linear stiffness, deformation characteristics, dynamic characteristics and damping ratio of Dougong. Based on the previous research results, they carried out horizontal low-cycle loading tests on the slightly complicated Dougong (similar to the step-out 3), obtained the P-A curve of the Dougong, and established the restoring force model. On this basis, they used the single-mass point spring element to simulate the Dougong to carry out numerical simulation analysis. By comparing with the test results, the validity of the parameters of the Dougong resilience model was verified. Akihisa et al. simplified the big bucket in the Dougong into a wooden block placed between the turns. The lower part was connected by short wooden pins. The upper part was subjected to constant vertical load, and the bucket and the raft were assumed to be elastoplastic.

3. Renovation design of ancient buildings

3.1. The overall reconstruction of the historical and cultural protection area

Landscape space is a material carrier, different from graphic design, starting from space design. Every ancient architectural project has inherent laws. Landscape space is not the same as architectural space, but the combination of human and nature (Dacarro 2012). In the planning and design, the building is the main factor for dividing the space, also the main material for the atmosphere, and the main part of the planning and design. Partial non-architectural construction can be used to maintain buildings, such as decorations. The use of decorative components can highlight architectural styles, such as earthen walls, curtains, etc. With the help of various decorative components, architectural styles and features can be continued. In the planning and design of architectural conservation areas in Qing Dynasty, color tone is one of the important characteristics of continuing cultural characteristics. The architecture of Qing Dynasty extended the characteristics of architecture in Yuan Dynasty and Ming Dynasty. The green bricks were widely used. Many old cities in Beijing are dominated by blue-gray, while official buildings are dominated by red walls. In the overall planning design, the traditional color tone shall be kept as a whole, and the overall effect shall be maintained. Some newly built buildings also need to be in harmony with the surrounding colors to form a good visual effect.

New and old buildings in any space need to be integrated and unified, and traditional blocks commonly used in China are the most effective. In planning and design, public space combined with greening can be used as transition space, and open space can be arranged between new and old buildings. If the protected area of cultural relics is small, outdoor space of old and new buildings can be increased. In the planning and design of surrounding residential buildings, the scale is a key consideration. From the perspective of protection, it is also necessary to strictly control the height of buildings and update the ancient buildings by means of planning.

For example, in the construction plan of the big Shan hurdles interchange, the space is small. It is a fusion of multiple cultures, presenting the state of...
great courtyard and living in multiple households. In the design, the original architectural exterior decoration features are maintained, and a large number of traditional green brick materials are used for construction. At the same time, the utilization of indoor space is increased. The glass curtain wall and wooden grating are designed to improve the lighting effect. In order to further improve the utilization rate of space, a three-dimensional public space is created on the roof, and the interior space is extended.

3.2. Space planning and design
In the process of space renovation and reconstruction of buildings in the Qing Dynasty, all kinds of buildings in the Qing Dynasty should be classified first, and the overall plan of repair, renewal and maintenance should be put forward. It is required not to change the appearance of the original building, maintain the cultural relics building and improve the internal facilities. The original components should be preserved for cultural value, such as ventilation, wood carving ornaments, flower cover, etc. Care should be taken to protect artifacts with higher cultural connotations rather than throwing them away.

Planning and design should cover consumption space, transition space and so on. Consumption space is also a variety of service space, such as bars, pedestrian streets, restaurants, etc. In the design, the positive space needs to be shaped to meet the basic needs of the people, while expanding the consumption demand. Secondarily, the rest space should be increased, and necessary small squares, rest seats, lawn greenbelts and so on shall be set up, especially the rest place, so people can be attracted to dwell. In transportation planning and design, in addition to pedestrian streets and public transportation, it is necessary to set up a stopover space, and at the same time, it cannot conflict with the protection street.

Transition space mainly refers to the transition area between protected areas and residential groups. In terms of street guidance, commercial and tourist signs should be strengthened to ensure that people can enter the consumption space through them. In terms of micro design, the planning diagram should be able to reflect the design effect of two plane corners. For example, the corners that are common in traditional neighborhoods are adopted in the design of Shichahai and surrounding neighborhoods to complete the street transition.

In the process of space conversion, the size nodes need to be controlled. In the design of each space and node, more than 70% of the space should be residential space according to the regulations and documents, and tourism setting is strictly prohibited in the planning area. The necessary internal orientation places should be provided to tourists to promote residents’ interaction. Road widening is the most common way in traffic planning, but it is easy to destroy the humanistic atmosphere of buildings. Small-area public transportation such as a small bus may be considered.

4. Architectural planning and design of cultural protected area
4.1. Qijiang ancient town
Located in the northeast of central Sichuan, the ancient town of Qijiang lies between Chengdu, Deyang, Mianyang and Suijing. In the Spring and Autumn Period and the Warring States Period, the ancient town of Qijiang was the seat of King Qi City of the princes. After King Hui of Qin destroyed Shu, he did not abandon the King of Qi. His capital was still called the King of Qi City. Architectural patterns of ancient towns are well preserved. From the Pre-Qin Dynasty to the Ming and Qing Dynasties, the remote and mysterious Qi guo State evolved into today’s Lingxiao ancient towns, forming the most unique picture of ancient towns on the spatial map of Chinese settlements.

External environment space—In the ancient town of Qijiang, natural elements such as mountains, rivers and forests are the external environment spaces where the building groups are located. The external environment plays a role in setting off the building groups. The building group is backed by mountains and waters, and it is at the junction of the two rivers. Its location in Fengshui has a great advantage. Jinzhongshan and Lion Mountain can form a good view exchange in the external exchange space. The tall ancient banyan trees in Qijiang Town also become a part of its external environment. In space, point exchange space can be formed to form the opposite view with mountains and waters.

Any material urban environmental space contains both material and spiritual contents, which not only have practical functions, but also have certain non-material spiritual connotations. In the sense of urban environment, the so-called non-materiality of space refers to the original behavior and cultural activities of people’s life, work, communication and entertainment in the material space and original environment composed of streets and buildings in ancient towns. This kind of immateriality depends on the material space, but it gives the soul of the material space and becomes the basis for the combination of urban history culture and space.

As a long-standing, simple and agile ancient town, the intangible behaviors of various material spaces in the ancient town of Qijiang are obvious. The street space of Guzhen, in addition to its basic function, is also an environmental space for people to conduct folklore activities and market transactions. The environmental space of the ancient theater building combined with the temple and the hall is characterized by the social and cultural behaviors of religious worship, interpersonal communication and drama. In particular, we should mention the ancient stage space environment, which is not only the venue for people to engage in spiritual and cultural activities in ancient towns, but also a manifestation of the spatial relationship between the material space of the stage and the intangible cultural and artistic form of opera culture. The intangible culture of Sichuan Opera performance is expressed through the material space of the stage.

4.2. The planning and design of Baita temple and bell tower and drum tower
Baita Temple is located in historical and cultural blocks, covering an area of 37 hectares, with a total construction area of 242 thousand square meters. The number of registered households in the region is 16,000, with more than 800 courtyards and more than 4,000 existing buildings. As Beijing promotes the overall protection and revitalization of the old city, courtyard houses are taken as the center in the planning and design, and the renovation is carried out according to the needs of residents.

The courtyard is located at the y-shaped inter-
section, facing a relatively complete facade along the street. The wall of the courtyard is relatively intact. The courtyard can accommodate 8 families. In order to meet the needs of life, there are many illegal buildings in the courtyard, which form a pattern of large courtyards and a messy space. In the planning, the illegal buildings in the central location are demolished to restore the original features. The straight corridor is set at the entrance, the Cafe is set on the right and the gate is at the end. Six guest rooms are designed in the courtyard, covering an area of 20 to 30 square meters. Apart from guest rooms, the rest area is public space. The guest rooms and public spaces together form square courtyards. The roof of the public space is reinforced and designed as a roof terrace, where the Baita Temple can be seen from afar. Indoor space is used vertically to improve the utilization rate of space and the ground is dug partially. To increase lighting effect, double glazing is used in skylight and open windows are designed inside the room.

Bell Tower and Drum Tower is known as a time museum, located in the central city of Beijing. In addition to the Bell Tower and Drum Tower itself, the other buildings are mainly traditional quadrangles which are the key protected areas in Beijing. Bell Tower and Drum Tower is the center of time reporting, and it is one of the landmark buildings in the Qing Dynasty. In the planning and design, the green space echoes with drum tower base, echoing the axis of the southeast triangle. Bell Tower and Drum Tower covers an area of 5847 square meters, with a total construction area of 14 thousand and 700 square meters. The relationship between the two sides of Bell Tower and Drum Tower and Bell Tower and Drum Tower begins to blur. In the design, the original style is maintained, the exterior decoration style is mainly based on ancient decoration, and the style and color of the ancient building materials are used. Meanwhile, the roof lighting and underground space are improved. In terms of layout, Bell Tower and Drum Tower is consistent with the traditional quadrangle courtyard, which is a floor building on the ground. The exterior decoration is mainly simple and generous, removing unnecessary decoration, using the ancient architectural texture. At the same time, modern technology is introduced, which is consistent with pure wood in the structure and appearance of doors and windows. Composite wood structures are used to improve the durability of windows and doors. In order to maintain the style of bell and drum tower, natural wood color spectrum is adopted. The roof is used to illuminate and solve the problem of ventilation. The underground space is equipped with exhibition halls, auction halls, office logistics and other departments. Interior space adopts modern style and flexible layout. Multiple spaces form a large space to meet functional requirements, and stone decoration is used partially. Diversity has been achieved in interior decoration. Decoration materials are mostly modern decorative materials, according to the needs of devices. The pattern is mainly represented by inlay and hardware.

5. Conclusion

Modern architectural design ideas come from the West, which have certain one-sidedness and undermine the historical charm of traditional blocks. The planning and design of Qing dynasty planning project was mainly discussed, in order to show the characteristics of the ethnic culture of the building. Based on the simple analysis of the planning of the material management law of the Qing Dynasty, the embodiment and transformation of the Qing Dynasty architecture in modern times were discussed. With a long history and profound cultural accumulation, Qijiang ancient town recorded the traditional architectural features, architectural features, excellent architectural art, and primitive spatial forms. Meanwhile, Qijiang ancient town is the carrier of traditional folk customs and excellent folk customs culture, which has high research and utilization value. The ancient town of Qijiang, located in Santai County, Mianyang City, currently retains some traditional architectural features and external space patterns. However, with the development and construction of the city and the transformation of unreasonable architectural features, the original architectural features and patterns of the ancient town are gradually disappearing. Therefore, how to deal with the relationship between urban construction and the protection of ancient buildings is a great challenge.

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CONSTRUCTION AND PLANNING OF LIBRARY SERVICE FACILITIES SYSTEM BASED ON PUBLIC DIGITAL CULTURE EDUCATION IN INTERNATIONAL CULTURAL METROPOLIS.

Guixia Li, Guiping Jiang

Abstract
To study the construction and planning of the library service facility system based on public digital culture teaching in international cultural metropolises, the main body of resources construction, channels, selection criteria, construction standards, user service policies, service methods and service objects of the National Digital Library of Russia were analyzed. The construction foundation, policy support and digital resource construction of the Chinese and Russian national digital libraries were compared. The results showed that the problem of digital copyright was solved while the library community was constructing digital resources according to the existing rules. Therefore, this method has certain implications for the construction of digital libraries in metropolitan areas in China.

Keywords: National Digital Library, Public Digital Culture Education, Services.

1. Introduction
Digital library construction has become the main direction of information industry development and an important part of information society. As the world enters the digital age, the results of millions of documents, museum exhibits and human intellectual activities are converted into electronic resources. According to experts, by 2020, all resources in the collection of libraries, archives and museums around the world will be digitized. Therefore, the digital library project has become a hot issue in the research of the library community around the world. How to build the library of international metropolises in China for public culture education has been the top priority.

Using the literature research method and comparative analysis method, the characteristics of the construction and service of the Russian National Library with the characteristics of a metropolis are discussed. The construction of the Russian National Library was learned to serve and be used in the construction of Chinese libraries.

The system features and services of the Russian National Library are comprehensively summarized. The Russian National Library’s experience in digital resource construction standards, digital resource construction characteristics, literature resource selection standards, user service methods, and service characteristics have been used for reference. This provides a new method for the construction of national digital libraries in China. The construction model, resource construction and policy support of national digital libraries in China and Russia are compared. The guarantee mechanism, digital resource construction, digital resource copyright resolution and user service methods of the construction of the National Library of Russia have brought certain enlightenment to the construction of China’s national digital library.

2. State of the art
For the massive literature resources of digital libraries, how to provide readers with information conveniently and quickly to meet their individual needs is a problem faced by library services. Recommended techniques are an effective tool for solving this problem. Several key technologies of digital library personalized recommendation service are elaborated, including modeling of reader interest, modeling of recommended resource objects and resource recommendation mode (Xiong 2014). The realization path of digital culture governance of public libraries in the era of big data is explored. The positioning and mission of the library in the construction of public digital culture was explored. Taking the digital construction of public libraries in Jiangsu Province and the practice of digital resources construction in Nanjing Library as an example, relevant suggestions and measures are proposed around the main content of library digital resources construction. The construction and status quo of digital libraries are comprehensively evaluated, including project background, resource organization, service characteristics, technical characteristics, etc., and evaluations and recommendations are given. The practice and research on the integration of foreign public digital cultural resources was investigated. Based on foreign research results, cooperation mechanisms, metadata standards, new technology applications and intellectual property protection in the integration of public digital cultural resources have been studied (Ximing and Qiaoyuan 2015). By visiting and analyzing the library’s website page, empirical research on the core services of the public libraries of thirty-one informatized international cities was conducted. The index system of digital library (virtual) and physical library (entity) in the role of public libraries in the knowledge society is defined (Mainka, Hartmann and Orszulok 2013).
3. Methodology
The literature research method is a relatively scientific research method. Through the HowNet, Wanfang, Google, and Yandex search engines, the literature on the construction of the Russian National Library was extensively searched. The contents of the document were sorted out. The background and development history of the Russian National Library, policy and legal support, and the characteristics of resource construction and services were studied. The development prospects of the Russian National Library are predicted.

Comparative analysis was applied. The construction of the Russian National Library is compared with the construction of the National Digital Library of China. The successful experience of the construction of the Russian National Library was borrowed. The experience of the construction of the Russian National Library in terms of legal policy funding, resource construction and services, and proper resolution of digital document copyrights has been studied.

3.1. Digital resource construction
The main body of the digital resources of the Russian National Library in the national metropolis of Moscow presents a clear diversity. In a way, this is a resource sharing. The Russian National Library is open. Any institution or organization that wants to join the project can become a member of the Russian National Library. At the same time, the resources of the Russian National Library are comprehensive.

At present, there are more than forty special collections in the resources of the Russian National Library. The main sources are divided into three parts: the resources provided by the national library of Russia, the national library of Russia and the national public library of science and technology of Russia, the resources with local characteristics provided by the 27 federally principal local libraries, and the publications digitized by the presidential decree of Russia 10% every year. The main digital resources of the Russian State Library are shown in Table 1. The main digital resources of the Russian National Library are shown in Table 2.

Due to the diversity of the main body of resource construction in the Russian National Library, the Russian National Library has developed a unified resource selection standard to ensure the quality of resource construction and the books required for digital readers, as shown in Table 3.

The Russian National Library is jointly built by the All-Russian Library. National unified technical requirements for document digitization must be formulated, i.e. resolution, color and other parameters. Digital resources are divided into three categories: Class I is a book treasure published before 1830, a special precious ancient book and manuscript. Class II is a publication with literary and cultural values and social significance, including the author's illustrations and manuscripts. Class III is a circulation document with information value in society. These three types of documents should be treated differently in terms of digital devices, digital document preservation requirements, scanning sources, scanning formats, resolutions, etc.

Every month, according to the discipline, on the website of the Russian National Library and the Partner Library, the digital book catalogue is published to the public. The public can comment on the list. On the basis of public discussion, a list of 10% of the works digitized each year is formed. The Russian National Library is a combination of distributed storage and self-built digital resources. The decentralized preservation and centralized use of resources saves the huge capital required for the uniform creation and maintenance of the database. The Russian National Library complies with copyright in the construction of digital resources and actively promotes the revision of copyright laws. The National Library of Russia first digitizes works in the public domain that are not protected by copyright and encourages authors to transfer digital rights for free. The digital copyright of books is purchased with 10% of the digital funds allocated by the Russian Ministry of Culture.
3.2 User service
Policy is the guarantee of achieving services. To protect users’ access to library services, the Russian government has formulated various service policies. To allow users to freely access the resources of the Russian National Library without restrictions on time and space, the unified portal of the Russian National Library was officially launched on June 24, 2015. Any Russian resident uses the portal to remotely obtain a digital copy of the publication in the library’s reading room or at home, and may find a hard copy of the publication in the nearest library.

The Russian National Library has four types of clients: First, as an individual Russian National Library user, users can read the literature from the Russian National Library’s central portal in the nearest library or home. Second, the Russian National Library participants. Third, the Russian National Library user. It is a library that only utilizes the resources of the Russian National Library but does not participate in the construction of the resources of the Russian National Library. Fourth, services for special user groups are mainly for the blind and visually impaired.

To facilitate users to take advantage of the resources of the Russian National Library, the Russian National Library adopts a flexible and diverse service approach. The national library of Russia is open not only to Russian residents, but also to people from all over the world. The scope of service has changed from Russia to the world.

4. Result analysis and discussion
4.1. Comparison of Chinese and Russian national digital libraries
Both China and Russia attach great importance to the construction of the national digital library. The project construction has been carefully planned and prepared. It has a good foundation for construction. The construction of the Russian National Library reflects the prominent role of the government. The state provides financial support and legal guarantee for the construction of the Russian National Library, and the development momentum is good.

China’s national digital library project lacks government leadership and legal support. Cooperation between various industries, departments and other libraries is not close. State funds are limited. Compared with the construction of the Russian National Library, there is a lack of unified planning at the national level. National specialized agencies were established for unified management and construction. Other social information institutions participated in the construction of the national digital library.

The Russian Ministry of Culture has planned the construction of the Russian National Library as a whole. The Russian National Library has a strong policy support and a relatively sound guarantee mechanism. In 2001, the State Council listed the National Digital Library Foundation Project as a national key project for the Tenth Five-Year Plan. However, there is a lack of policy support from more authoritative national departments, long-term and continuous national digital library construction policies and funding.

4.2. The enlightenment of the construction of Russian national digital library to China
At present, China’s legal system is still not perfect. Compared with developed countries, there is still a certain gap in legal construction. The law of the People’s Republic of China on public libraries takes effect on January 1, 2018. The bill focuses on the construction of the service system and the improvement of service levels. The experience of the construction of the Russian National Library shows that a library law cannot solve all the problems of digital library construction. The legal system of the library community in China is not perfect, which limits the development speed of the library industry. There is no law for reference in the construction of digital libraries. Therefore, China should plan the long-term development of the library business and formulate and improve the construction of relevant legal systems as soon as possible.

Sustained capital investment is the lifeblood of digital library construction and requires long-term policy mechanism guarantee. The construction of the national digital library mainly relies on government grants, library funding and market operations. The Chinese government has limited investment in the construction of digital libraries. Based on existing policies, a long-term national digital library policy was developed. An inter-departmental committee for the development of Russian national libraries like Russia was established to solve problems in the development
of the national digital library. This escorts the construction of the national digital library.

The digital literature of the Russian National Library focuses on listening to the public. However, the digitized collection of documents in China’s national digital library is the type of digitized books determined by the national library itself. The reader’s needs are less considered. Therefore, resource utilization and satisfaction are not high. The construction of digital resources of the National Digital Library should also be guided by the needs of users and adhere to the people-oriented principle. The user’s reading needs were investigated. The public actively participates in the construction of digital resources in libraries. Copyright should not be neglected in the construction of digital library resources. The Russian National Library is actively involved in the revision of the intellectual property component. The revision of the legal provisions is conducive to the construction of the resources of the Russian National Library.

5. Conclusions
Through the research on the resource construction and user services of the Russian National Library, it can be seen that the Russian National Library has multiple sources of resources, unified resource selection standards and technical specifications for resource construction. The public actively participates in the construction of national library resources. This is a resource-sharing model for division of labor and cooperation. Digital resource copyrights are properly addressed. The library’s service coverage is wide, the service methods are diverse, and the service means are advanced. The digital resource construction of national digital libraries in China and Russia is compared. The Russian National Library has become a national project. Its government-led role, cooperation between government departments, legal and policy support, funding for construction, and advanced service concepts are all worth learning. China’s national digital library should learn from the Russian National Library experience and develop similar reading licenses. This provides Chinese information resources to more users in the world.

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Abstract
Petroleum resource-based city is an important part of urban system in China. Under the background of green growth and economic transition, petroleum resource-based city is facing the problem of sustainable development. This paper takes petroleum resource-based cities in China as the research object, and uses urban ecological planning method to analyze the basic methods of petroleum resource-based urban ecological planning and development from three aspects: establishing multi-level city circle layer, building urban ecotope and promoting urban renewal. The results show that green growth and economic transition of petroleum resource-based cities in China depend on government planning for urban development, including statutory planning and non-statutory planning. Petroleum resource-based cities should promote the ecological planning and development of petroleum resource-based cities in China from three aspects: optimizing the industrial structure of cities, optimizing the layout of urban functional areas and optimizing the layout of urban ecocircle in order to adapt to green growth and economic transition.

Keywords: Urban Planning, Ecological Planning, Green Growth, Petroleum Resource-Based City, Economic Transition.

1. Introduction
According to existing research, it is generally believed that resource-based cities refer to the type of cities that rely on the development of natural resources (such as coal, oil and gas, other minerals), the export of energy or raw materials or the development of resource-based industries. The petroleum resource-based city is an important part of Chinese cities, which is basically accompanied by the development of Chinese petroleum industry. From the perspective of life cycle theory and the development of resource-based cities abroad, resource-based cities inevitably go through the process of construction-development-prosperity-recession-transformation (or decline). The typical petroleum resource-based cities in China include Yumen City, Daqing City and Karamay City. With the gradual depletion of petroleum resources, these resource-based cities inevitably face the transformation problems that all resource-based cities will face, otherwise they can only wait for decline. In fact, the concept of green growth put forward by the Chinese government in recent years has forced these resource-based cities to adjust their industrial structure, gradually weaken the oil and gas industry with high investment, high risk, high pollution and high energy consumption, and develop relatively green industries.

Under this background, it is very necessary to study the ecological planning and development of petroleum resource-based cities. In fact, the transformation of petroleum resource-based cities can be understood as the problem of urban functional growth and structural innovation. This means that the transformation of petroleum resource-based cities depends on the government’s planning for urban development. Whether it is statutory planning or non-statutory planning, the effective response of the planning system, planning content and planning implementation to the transformation of resource-based cities is an important guarantee. Under the double pressures of green growth and economic transition, the adjustment of land use pattern, the division of urban functional areas and the development of urban ecology in petroleum resource-based cities require the government to respond positively to urban planning. Only by planning first can we lead an orderly transformation and achieve sustainable development.

2. Research status
Since industrial revolution, great changes have taken place in the mode of production of human society. Resources have gradually become the basic elements supporting the development of human society. Resources-based cities, which grow up with the development of resources, have also become an important member of urban system. From the point of view of existing research, there are relatively many studies on resource-based cities transformation. For example, Lockie Stewart (Lockie, Franettovich and Petkova-Timmer 2009) conducted an evaluation study on the economic and social impact of resource-based cities in Coppelabella Coal Mine in central Queensland, Australia, and included the factors of government urban planning in its evaluation index. Pitlik H et al. and Smith S M et al. (Pitlik, Frank and Firchow 2010; Smith, Shepherd and Dorward 2012) believe that international standards of resource-based cities government management should be established to achieve the purpose of strengthening resource-based cities organization management and rational development. The research on the transformation of petroleum resource-based cities is mainly carried out from the perspective of industrial development and transformation. Houghton (Houghton 1993) treats the trans-
formation of petroleum resources cities from the direction of industrial restructuring in petroleum resources cities. Schelling and Nijkamp found that the transformation of petroleum resources cities in many countries mainly depends on industrial restructuring (Ludwig and Iannuzzi 2006; Güneralp, Perlstein and Seto 2015). In addition, there are also some petroleum resources urban transformation studies from the perspective of government governance. These scholars advocate that in the transformation of resource-based cities, the government should establish financial support, training services, fund management and other mechanisms, and put forward the development strategy of industrial transformation from the government level. Of course, there are also some scholars in China who have studied the transformation of petroleum resources-based cities, but generally speaking, there are relatively few studies on the transformation of petroleum resources-based cities at home and abroad from the perspective of urban ecological planning and development, so this study has certain theoretical and practical significance.

3. Petroleum resources-based urban ecological planning method from the perspective of green growth and economic transition

3.1. Reasonable control of ore district and establishment of multi-level city circle layer
Since the reform and open in China, socioeconomic has achieved considerable development, but at the same time energy consumption has also increased dramatically. In 2013, China’s oil imports reached an all-time high of 304.2 million tons, and the proportion of imported oil to national oil consumption (import dependence) rose to 61.7%. The rapidly expanding energy consumption demand has exposed the inherent contradiction of China's energy shortage and the difficulty of energy supply. Therefore, the petroleum resources-based city cannot get rid of the resource mining and processing industry in a short time. Taking Daqing City as an example, Daqing belongs to a typical petroleum resources-based city, which is built on Daqing oilfield. Daqing oilfield is composed of Sartu, Xingshugang, Lamadian, Chaoyanggou and Hailar oil and gas fields. Reasonable control of mining scale in Daqing oilfield is not only conducive to providing sufficient land and space for the development of socioeconomic, but also conducive to establishing the development idea of paying equal attention to the triple objectives of economic benefits, social effects benefit and ecological benefit, and promoting the harmonious coexistence of urban development and natural environment. From the perspective of planning angle, petroleum resources cities should establish a multi-level urban circle layer. The core circle layer is the existing urban economic and administrative center, the middle circle layer is the industrial development zone, and the outer circle layer is the urban development control zone.

3.2. Make efforts to promote ecological restoration of ore district and build urban ecotope
Since reform and opening, China’s economic development has mainly depended on the secondary industry, but the basic national conditions are that the industry started late and had a weak foundation, especially at the cost of a large number of environmental damage in the early stage of development. In the process of production and exploitation, a large number of resources and energy are consumed, and a large number of waste and waste residue appear, which has caused great pressure on ecotope. Petroleum resources cities in China have played a very important role in the long-term economic and social development process, but in the long-term development process, they have formed a serious ecological damage problem. For a petroleum resources-based city to achieve green transformation, efforts must be made to promote the ecological restoration of ore distribution. Taking Daqing City as an example, Daqing Oilfield National Mine Park has been established through ecological restoration, which not only improves the ecotope of the oilfield, but also relies on the old ore district. Daqing Oilfield National Mine Park currently has 22 sites, including Daqing History and Exhibition Hall of Oil Field, Iron Man’s first well-Sa55 Well, Iron Man Wang Jinxi Memorial Hall, Daqing Petroleum Science and Technology Museum and other mining sites.

3.3. Actively promoting urban organic renewal and constructing green low carbon city
Most of the petroleum resources cities are located in remote areas, especially in the western petroleum resources-based cities, many of which are in places with few people. These remote petroleum resources cities have been expanding slowly in the process of gradual development, but due to the reasons of economic and social development, the urban architectural style and quality are also uneven. To promote the resource-based cities organic renewal can start from two aspects, on the one hand, actively promote the transformation of old residential buildings and other buildings, including the renovation of building facades and building comfort and energy-saving environmental protection. On the other hand, it should increase the proportion of green building in the new building of the city, integrate new ideas and new achievements such as healthy building, sustainable building, century-old architecture and prefabricated building, and expand the connotation of green building. The new building in the city fully implements the green building standard and expands the scope of mandatory promotion of the green building. Some green building schemes, which can save resources to the maximum extent, including energy saving, land saving, water saving and material saving, protect the environment and reduce pollution, provide people with healthy, comfortable and efficient use space, and build a harmonious coexistence with nature.

4. Resource-based cities development path from the perspective of green growth and economic transition
4.1. Optimizing urban industrial structure with economic green transformation as the goal
Petroleum resources-based cities have gradually emerged and developed along with petroleum industry in China. Without exception, the leading industries of these cities are all petroleum industries. Petroleum industry is a traditional resource industry, which may cause environmental pollution in exploration and development of oil and gas, oil and gas processing, oil and gas gathering and transportation, storage and transportation, and oil and gas sales. Obviously, this is not conducive to the green growth and ecological transformation of the city. Taking Daqing as an example, Daqing is China’s largest petroleum industry base and an important petroleum processing base. Its oil...
and gas industry is a well-deserved leading industry. However, after decades of development, the Daqing oil field has shown a depletion trend. Coupled with the popularity of the Green low carbon consciousness, Daqing, an oil-producing city, is under pressure from an economic transition. Petroleum resources-based cities need green transformation. On the one hand, they need to fully integrate existing resources, actively create development conditions, actively develop the exploitation and commercial utilization of new resources such as Shale gas, and strive to promote the optimization of oil and gas industrial structure. On the other hand, we should actively guide the development of other industries, relying on the unique natural environment of petroleum resources city, and actively develop tourism industry, literary and creative industries and high-tech industries.

4.2. Optimizing urban function area layout guided by sustainable development

Urban functional area is a geographical space that can realize the accumulation of relevant social resources and effectively exert the functions of a certain city. It is an important space carrier for realizing the economic and social functions of the city. It reflects the characteristics of the city and is a form of modern urban development. For most of the petroleum resources-based cities, the population gathering brought about by the development of the petroleum industry has gradually developed. Therefore, the original urban center is located in a relatively concentrated area of oil and gas enterprises, which indirectly leads to the planning of the urban functional area is not reasonable enough. Generally speaking, business quarter, uptown, industrial estate, canton, culture area and suburbs constitute the basic functional areas of the city. For petroleum resources cities, business quarter, uptown, industrial estate and canton are basically highly coincident, which indirectly leads to the congestion in the core areas of the city. Under the background of green growth and economic transition, petroleum resources type cities must optimize the original urban functional area if they want to obtain new driving force for development. From the perspective of the long-term development of the city, the overlapping of functional areas is not conducive to the radiation effect of the city center. Therefore, it is considered to move the canton of the petroleum resource-type urban center away from the original urban center, and at the same time expand the industrial estate gradually. The business quarter and the culture area and suburbs can be dynamically fine-tuned according to actual needs. Specifically, the business quarter can keep the original plan basically unchanged, the canton needs to gradually move away from the original space, the uptown can be moderately extended, the industrial estate space is relatively fixed, and the suburbs are dynamically adjusted according to the urban development needs. Other functional areas are planned to provide resources such as land.

4.3. On the principle of natural harmony, optimize the layout of urban ecolandscape

As an important part of Urban Planning, ecolandscape also plays an important role in the process of resource-based cities transformation. Taking Daqing as an example, Daqing Oilfield implements ecological improvement projects with the opportunity of creating green oil field. In the process of implementation, ecolandscape is planned from three aspects, fully respecting the natural law. First, the low-lying areas and water bubbles formed naturally are cleared and expanded to connect the whole and the sub-areas and to improve the self-purification ability of water bodies. The second is the natural growth of grasshoppers, fence protection, reducing manual intervention, less artificial creation, more natural regeneration, careful protection and restoration of grassland and lushi landscape; third, the construction of “Garden mining area” in the central area of oilfield workers’ lives, Planting ornamental trees; constructing “Forest mining area” in the southern part of the oil field suitable for tree growth, and planting Yinzhong poplar and Corolla wood into strips. The creation of these ecolandscapes has made the entire Daqing City a good ecotope with blue sky, green grass and green mountains. For resource-based cities, the optimization of urban ecolandscape layout requires urban green space system planning to further promote urban green space construction and urban external natural environment, agriculture and forestry industry, and build urban gardens and suburban green resources, rural agriculture and forest resources integration. The large green space system constructs urban and rural green space systems of three major spatial types: urban green space, suburban green space and rural green space.

5. Conclusion

China’s socioeconomic development is in a transitional period. The resource consultative economic growth adopted at the beginning of reform and opening has been unsustainable. Only by speeding up the adjustment of economic structure and changing the mode of economic development can we promote the coordinated development of resources, environment and socioeconomic. In order to adapt to the general trend of green growth and economic transition, petroleum resources-based cities must start with urban planning and use urban ecological planning method to strengthen urban circle layer planning, ore distribution ecological restoration and urban organic renewal. The study also shows that the petroleum resource-based city must optimize the urban industrial structure with the goal of green low carbon; optimize the urban functional area layout with sustainable development; optimize the urban ecolandscape layout based on the principle of natural harmony. Only by adhering to the development ideas of low carbon, green, and harmonious, and making urban development plans in advance, the petroleum resources-based cities can complete the transformation and development.

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REGIONAL LAYOUT AND PLANNING OF LARGE-SCALE SPORTS STADIUMS AND GYMNASIUMS IN CITIES.

Jinao Chen, Aming Lu, Feng Zhai

Abstract

In order to ensure the high-quality completion of the construction of stadiums and gymnasiums and the smooth holding of the Fourteenth National Games, through on-the-spot investigation and collation of relevant literature at home and abroad, lessons are drawn from the experience of the planning and construction of the stadiums and gymnasiums of the recent three National Games. According to the investigation of the stadiums and gymnasiums in Shaanxi Province, the number, characteristics, overall layout and construction methods of the required stadiums are specifically analyzed. Taking Xi’an Sports Center as an example, from the point of view of the construction requirements of the main stadium of the National Games and the sports construction technology, the functional orientation and construction standards of the competition facilities and training base facilities are put forward. Especially for the planning and design of sports construction facilities including “one stadium, two gymnasiums”, Tennis Center and outdoor sports stadium, the specific index analysis is made. The index analysis provides suggestions for the compilation of the planning and design task sheet of Xi’an Sports Center, and provides reference for the planning and construction of other stadiums and gymnasiums for the Fourteenth National Games.

1. Introduction

With the opening of major international sports events such as the Asian Games and the Olympic Games in China, stadiums and gymnasiums have been built all over the country. However, due to the lack of theoretical analysis on the long-term planning and construction of stadiums and gymnasiums, many stadiums and gymnasiums are planned and constructed solely for the purpose of hosting competitions. Most of the stadiums and gymnasiums are designed with the emphasis on the requirements of the competition and less consideration of the requirements of the post-competition mass sports, which results in the low utilization rate, lack of analysis and comprehensive consideration of the actual situation. As a result, it leads to a high level of construction of large venues, and invests a lot of financial and material resources, but after the competition, the utilization rate is generally very low and there are a series of contradictions (Baade and Matheson 2016; Rubin, Woodward and Harrison 2016).

The relevant theories at home and abroad are summarized by the methods of field investigation, comparative analysis, and logical induction, and the construction planning of other stadiums and gymnasiums is analyzed in order to provide some reference for the construction practice of Xi’an Sports Center, the Fourteenth National Games and other stadiums and gymnasiums, so as to make them meet the requirements of competition rules, function construction, and urban development. The research method can be used to comprehensively and systematically understand the planning and layout of the construction of stadiums and gymnasiums at home and abroad, help to make up for the deficiencies of the compilation of the task book of the planning and design of stadiums and gymnasiums in China, and put forward a relatively complete planning and design of stadiums and gymnasiums from the perspective of sports construction technology. It has practical guiding significance for the construction of Xi’an Sports Center and the Fourteenth National Games and other stadiums and gymnasiums.

2. State of the art

In terms of the breadth of research, domestic scholars mainly focus on the status, principles, relationship between stadium layout and regional development, factors affecting stadium layout. On the basis of the above research, foreign scholars further study the evolution process, development trend, motivation causes, and whether to promote regional economic development of stadium layout (Steffen, Moseid and Engebretsen 2017). From the point of view of research methods, the layout of stadiums and gymnasiums in foreign countries is more inclined to empirical research and using a dynamic analysis perspective to study the development trend and characteristics of the layout of stadiums and gymnasiums. Whereas, Chinese scholars mostly use static methods to analyze the overall situation of the layout of stadiums and gymnasiums in foreign countries is more inclined to empirical research and using a dynamic analysis perspective to study the development trend and characteristics of the layout of stadiums and gymnasiums. Whereas, Chinese scholars mostly use static methods to analyze the overall situation of the layout of stadiums and gymnasiums, so that they cannot fully and thoroughly explain the development trend and influencing factors of the layout of stadiums and gymnasiums, let alone guide the practice process of venue layout (Freitas et al. 2016; Ramshaw 2017). From the results of the research on the strategy of stadium layout, domestic scholars only discuss how to optimize the strategy of stadium layout from the aspects of objectives, modes
and principles. However, foreign scholars have studied the government’s behavior of utilizing public finance, urban development plan, site selection intervention measures, and professional alliance’s control over the monopoly of stadium, which has important enlightenment significance in enriching the research on optimizing the strategy of stadium layout. Overall, foreign scholars mainly emphasize the dynamic perspective to analyze the evolution process, development trend, and change causes of the spatial layout of stadiums and gymnasiums, and use case-based empirical methods to support the objectives, models and methods of the layout. In addition, usually, from the two aspects of government administrative intervention and market economy orientation, they study how to achieve the optimal layout of stadiums and gymnasiums.

3. Methodology

3.1. Analysis of venues in the last three national games
According to the statistics of the venues of the organizers of the last three National Games, the demand for the venues of the National Games is large, and the construction standard of the venues is high. The total number of venues of the last three National Games shows a decreasing trend, and 116 venues can meet the needs of the hosts of the Games. In addition to the large demand for the number of venues, the construction standards for venues are also relatively high. There are clear requirements for warm-up venues, the number of seats for spectators, competition lighting indicators, etc. Even combined with the type of competition to be undertaken in the future, the use rate of venues is greatly improved by controlling the standards of International competitions.

Summarize the experience of stadium planning and construction in the past three National Games as follows: First, implement the coverage of the games to the whole province, and promote the construction of stadiums in various regions. Second, pay attention to the planning and design approval of stadium construction. The planning and design of stadiums should pay attention to the infiltration of sports functions, not only to meet the requirements of the national games, but also to take into account the utilization after the games. Third, attach importance to the technical guidance and testing of stadium construction. The technical guidance of stadium construction should run through the whole process of stadium construction to control the quality of stadium construction. Fourth, focus on the training of staffs in stadium construction, strengthen the understanding of stadium sports technology among stadium builders, and improve the level of sports technology construction and management.

3.2. Layout analysis of Shaanxi stadiums and gymnasiums during the fourteenth national games
There are 230 recommended venues in Shaanxi Province, including 150 competition venues and 125 training venues. The planning and construction of the Fourteenth National Games venues should be based on scientific norms, overall allocation, rational functions, leading technology and economic efficiency. Firstly, the competition bidding mode of 13 cities (districts) should be adopted to achieve the full coverage of the competition items in the province, promote the construction of sports venues, and promote the development of sports. Secondly, it is suggested that the venues of the National Games should take Xi’an as the core, Guanzhong city (district) as the focus, and southern Shaanxi and Northern Shaanxi as the support to carry out the layout of competition events and venues construction. In principle, the major events or related events should be held in the same area, and take the main urban area of each city (region) as the center to radiate to the adjacent jurisdiction areas and counties. Thirdly, it is suggested to arrange the National Games to enter the campus according to the actual situation of the stadiums and gymnasiums in Shaanxi Province, so as to achieve a breakthrough in the history of the National Games. Fourthly, arrange for all-round transport projects to enter counties and townships, such as equestrian events in Fuping, beach volleyball events in Dali, and triathlon events in Nanzheng. Fifthly, a small number of sports venues with strong specialty should be built centrally to avoid waste of venue construction. Sixthly, actively guide and according to the principle of “training, warming-up and competition integration for new stadiums and gymnasiums”, timely adjust the proposed and constructed stadiums and gymnasiums, so as to achieve the construction service of the Fourteenth National Games in the most optimized way. Seventhly, the National Games venues take Xi’an as the core, Guanzhong city (district) as the focus, and southern Shaanxi and Northern Shaanxi as the support to carry out the layout of competition events and venues construction. Finally, in order to better serve the National Games, new venues should follow high standards and take a sustainable road.

According to the conventions and basic principles of the National Games, as well as the competition rules of the past two sessions, Shaanxi Province needs no less than 116 sports venues to host the Fourteenth National Games, including 58 competition venues and 58 training venues. In addition, it is equipped with three spare venues, including one spare stadium, one spare stadium and one spare swimming pool.

3.3. Method of planning and construction of the fourteenth national games stadium
The Fourteenth National Games stadium has high construction standard, short construction period and relatively scattered distribution. It is suggested that the planning and construction process should follow the following procedures. In view of the current situation of the existing sports facilities in Shaanxi Province, on the basis of understanding the family background, the new and expanded sports facilities are planned reasonably. According to the project and venue setting requirements formulated by Shaanxi Sports Bureau, the competent sports departments of various cities (districts) put forward the site selection and scale of the venue, the plan and guiding ideology, energy saving, water saving and environmental evaluation, transportation, safety, health and fire protection, organization and human resources allocation, project construction implementation plan, investment estimation and funds financing, financial evaluation, social and economic benefit evaluation, conclusions and suggestions, etc. Planning and design work should be involved in the pre-project research as soon as possible so as to make the design task book more realistic, thus reducing design changes, shortening the design cycle and controlling project cost; the competent units...
of each venue should complete the bidding of venue construction units according to the procedures, strictly control the progress, quality and cost of venue construction, and do a good job of project management in the construction stage of venues. The organizing committee shall organize various sports support departments to conduct large-scale inspections of all kinds of vehicles and personnel routes, rooms and venues in various functional areas of the venues, and put forward suggestions for rectification of the differences in the standards of functional rooms that do not meet the competition conditions and affect the competition functions and relevant support offices. According to the plan of the Fourteenth National Games, all stadiums and gymnasiums should be built in 2021 and submit to the Organizing Committee of the Competition for unified arrangement of relevant test competitions, maintenance and trial operation.

4. Result analysis and discussion

4.1. Planning and construction contents

The competition venues of Xi’an Sports Center are composed of “one stadium, two gymnasiums” and “tennis center”, of which “one stadium, two gymnasiums” occupy about 75.3 hectares and “one center” occupies about 33.3 hectares. stadiums, comprehensive gymnasiums, swimming and diving halls, tennis centers; outdoor sports venues, such as outdoor basketball courts, football courts; sports cultural landscape, to show the Olympic spirit, Chinese sports spirit, and other sports ancillary facilities are planned to be constructed here.

Xi’an Sports Center Training Base covers an area of 32.7 hectares. Track and field hall, shooting hall, comprehensive training hall; track and field, baseball field, archery field, flying saucer field, basketball court, etc.; Sports Education Research Center for sports science research and sports teaching; international exchange center, including athletes’ apartment, coaches’ apartment, exchange resident training personnel apartment at home and abroad and athletes’ restaurant, professional restaurant, domestic and foreign exchange restaurant, etc. are planned to be constructed here.

4.2. Overall design orientation

Functions of Sports Competition Center: After the completion of the Sports Center, it can meet the needs of holding high-level sports competitions at home and abroad, professional training of professional sports teams, and the development of national fitness activities. Function of the National Fitness Center: It should become the main place for the national fitness and leisure entertainment in Xi’an to meet the needs of the residents of Xi’an for the national fitness. Function of Sports Training Center: It can meet the training needs of young people and athletes at home and abroad in Xi’an. Function of sports culture center: it embodies the Olympic sports spirit, the concept and culture of sports architecture, and the characteristics of sports culture landscape and environment in Xi’an. Function of Public Disaster Relief (Asylum) Center: It has the function of safe shelter for major public emergencies in modern metropolis. In addition, according to the scope and nature of its use, the functions and tasks it possesses, the volume of sports buildings, as well as the objectives of construction, etc., the grade positioning of individual sports buildings in sports centers should meet the relevant standards.

4.3. Planning and design analysis of sports buildings

“One stadium, two gymnasiums” and tennis center are used for holding large-scale and high-level sports competitions, taking into account the development of popular sports training, mass sports competitions, national fitness and other activities. They are required to meet the requirements of the national green building with two stars. Warm-up training venues should fully consider natural lighting, reflect the characteristics of intelligent venues, consider solar energy (photovoltaic) system, and power supply can be considered in 1600 kw-2000kw. Specific basic requirements for planning and design are as follows. Stadium planning and design requires that the building height be controlled at about 45 meters and the torch orientation should be set in the northeast or southeast of the main track and field. The basic requirements of comprehensive gymnasium planning and design are that the height of the building should be controlled at about 30 meters and the net height of the competition venue should not be less than 15 meters; the height of the equipment transport corridor should be controlled at about 4 meters and the box should be set at three U-shaped; and the basic requirements of the planning and design of the swimming and diving hall should be controlled at about 20 meters and the net height of the competition venue should be no less than 16 meters.
Outdoor sports venues are mainly used for mass sports training, mass sports competitions, national fitness and other activities. According to the characteristics of sports, the venues of various sports should be arranged relatively centrally so as to meet the requirements of competition and national fitness, and reflect the theme of sports. The stadium sub-stadium is a standard 400-meter track and field with embedded standard football stadium, which is controlled at 188m*112m, four-tower lighting, rubber compound coil on the ground layer of the track and field, artificial grass on the ground layer, 10 straight runways, 9 curves, U-shaped sand spillway for sand pits in field competitions, and 4m barrier-free zone control.

The sports training base mainly satisfies the training and part of the competition functions, including two comprehensive training halls, track and field halls, shooting halls, track and field training grounds, football training grounds, baseball training grounds, basketball training grounds, archery training grounds, outdoor swimming pools and other sports facilities, as well as the main subsidiary buildings of the International Exchange Center (i.e., teaching and research center) and sports apartment. The comprehensive training hall is required to be controlled at 120 meters by 60 meters. The track and field hall is required to be controlled at 146 meters by 65 meters and the building height is about 20 meters. The main building function of the International Exchange Center is physical education teaching and scientific research, and the attached building function is administrative office. The main building function of the sports apartment is the apartment for athletes and coaches. It has a dining room for athletes and a reception restaurant for exchanges.

5. Conclusions
The relevant theories at home and abroad are summed up by means of field investigation, comparative analysis and logical induction, and the construction planning of other stadiums and gymnasiums is analyzed. In addition, the layout method and construction planning of the Fourteenth National Games are discussed in detail. Moreover, combined with the planning of the Fourteenth National Games in the aspects of competition venues and training facilities, as well as its functional orientation and main sports, from the point of view of sports construction technology, a concrete analysis of the planning and construction of the gymnasium including “one-two gymnasiums”, tennis center, outdoor sports venues, training base venues, etc., is made and relatively complete basic requirements for the planning and design of the gymnasium are given, which has practical guiding significance for the construction at the Xi’an Sports Center and other Fourteenth National Games venues.

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1. Introduction
The level of supply of sports facilities marks the civilization and development of a city. The needs of fitness, leisure and entertainment are met. Sports facilities are one of the signs of improving the quality of life of the masses (Martínez, Hermanns and De Ierma 2016). Reasonable sports facilities layout will also promote the development of the sports industry. At present, domestic research on public service facilities focuses on the macro layout of the city. The user experience is ignored (Finn 2016).

The literature data method, the questionnaire survey method, and the comparative analysis method were used to study the operational management benefits of large-scale sports stadiums in China. Through the analysis of the operational management benefits and its influencing factors of large-scale sports stadiums in China, the real reason for the poor performance of stadiums is found. Methods and recommendations for the efficient operation of venues were put forward.

Through the comprehensive application of various methods, the operational management benefits of large-scale sports stadiums in China were studied. The benefits of the venue and its causes were analyzed. This is conducive to the venue operators to adjust the management mode. Business processes are optimized and operating costs are reduced. Innovative products and differentiated services are continuously introduced according to market conditions and customer needs, and core competitiveness is discovered and cultivated in the market competition, thereby further improving the efficiency of the venue.

2. State of the art
Foreign studies on sports buildings have started earlier than in China, and they are more systematic (Flourentzou, Pantet and Ritz 2017). As early as in ancient Greece, the Olympic Games of Zeus was born. Therefore, the oldest existing sports stadium is located near the temple. However, with the passage of time and the changes in the architectural genre, the development of the form of sports architecture has not been a fixed model (Yu 2016). Until the end of the twentieth century, the study of sports architecture had systematic results. Scholar Perrin proposed the development direction of sports architecture from the overall planning, single design and management of sports architecture, and put forward his own views on the development of sports architecture after the 1980s (Dinces 2016). At the same time, there are many research results on large-scale sports buildings in foreign countries. For example, American scholar Barclay made a systematic introduction to the summer Olympic venues. The research results of Olympic sports buildings abroad have always been the guiding basis for sports building construction around the world (Li, Ren and Jia 2016). However, people soon realized that sports buildings around the world were uniform and without personality, and regional architecture began to receive widespread attention (Deschriver, Rascher and Shapiro 2016). Buckhardt used pictures to explore the regional characteristics of traditional materials in sports architecture. As a result, the sports building began to transform from a grand and majestic landmark to a human nature. Research results on the regional and environmental psychology of sports buildings are constantly emerging. Japanese sports architecture is an excellent example of combining various factors (Vandeviver, Bernasco and Van doele 2018). In summary, the above studies are all about the design of sports buildings. Therefore, the planning and management of sports venues are studied.
3. Methodology

3.1. Literature method
According to the purpose and content of this study, relevant materials, journals, magazines, yearbooks, and other materials are searched and collected through various channels such as the National Library, Beijing Sport University Library, China Knowledge Network, and Weipu Information Database. Theories of other related disciplines such as economics, management, and marketing are reviewed. This provides a theoretical and practical basis for the research content.

3.2. Questionnaire
In order to study the operational benefits of large-scale sports stadiums in China, questionnaires were designed from the aspects of stadium construction, operation and expenditure, number of events held, and staff training. Approved by the experts of the China Sports Association, the provincial and municipal sports bureaus issue and collect questionnaires from large-scale sports venues with certain representativeness in the authority. This has ensured the reliability and validity of the survey to a certain extent. A total of 26 questionnaires were distributed in this survey, 26 copies were recovered with the support of the provincial and municipal sports bureaus, and the recovery rate was 100%, of which 24 were valid questionnaires, and the effective recovery rate was 92.31%. A large amount of first-hand information was collected, and the basic situation of the operation and management of large-scale sports stadiums in China was understood.

3.3. Comparative analysis
When analyzing the operation and management benefits of large-scale stadiums, the data on financing modes, management methods and operational efficiency indicators of domestic and foreign venues were compared and analyzed. The essential reasons for the relatively low management benefits of the operation of large-scale sports stadiums in China were found and solutions were provided.

4. Result analysis and discussion
4.1. Macro external countermeasures for improving the operation and management benefits of large-scale sports venues
The external factors of the stadium refer to the sum of various objective factors and forces that exist around the stadium and affect the operation and management activities of the stadium and its development. The macroscopic external factors that affect the benefits of stadium operation and management refer to the general factors that have no direct effect on the activities of stadium operation and management but often have potential influence on the decisions of venue owners and operators. It includes political and legal factors, economic factors, geographical environmental factors, and social and cultural factors.

Political and legal factors refer to the political system, system, political situation, principles and policies, laws and regulations of a country and region. It is directly related to the promulgation of sports-related policies and laws, which in turn affects the operation and management of sports venues. Since the reform and opening up, China has promulgated eight laws and regulations related to sports venues (Table 1). However, the contents of relevant laws and regulations are lagging behind, and the contents of different laws and regulations conflict with each other. The laws and regulations on the construction of urban sports venues in China are relatively operability, and have no guiding effect on the construction practice of urban sports venues. The legal supervision mechanism is not sound enough. The implementation of laws and regulations was affected. Therefore, in order to make the stadiums operate smoothly and healthily, it is necessary to establish sound laws and regulations and increase supervision and enforcement.

Economic factors refer to the objective factors such as various economic conditions, economic characteristics and economic links in the operation and management of sports venues. It is an important factor that must be considered in the operation and management of sports venues.

With the development of economic globalization and the further acceleration of the development of the service industry, the living standards of our people have been continuously improved. The demand for sports leisure and entertainment services is constantly expanding. As a carrier of leisure and entertainment services, the stadium will continue to usher in a major development opportunity, which will benefit the stadium’s efficiency. A blind copy of the concept of venue operations in Western developed countries, especially the operation mode of large stadiums in the United States, may not work in China. The United States has always been a very mature and fully open market economy system. In this economic environment, the sports industry is highly commercial and competitive. However, China’s sports stadium industry and even the sports industry cannot reach such a height in a short period of time under a regulated market economy system. Therefore, while learning from the operation and management methods of foreign stadiums, China’s economic environment must be considered. The operation strategy of large stadiums suitable for China’s national conditions was explored. Finally, the efficiency of venue operations management has been improved.

The development of science and technology directly affects the operation and management activities of sports venues. The application of facilities and equipment for large-scale sports stadiums, the man-
4.2. Micro external countermeasures for improving the operation and management benefits of large-scale sports venues

The market supply of large stadiums refers to the number of venue products or services that venue operators are willing to offer and can sell at various possible price levels for a certain period of time. The market demand for large stadiums refers to the number of venue products or services that consumers are willing and able to purchase at various possible price levels for a certain period of time. The effectiveness of sports venues is constrained by both supply and demand factors. A clear understanding of the law of supply and demand is of great significance for improving the operational management efficiency of large stadiums.

According to the supply and demand theorem, from the perspective of supply, the increase in the supply of large stadiums providing the same kind of service (S0→S′) will cause the equilibrium price to fall (P0→P′), while other conditions remain unchanged. The number of equalizations increases (Q0→Q′). Conversely, a decrease in supply (S0→S′) causes an equilibrium price to rise (P0→P′), and the number of equalizations decreases (Q0→Q′). The price factor directly affects the operational efficiency of the stadium, and the price is determined by the relationship between supply and demand. Therefore, in the same city or region, the supply of large-scale sports venues must be planned according to local needs. Due to the high investment amount, if the oversupply after the completion of the construction leads to the idleness of the venue and the loss, it is very unfortunate for the local residents or the whole country. On the contrary, if the supply of large stadiums providing the same kind of service is too small and the demand for supply exceeds demand, consumers are likely to stop using the venues and switch to their substitute goods or services, which is still not conducive to the benefits of the venue.

According to the survey data of the Urban Social and Economic Investigation Department of the Bureau of Statistics, in 2007, Chinese cities (towns) had an average of 8.90 stadiums per 100,000 people. Among them, Beijing, Tianjin, Nanjing, and Chengdu have more than 50 stadiums per 100,000 people. In most second-tier cities, there is less than one space per 100,000 venues, while other towns are minimal (Table 2). Therefore, China’s sports stadiums still need a quantitative growth and qualitative leap in the future.

From the perspective of demand, the increase in consumer demand for venue products or services (D0→D′) will cause the equilibrium price to rise (P0→P′), and the equilibrium quantity will increase (Q0→Q′), while other conditions remain unchanged. The decrease in demand (D0→D′) causes the price to drop (P0→P′), and the amount of equalization decreases (Q0→Q′). Therefore, increasing consumer demand for stadium products and services has an indispensable effect on the improvement of stadium performance. The factors that influence demand are mainly the price of the venue product or service itself, the price of the relevant commodity, the level of consumer income, consumer preferences, and consumer expectations for the future.

4.3 Internal management strategy

Changes in the external environment have a certain degree of uncontrollability for stadiums. The environment provides opportunities and support for the operation and management of large stadiums. The harsh environment brings obstacles and challenges to the survival and development of large stadiums. In order to truly seize the opportunity and meet the challenge, the venue must have good internal conditions. It includes materialized hardware conditions such as various facilities and equipment in the venue and non-materialized software conditions such as venue management system, organization, employee management, and business capabilities.

When seeing such a large stadium with excellent hardware, people can’t help but want to have fun. However, the superior facilities of large stadiums can only attract customers to the venue. Long-term customers depend on the software environment of the stadium.

5. Conclusions

Through this research, it is found that the proportion of the business structure of large-scale sports stadiums in China is unreasonable. The ontology management is in a polarized development trend, and the utilization rate of the venue is generally low. Some venues are in a state of excessive idle, and the intensity of opening venues is seriously inadequate. The opening hours are not reasonable. In addition, the operation and management benefits of large-scale sports venues in China are influenced by the macro external factors such as politics, law, economy, geography, population, society, culture, science and technology, as well as the micro external factors such as market supply.
and demand, the competitiveness of the venue industry, the development of the sports industry, and the internal environment of the venues. Therefore, in order to improve the operation and management efficiency of stadiums, venue operators must be sensitive to the ever-changing internal and external environment, clarify their own positioning, and adopt appropriate operational measures.

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HUMAN-ORIENTED SMART CITY PLANNING AND MANAGEMENT BASED ON TIME-SPACE BEHAVIOR.

Abstract
To improve the quality of life, human-oriented smart city planning and management based on time-space behavior was studied. First, the basic theory of time-space behavior and smart city was introduced. The relationship between public participation and smart city construction planning was analyzed, and the positive and negative significance of public participation in smart city construction planning was expounded. Then, the mechanism for public participation in smart city construction planning was proposed. Finally, public participation in smart city construction planning was analyzed from the perspectives of power balance, interest coordination and safeguard measures. The results showed that public participation in smart city construction planning was an important manifestation of the realization of public democratic rights. The scientific nature and feasibility of smart city construction planning was enhanced. The smooth implementation of smart city construction planning was an important foundation for promoting smart city construction. Therefore, public participation is an important way to safeguard social public interests and build a harmonious society.

Keywords: Time Space Behavior, Smart City, Urban Planning, Public Participation

1. Introduction
Smart city is based on the concept of smart earth, which was proposed by an Internet company rather than a real estate company. This objectively reflects that the construction of smart cities is inseparable from the support of information technology and the Internet. Since IBM put forward the idea of “smart planet” at the end of 2008, in 2009, the idea of building a “smart city” has been proposed. The construction and development of smart cities has become an unstoppable trend, which has become a new development form of the city.

With the strong support of the national policy and the active promotion, the development of smart cities in China has sprung up. Various participants actively mobilized the diverse forces of society to build smart cities. These factors will promote continuous innovation in development patterns and construction models. In addition, the building power of diversified smart cities is gradually guided. The fundamental role of market factors in the construction and development of smart cities is fully exploited. The public is an important participating force in the construction of smart cities, which has gradually become an important driving force for the development of smart cities. The healthy and orderly construction and development of smart cities is guaranteed and promoted.

Smart city construction planning is the blueprint for the promotion of smart city construction, which provides action guides and behavioral directions for smart city construction. By studying the role of the public in the construction of smart cities, the significance of the public in the process of building smart cities is clarified. The public’s ability to participate in the construction and planning of smart cities is improved, and citizens’ awareness of political participation is cultivated. The pattern of public participation is optimized. This provides a good social foundation for the construction and development of smart cities. A harmonious smart city building social atmosphere was created.

2. State of the art
The public participation in urban planning and town renewal processes in Germany was analyzed. The importance of German legal and political systems for urban construction is reflected. According to the German urban planning law, the stage of public participation in German cities and the method of public participation are systematically introduced (Hashem, Chang and Anuar 2016). The construction and development of large international cities such as the United Kingdom, the United States, and Japan cannot be separated from the effective participation of the public. The effective participation of the public in urban construction planning can promote urban construction and provide favorable suggestions and opinions for urban construction (Caldeira and Kastenholz 2018). The basic development trend of public participation in the government policy development process was studied. Taking “public ponds” as an example, the significance and value of citizen participation in water environmental governance policy formulation are analyzed. The important role of public participation in public policy development is discussed. The rationality and scientificity of public participation are emphasized (Hao, Zhu and Zhong 2015). The land planning process should involve groups representing different interests. Under the stimulation of different interests,
different modes of social benefit distribution are selected, so that the diversified interests can achieve the game. Planning is more rational (Yibin, Dai and Ming 2016). The communicative behavior in planning is introduced into the planning and formulation field. Multi-participation, including the public, plays an important role in promoting the formulation of construction plans, thus forming a new theory of planning and formulation (Centenaro, Vangelista and Zanella 2016). The issue of public participation in the construction of low-carbon cities was analyzed. On the basis of defining the relevant theories of public participation in low-carbon cities, the issue of public participation in the construction of low-carbon cities was discussed. This provides basic countermeasures and suggestions for improving public participation in the construction of low-carbon cities (Travis 2017). Public participation in urban construction planning is conducive to promoting the process of social democratization. Based on the beneficial experience of urban construction and management in developed countries, the institutional guarantee and organizational guarantee for public participation in urban construction planning are proposed (Kobayashi and Ikaruga 2016).

3. Methodology
3.1. Smart city
Digital city construction focuses on the construction of information technology hardware, which is an essential foundation for building a smart city. Smart cities are developed from ordinary cities. As a complex, a city is a complex containing a wide range of contents (Habibzadeh, Boggio-dandry and Qin 2018). The definition of cities is divided into different opinions. Cities are defined in terms of characteristics, population, physical geography, and function. The various concepts are mainly to define the city from a certain aspect. Therefore, smart cities are based on the definition of ordinary cities, and the definition of smart cities should be comprehensive and systematic.

According to the geographical location of the city, urban natural conditions, social and economic conditions, social customs and population distribution, smart city construction planning is a macro-strategic arrangement that combines emerging information technology with urban construction and development. According to the supply and demand situation of urban construction development, urban information infrastructure is promoted. The smart city development plan is not static, and the smart city construction plan has not changed much overall. However, with the advancement of smart city construction, some unreasonable smart city construction plans should be revised and improved accordingly. According to the objective development reality, the smart city development plan can scientifically guide the construction of smart cities. The designed smart city development plan becomes the actual urban form, thus maximizing the rationality and feasibility of smart city construction planning.

3.2. Public participation
Public participation is a composite concept. The public is a broad concept that refers to all people in a certain area, and is a collection of objects that communicate and exchange with each other. Participation is both an act and a dynamic process. As a dynamic process, public participation can effectively promote the democratic and scientific decision-making of the government, and realize the supervision of government behavior and the restriction of government power. From the perspective of public power, public participation is defined. Public participation is a kind of public behavior after the separation of the power of the public and the government. Through administrative decision-making and business management, the role of public participation is played. Public participation is an important symbol of modern democracy and plays an important role in promoting the democratic process. Public participation mainly refers to the behavior of the public to have various rights in the process of decision-making, management, execution and supervision of public affairs, so as to safeguard the interests of individuals and social organizations.

3.3. Human-oriented smart city planning and management
The new situation of building a human-centered city in China needs to advocate a new model of smart city planning and management with the focus on residents’ time-space behavior as the core of daily life. On the one hand, based on individual behavior, the optimal adjustment of urban spatial structure (such as land use layout) and urban time structure (such as public service facility operation time) ensures that the urban time space structure matches the needs of residents’ living activities. This provides the basic guarantee for the urban material environment for the wisdom of residents’ daily life. On the other hand, for individual behaviors, direct behavioral guidance is used to assist residents in making intelligent behavior decisions in their daily lives through soft policies and informational means. Residents form smart, healthy, low-carbon behavioral patterns and lifestyles, and realize smart cities with the wisdom of residents’ daily lives. Therefore, the smart city planning and management based on time-space behavior and people-oriented
includes the life space planning and life time planning based on individual behavior, as well as the behavior guidance of urban residents.

4. Result analysis and discussion

4.1. Living space planning for smart city

The urban living space reflects the interaction between urban residents' life, leisure, shopping, commuting and other activities and urban material space. Through the overlapping analysis of the activities of residents in neighborhoods, neighbourhoods, and urban land use, the daily activities and travel characteristics of residents and their relationship with personal attributes are identified, and the objective needs of different groups are understood. The daily demand characteristics of the residence are projected onto the urban physical space. Therefore, according to the different needs, frequency and scale of the living space of the residents, the urban resident living space system of “the daily life circle-commuting life circle-urban life circle” is constructed, which is the core of the urban spatial structure oriented by the study living space. Therefore, based on the urban living space system of the “daily life circle-commuting life circle-urban life circle” hierarchical structure, the characteristics of each circle layer are analyzed by using the spatial time behavior data of residents. The construction of urban spatial structure planning oriented to living space can improve the planning and management of various levels and different scales of the city.

4.2. Life time planning of smart city

Based on the needs of residents, the life time planning of smart city is promoted. By providing residents with a platform for planning participation, the subjective needs of residents in daily life are understood in many ways to improve public participation in different stages of preparation and implementation of urban planning. Based on the time-space behavior data of residents, the relationship between their daily activities and travel trajectories and their personal attributes was analyzed to understand the needs of different groups. The subjective and objective are combined, and the individual and the whole are considered. The optimal allocation of supply and demand is realized. For example, information such as facilities and usage in a smart community center is integrated. The development functions of public facilities at different time periods are adjusted. A time management plan for community public facilities is created for different groups of facilities, and the spatial and temporal layout of community public facilities is adjusted to achieve optimal allocation of community resources.

In general, the life time planning of smart cities includes two aspects. On the one hand, the operation time management and planning of community public facilities achieve the optimal allocation of community public facilities resources. On the other hand, the dynamic adjustment of the functions of public facilities in the community improves the efficiency of the use of public facilities and meets the needs of various activities in accordance with local conditions.

4.3. Public participation in smart city construction planning

Public participation in the planning process of smart city construction is a long-term behavior. The public must choose the appropriate smart city construction planning participation model to fully exert the influence and role of the public in the smart city construction planning and safeguard the interests of the public. The choice of the model of the public to participate in the planning process of smart city construction depends on the country’s policies and regulations, the social system environment, the social and economic level, the quality of the public, the people’s living standards and quality, and the formulation, revision and improvement of the smart city construction plan and the process of implementation. In addition, it is closely related to the decision-making process of smart city construction planning.

There is only one goal for the public to participate in the planning of smart city construction, that is, to participate in the formulation and implementation of the planning of smart city construction as far as possible, so that the public can enjoy the achievements and convenience brought by the construction and development of smart city. Public participation in smart city construction planning reflects the enjoyment of citizens’ political participation and political power. The interest dialogue and game between the public and the smart city construction planners are realized. The common interests of the public are combined with the construction of smart cities. The wisdom of the people is motivated, and the scientific nature and feasibility of the smart city construction plan are guaranteed.

5. Conclusions

The basic theory of smart city construction planning and public participation was introduced. The relationship between public participation in smart city construction planning was analyzed. The positive and negative significance of public participation in the construction of smart cities was elaborated. At present, the construction and management of smart cities have deviated from the daily needs of residents and the people-oriented concept of urban development. The premise and objectives of public participation in smart city construction planning are analyzed.

From the formulation and implementation phases of the plan, the content of public participation in smart city construction planning was determined. The modes of public participation under government guidance and public active participation in smart city construction planning are respectively elaborated. In the context of new requirements and goals for building a new smart city, big data and time-space behavior are integrated. A framework of smart city planning and management based on time-space behavior is proposed. Based on the individual behavior patterns and decision-making mechanisms of residents, the human-oriented smart city planning and management model is constructed. From the three dimensions of living space planning, life time planning and behavior planning for residents in smart cities, the wisdom of residents’ daily life is guided to promote human-oriented smart city planning and management.
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SAFETY URBAN PLANNING AND DESIGN BASED ON DISASTER PREVENTION, CRIME PREVENTION AND PSYCHOLOGICAL SAFETY.

Jinke Yang

Abstract
In order to ensure the public safety of residential areas, starting with the urban public safety of Xi’an, the construction environment of defense safety, fire safety and traffic safety, and the public safety environment of residential areas are investigated. According to the characteristics of housing in Xi’an planned economy era and market economy era, the existing situation is analyzed from the aspects of overall planning layout, road traffic space, building monomer, public activity space, greening space, and lighting facilities. Based on the analysis results, the principles of planning and design of public safety space environment in Xi’an residential areas are put forward. The planning and design methods of residential space environment are discussed and studied in detail from the aspects of residential defense safety, fire safety, and traffic safety, so as to provide reference for the planning and design of urban residential safety and to create a safe, healthy and harmonious living environment for residents.

Keywords: Xi’an Residential Area, Public Safety, Residential Environment.

1. Introduction
Urban residential area is the main place for urban residents to survive. The public safety of residential area is related to the vital interests of residents. With the development of social economy, more and more unexpected incidents and disasters occur in urban residential areas. Through the study of public security environment in residential areas, reasonable planning and construction of residential environment are carried out to ensure public security in residential areas. This has a very realistic meaning for the people of residential areas (Houle et al. 2017).

In the process of researching the public security environment of Xi’an residential area, the idea of “theory-practice-theory” and multi-disciplinary comprehensive research method are used to study the construction environment of public security of Xi’an residential area from the perspective of urban planning and design (Hyojik et al. 2017), and the planning method of public security space environment of residential area is discussed in detail.

From theory to practice and then to the application of deductive induction of theory, practical problems and theoretical analysis can be combined. With the help of multi-disciplinary induction, the current problems can be comprehensively understood from multiple dimensions. Through this research method, the theories of many different fields are creatively linked, and the construction environment of Xi’an residential public safety is accurately studied.

2. State of the art
For the study of urban public safety, the specific conditions of each country are different. In Japan, because of its geographical location and conditions, it is often attacked by natural disasters such as earthquakes and typhoons, so there are many studies on disaster prevention (Ming and Xiang 2017). In the United States, the response to natural disasters is mainly transferred to the handling of multiple crisis events. At present, the public safety management in the United States includes national security management, social crisis management, economic crisis management mechanism, and moral crisis management (Butun et al. 2016). Russia’s public safety includes a wide range of natural disasters, emergencies, public health incidents and so on (Fraga-lamas et al. 2016). In China, the study of urban public safety mainly includes urban safety planning with disaster prevention as its main focus. In the 1980s, China began to form some relevant laws and norms. With the development of society, the problem of urban security has become more and more serious. China has gradually shifted from focusing on natural disasters and individual security to dealing with comprehensive public security incidents (Prasad et al. 2016). Referring to the research methods and thinking of urban public safety, the public safety of residential areas is discussed, so as to provide a safe and harmonious living environment for urban residents.

3. Methodology
3.1. Investigation and Research on public safety environment of residential areas in Xi’an
The public safety space environment of Xi’an residential area is investigated and studied by using the methods of field investigation, questionnaire survey and on-site interview, and its current situation is summarized. A total of 360 questionnaires were sent out and 280 were recovered. 270 valid questionnaires were statistically valid. According to the survey results, the types of public safety incidents are as follows. Urban residential public security mainly comes from human-made public security problems in residential areas and outside. Human-made public security prob-
lems can be reduced by means of space environment planning and the creation of public security environment atmosphere. However, natural safety accidents are often unpredictable, irresistible and unavoidable. It is concluded that there are several types of human accident safety incidents frequently occurring in Xi’an residential areas: theft and robbery incidents, fire incidents, traffic accidents and so on. The proportion of all kinds of incidents is as follows.

3.2. Analysis on the space environment of residential defense safety

In the planned economy era, some old residential areas are not clearly separated from the outside world. If the design of the entrance and exit of residential areas is not reasonable, the visibility of some residential roads is not high; the public communication space of residents is insufficient or even absent, which reduces the opportunities to provide natural surveillance for people; on the contrary, the burglar-proof windows at the bottom will provide convenience for criminals to climb to a certain extent. Drainage pipes and air conditioning racks in some residential areas are also one of the reasons for more burglaries in residential areas. Because some trees are too close or the branches of big trees have reached the windows of houses, they may become a hiding place for criminals. The lack or damage of lighting facilities in old residential areas is also one of the reasons for theft.

Under the market economy system, there is a negative space near the entrance and exit of many residential areas, which is not often used; in the road traffic planning of residential areas, the visibility of road organization in some residential areas is poor, which gives criminals shelter; Many commercial housing residential areas do not have a reasonable allocation of greening, but provide a hiding place for criminals to commit crimes; some residential areas in the building facade design some prominent decorative components, providing opportunities for criminals; unreasonable allocation of residential lighting facilities in the number and location should cause the attention of relevant departments.

3.3. Analysis on the present situation of fire safety space environment in residential areas

Under the planned economy system, the fire prevention spacing between some buildings is too narrow, and more and more private cars lead to the narrow multi-way traffic and even occupy the fire control passage. In some residential areas, there are piles of debris on the fire control passage, which cause blockage and affect the efficiency of emergency rescue; the public activity space in residential areas is insufficient, which does not combine with the fire safety settings in residential areas; the quality of residential buildings is aging and there are potential fire safety hazards; some residential fire safety facilities are damaged or missing.

Under the market economy system, some residential buildings do not have enough firefighting operation sites, and the road structure of residential areas is too tortuous, which will affect the efficiency of disaster prevention and relief in residential areas; the situation of vehicle parking in disorder is widespread, which will affect the efficiency of disaster relief in residential areas to a certain extent; high-rise residential buildings have the characteristics of high building height and large flow of people. Once a fire occurs, the loss will be great, so it is necessary to combine the characteristics of high-rise residential buildings to carry out fire protection design for high-rise residential buildings.

3.4. Analysis on the present situation of traffic safety space environment in residential areas of Xi’an

In the planned economy era, roads in residential areas are not clearly classified and boundaries are not clear. Most residential areas adopt the mode of mixed traffic, which affects the traffic safety of residents in residential areas; narrow multi-roads affect the traffic safety of residents, especially in the areas where public activity sites intersect with roads in residential areas, the contradiction between people and vehicles is more prominent; trees and plants grow too vigorously so that they should be pruned in time to ensure the traffic safety of residential areas; and some of the traffic safety facilities in residential areas have been damaged.

Under the market economy system, the road structure in some residential areas is too circuitous, and the conflict between the low of people and vehicles at the intersection of the road and the public activity space is serious. The traffic organization mode of people-vehicle diversion in some residential areas of commercial housing built under the market economy system ensures the traffic safety of residential areas to a certain extent. Because of the increasing number of private cars, the contradiction between pedestrians and vehicles often occurs in residential areas, which results in potential safety hazards; residential areas often use a large number of tall trees, shrubs and other dense planting, and the traffic safety considerations in residential areas are not comprehensive; the allocation of traffic safety facilities in residential areas is also significantly better than that in old residential areas.

4. Result analysis and discussion

4.1. Planning and design principles

In terms of systematic principles, in view of the current situation of public security in Xi’an residential areas, it should be planned from the material space environment. At the same time, it is also supposed to pay attention to the construction of public security environment in residential areas. For the principle of overall coordination, to study the public safety of Xi’an’s residential areas, it needs to place the residential areas in the city to study, grasp the integrity of the city, link the residential areas with the surrounding environment, and strengthen the relationship between the residential areas. Meanwhile, it is necessary to also consider the overall coordination of the interior of the residential area, grasp the whole residential area, and make rational layout and planning of the buildings, road space, green space, public communication space, security facilities, etc. According to the principle of adapting measures to local conditions, for different residential areas, specific planning of public safety space environment of residential areas should be carried out based on local conditions. The principle of people-oriented is to consider the public safety needs of residents in Xi’an, and to plan, design and arrange the space environment based on people’s behavior and psychological needs, so as to embody people-orientation. As the principle of public participation, in public safety space environment planning in residential areas, familiarity among residents in increased
4.2. Space environment planning for residential defense safety

In terms of overall planning and layout of residential areas, the boundaries between residential areas and their surrounding environment should be clearly defined, and the sense of domain of residential areas should be emphasized, so as to give psychological hints to criminals. For the peripheral roads of residential areas, it is urgent to try our best to combine the layout of public service facilities such as commerce, medical treatment and entertainment to form the opportunity of natural surveillance; for the internal roads of residential areas, it is required to have a clear level; when setting up parking lots in residential areas, it is supposed to consider the adjacent buildings, so as to be able to appear in the sight of residents, and underground garage can install intelligent anti-theft devices. In residential areas, try our best to avoid the emergence of unused and managed negative space. The public space between groups should be equipped with seats, so as to form natural surveillance, so that strangers entering residential areas have psychological fear. The greening inside the residential area should not block people’s sight. At the same time, some activities and rest facilities should be reasonably arranged to gather popularity and form the effect of public surveillance. In the facade design of residential buildings, people should try to reduce the building components which are easy to climb, and avoid over-hanging structures as far as possible. In order to ensure the safety of residential areas, there are certain requirements in the brightness and intensity of residential lighting facilities. The number, type and location of lighting facilities will affect the safety of residential areas.

4.3. Planning of fire safety space environment in residential areas

The overall planning layout should be based on the disaster prevention planning at a higher level, and the location of residential areas should be far away from dangerous sources, such as gas stations; the road space, green space, building groups and environmental facilities of residential areas should be rationally organized to ensure the fire safety of residential areas. To ensure reasonable fire prevention spacing of residential buildings, the basic requirements of fire passage in residential areas should be met. Negative space should be minimized in residential areas so as not to become a place for garbage and debris to pile up or bring about certain fire hazards. For areas with relatively concentrated residential areas, necessary refuge sites should be set up. Road organization in residential areas should take into account the evacuation of people and the avoidance of interference. Road design in residential areas should take into account the density and width of roads to ensure the smooth passage of evacuation. In addition, road space also has the function of preventing fire spread. For the organization of static traffic in residential areas, it is necessary to reasonably predict the future private car ownership. Greening in residential areas can also play a role in preventing the spread of fire, so it is supposed to choose some plants with higher fire resistance and more water content. The public greening space of residential area is arranged in combination with the public center of residential area, which can provide temporary shelter for residents. For street greening, it usually plays a certain role in preventing the spread of disasters, but the tree species used should not be too large. In the design of building units, the fire-resistant grade of buildings should be considered, smoke-proof zones and fire-proof zones should be reasonably arranged, the number and width of safe exits of building units should meet the relevant standards, and the layout of building groups should meet the relevant standards as far as possible; the fire-fighting emergency facilities in residential areas should meet the temporary domestic water and emergency fire-fighting water when the fire comes, and the safety facilities should provide convenience for people and improve the efficiency of rescue and evacuation in the event of disasters.

5. Conclusions

Starting from the public safety of Xi’an, the public safety of residential areas constructed in different periods in Xi’an is investigated and studied. It mainly investigates the construction environment of defense safety, fire safety and traffic safety, and the public safety envi-
Enronment of residential areas, and its current situation is also summarized and analyzed. According to the analysis results, the principles of planning and design of Xi’an residential public safety space environment are proposed. On the basis of following the above principles, the planning methods of Xi’an residential defense safety, fire safety and traffic safety are put forward, and the spatial environment planning of other public safety events in residential areas which are sensitive to residents is briefly discussed.

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CONFIGURATION OF PUBLIC SPORTS VENUES IN CHINA'S COUNTIES UNDER THE BACKGROUND OF URBANIZATION.

Abstract
To promote the effective allocation of public sports venues in the county and promote the construction of new urbanization, the allocation of public stadiums in the county was studied under the background of new urbanization. Interviews and literature research methods were adopted. The differences between the new urbanization and the traditional urbanization of the county's public stadiums were discussed. Under the background of new urbanization, the status quo of the allocation of public stadiums in China's counties was studied. Under the background of new urbanization, the problems and influencing factors of the allocation of public stadiums in China's counties were analyzed. The corresponding proposal was put forward. The results showed that the number of county venues in China was greatly improved, but the total amount was still insufficient. The configuration structure was improved, but the structural imbalance was still significant. The way of configuration was innovative, but the government dominated the main position. The configuration policy was constantly improving. The legalization was not perfect. Therefore, the balance between supply and demand, the balance of urban and rural settings, the optimization of public sports venues, and the establishment of public stadiums under new urbanization are important. This will help to promote the study of the allocation of public sports venues in China's counties under the background of new urbanization.

Keywords: New Urbanization, County, Public Stadium, Configuration.

1. Introduction
Over the past 30 years of reform and opening up, with the continuous development of China's economy and the improvement of people's living standards, the people's demand for public sports venues has been increasing. However, the number of public stadiums is difficult to meet the growing material and cultural needs (Ritz, Brewer and Neumann 2016). The proposal of new urbanization shows that urbanization begins to shift from focusing on development speed to fairness, which also requires the government to change the focus of work. More attention has been paid to the equalization of public sports venues between urban and rural areas. The quality problem in the configuration of public sports venues takes precedence over the quantity (Mingxing, Weidong and Dadao 2016). The county-level government is a key link in the allocation of public sports venues. The configuration of public stadiums in the county directly affects the overall level of public stadiums in China. Starting from the main body of the county government, it is of great research value to study the related issues of public stadiums in the context of new urbanization (Torsing et al. 2016). To this end, the basic principles proposed in the “Urbanization Plan” are used as a theoretical basis and policy orientation. Based on the status quo and problems of county venues, the development scale, structure, configuration methods and policies of county public stadiums in the context of new urbanization are discussed (Considine and Doran 2016). Using the interview method and the literature research method, the configuration status of the county public sports stadiums under the background of new urbanization was analyzed.

From a research perspective, this study is different from the previous research on the mechanism of public stadiums. This study is based on the background of new urbanization. The new characteristics, problems and influencing factors in the allocation of public stadiums in the county are mainly analyzed under the background of new urbanization. Under the guidance of the service-oriented government theory, the countermeasures for solving the problem of public stadiums allocation are proposed. This research perspective is an innovation of this paper.

2. Related work
Domestic and foreign scholars have relatively little direct research on the allocation of public sports venues under the background of new urbanization. Their research focuses on the connotation, configuration status and problems of public sports venues, and effective provision of public sports venues. Jiankang et al. used literature data method, field investigation method and expert interview method to explore the market allocation risk and monitoring problems of public stadiums in China. The study believes that the market-based allocation of public stadiums in China's counties is limited in marketization. Under the condition that China's market economic system is still not perfect and there are differences in the economic and social development stages of different counties, the market-oriented reform of county public stadiums is a gradual process (Jiankang et al. 2016).
Chen et al. studied the status quo of the deployment of county sports stadiums in China during the urbanization process. The current configuration is characterized by a shortage of quantity, low quality, single function, low usage rate, and a combination of government financial allocation and market financing (Chen, Yao and Zhang 2016).

Lang et al. studied the status quo and development strategies of rural sports public product allocation under the background of new urbanization. It is found that in the configuration of many public goods, such as sports public goods, the new rural areas still show serious imbalance between supply and demand and supply anomy (Lang, Chen and Li 2016).

3. Methodology
3.1. Interview method
There are two types of interviewees. The first category is for the county sports center planning and design, investment and financing, supply main body, operation mode, etc., consulting the county-level sports department management personnel and some enterprise management personnel who have long been engaged in the planning, construction and operation of sports venues. The second category is a topical interview with local stadium users during the field survey. Residents’ satisfaction with the status of county sports venues was investigated to understand their actual needs and expectations.

The use of interviews can directly understand the real needs of residents and the recommendations of sports-related management personnel, which is conducive to responding to the government’s opinions on residents and sports-related management personnel, so that the government can configure sports venues as needed.

3.2. Literature research
Academic works such as the Public Library of the Beijing Sports University Library and the National Library were reviewed. In the EBSCOHost, SpecialSciDBS, China Knowledge Network Journal Database, Wanfang Dissertation Database, Super Star Electronic Library, Google Academic and other electronic resources platforms, more than two hundred academic and dissertations have been obtained. Relevant data on economic and social development and sports venues, as well as news reports, were collected on the website of some county governments, the State Sports General Administration and the websites of the provincial and municipal sports bureaus, the National Bureau of Statistics, and other government departments.

Through the literature research method, the situation of various public sports venues in the county finance is understood, which is conducive to comparing the financial history of public sports venues. At the same time, the literature research method is also an effective way to understand the status quo of the allocation of public stadiums in the county.

4. Result analysis and discussion
4.1. Differences in the allocation of public sports venues in counties under the new urbanization and traditional urbanization
In the context of the continuous advancement of new urbanization, the allocation of public stadiums in the county has changed in many aspects, including changes in subjects, objects, concepts, and methods.

Table 1. Comparison of different aspects of county public sports stadiums allocation under new urbanization and traditional urbanization

These changes have to some extent catered to the requirements of new urbanization for the allocation of public sports venues. This is the product of advancing with the times. At the same time, new requirements were put forward for the in-depth development of public stadiums.

4.2. Status quo of the distribution of sports facilities in China’s counties during the process of urbanization
The “National Sports Ground Census Data Bulletin” shows that there are 679,700 sports venues distributed in rural areas, accounting for 41.39%. The site area is 612 million square meters, accounting for 31.39%. Among them, there are 27,300 indoor sports venues with a site area of 0.05 billion m². The outdoor sports ground is 652,400, and the site area is 607 million m². The fifth national census data shows that the proportion of various sports venues in township (town) villages is only 8.18%. Compared with this result, the area of sports fields in China’s counties has increased by a large margin. The 6th Sports Field Survey Data Bulletin of Hunan Province also shows that the county sports grounds are developing rapidly. However, in terms of quantity and scale, there are still problems of imbalance between urban...
and rural areas and difficulty in full coverage, as shown in Table 2.

As of 2010, the population of Hunan County was 51.119 million, accounting for 72.39% of the total population of the province. In addition, the population of the county is sparsely distributed and the population density is small. The implementation of full coverage of county sites is very difficult. It can be seen from Table 3 that the number and scale of county sports venues in Hunan Province show the following characteristics:

It can be seen that the total amount of facilities and facilities in the county sports fields in China is not compatible with the sound and rapid development of the economy and society, the urban appearance environment and the fitness needs of the people. The urgent need for the masses to improve their health through fitness is difficult to be met.

4.3. Analysis on the problems and influencing factors of the configuration of sports venues in China’s counties under the background of new urbanization

According to the survey, the problems in the allocation of county sports venues are mainly concentrated on the mismatch between supply and demand and urban-rural imbalance. These problems are also common problems in most counties in the context of new urbanization. It is urgent to conduct research and propose solutions. In the final analysis, these problems are caused by the government’s lack of supervision and insufficient public participation. Therefore, to find a good solution, the essence of the problem and the influencing factors need to be clarified. The specific analysis is shown in Table 4:

4.4. Suggestions on the configuration of China’s county sports centers under the background of new urbanization

Under the guidance of the service-oriented government theory, the countermeasures for solving the problem of the allocation of public stadiums in China’s county areas under the background of new urbanization were proposed. A method to solve the problem of dislocation of public stadiums in the county and the imbalance between urban and rural areas was found.

5. Conclusions

New urbanization is proposed by the development of urbanization to a certain level. It is a continuation of the urbanization process. The uniqueness of China’s counties determines that new-type urbanization of counties is the key to new-type urbanization. Human-oriented is insisted on safeguarding and improving people’s livelihood. Equalization of public sports
venues is one of the important quality connotations of new urbanization in the county. The conclusions of the study include the following aspects: First, with the development of economy and society and the advancement of new urbanization, China began to attach importance to the allocation of county-level public sports venues. Many county-level governments in China have also made good progress in providing public sports venues. Second, although the economic development and new urbanization have been continuously promoted, great progress has been made in the allocation of public stadiums in the county. However, there are still many problems. Third, after analyzing the existing problems and influencing factors, the corresponding solutions are proposed. At present, there are few theoretical studies on new urbanization and the allocation of public stadiums in counties, and the data is limited. In particular, the study linking the two is even more limited. Under the background of new urbanization, how to achieve the balance between efficiency and fairness of county-level government public stadiums is also a problem worth studying.

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Table 5. Suggestions on the allocation of county venues in China under the background of new urbanization.

<table>
<thead>
<tr>
<th>Number</th>
<th>Suggestions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A unity of service-oriented government was built to improve government supply efficiency.</td>
</tr>
<tr>
<td>2</td>
<td>Power is properly divided to give full play to the role of the various supply entities.</td>
</tr>
<tr>
<td>3</td>
<td>The market model was introduced to clarify the competitive partnership between public stadiums.</td>
</tr>
<tr>
<td>4</td>
<td>The supervision of citizens was strengthened to ensure the rational operation of the supply entities.</td>
</tr>
<tr>
<td>5</td>
<td>The utilization of small and medium-sized sports venues is the core. The total allocation of county venues has been increased to achieve fair sharing between urban and rural areas.</td>
</tr>
<tr>
<td>6</td>
<td>The top floor of the county venue was designed, the venue structure was optimized, and county differences and fairness were reflected.</td>
</tr>
<tr>
<td>7</td>
<td>Collaborative governance of “effective markets” and “promoting governance” is combined. The model of government cooperation with social capital is used.</td>
</tr>
<tr>
<td>8</td>
<td>The relevant legislation of the stadium was revised and improved. The configuration of public stadiums is included in the legal text.</td>
</tr>
</tbody>
</table>
Abstract
In order to find a way to combine traditional culture with modern living needs, taking “Chinese painting” as the breakthrough point, through the study of the development process and artistic characteristics of Chinese painting, four aspects of classical philosophy, natural landscape image, brush and ink composition artistic conception, and abstract aesthetic conception contained in Chinese painting are summed up. The results of the study provide enlightenment for contemporary residential landscape design, and summarize the methods of creating Chinese paintings in residential landscape design. Thus, a residential landscape model with the characteristics of “Chinese painting” is found out.

Keywords: literati painting, aesthetic concept, urban planning, Chinese painting.

1. Introduction
The splendid civilization of the Chinese nation for 5000 years has bred splendid traditional culture and absorbed various foreign civilizations on the basis of the inherent traditional culture of the nation. After digestion and integration, it contains many factors such as philosophy, religion, art, literature, music, customs, etiquette and so on, forming our extensive and profound traditional culture (Jie and Xin 2017) and creating our unique national aesthetic concept. As the mainstream of Chinese painting, literati painting also reflects the traditional aesthetic concept of Chinese art to a large extent. Literati painting began in Tang Dynasty, flourished in Ming and Qing Dynasties after Song and Yuan Dynasty, and occupied the main position in Chinese painting circle after thousands of years of development. Scholar paintings adhere to Confucianism, Taoism and Zen in philosophy and personality to express Confucianism’s self-cultivation and gentleman’s character (Chiem 2017); they pursue Taoism’s chic and free appearance; they also pursue Zen’s spiritual comfort, the attitude of “seeing nature from the heart”, “agreeable intention”, “natural” life, and Zen’s love for natural mountains and waters, which have great influence on literati paintings (Weili 2017). Literati painting pursues free and easy mood and expresses one’s mind directly in artistic style, which is a kind of art with emphasis on expression. In terms of aesthetic character, it is shown that “light, clear” is the beauty, and “nature” is the ultimate beauty (Lee 2017).

Based on the study of the development process and artistic characteristics of Chinese painting, the classical philosophical ideas, natural landscape imagery, brush and ink composition artistic conception, and abstract aesthetic conception contained in Chinese painting are summarized.

From the core point of view of “Chinese painting meaning”, new requirements for residential landscape design are put forward, and new ideas and new methods of modern residential landscape design are summarized. It is emphasized that residential landscape design must make people feel “unrepeatable” painting beauty and “harmony between man and nature” artistic beauty, so as to obtain great artistic enjoyment. At the same time, the combination of subjective thoughts, feelings and objective scenery produces a new “painting idea”.

2. State of the art
The earliest proposal of “painting idea” was that “painting idea does not draw shape” advocated by Ouyang Xiu in Song Dynasty. His idea was supported by many literati painters, and they began to regard “painting idea” as an important criterion for judging painting, which had a great impact on later painting and gardening. Chinese traditional gardening and Chinese painting share the same artistic characteristics. In the book Yuanye, Jicheng of Ming Dynasty emphasized that gardening should “imitate the environment, natural painting”, “deep drawing, remaining feeling hilly”. It can be seen that the idea of “painting” had been deeply rooted in people’s hearts at that time, and was fully embodied in the gardening activities in the late Ming Dynasty. Emperor Qianlong once described the Lion Forest with such poems as “a tree with a peak in the picture, a few curves in the distant world”, expressing his appreciation for the picturesque beauty of the Lion Forest.

In the new century, people have higher requirements for the quality of residential environment, but compared with the rapid development of urban residential environment practice in China, the corresponding theoretical level is still lagging behind (Pamučar et al. 2016). At the same time, the residential landscape has also attracted increasing attention. It is considered that the residential landscape is a very important part of the overall living environment, which affects people’s living feelings at anytime and anywhere (Yishao and Yongjian 2016). At present, it is
urgent to study the residential landscape pattern with Chinese national characteristics and create a living environment that not only satisfies the coexistence of man and nature, but also has Chinese cultural and artistic characteristics (Chao et al. 2017). Based on the current residential landscape practice, a systematic and comprehensive theory is summarized to guide the healthy and correct development of urban residential landscape design.

3. Methodology

“Literati painting” has occupied an important and special position in the Chinese painting circle for thousands of years, which has exerted a tremendous influence on ancient Chinese painting. As a representative kind of Chinese painting, literati painting reflects the mainstream aesthetic preferences of Chinese painting to a large extent. For the concept of “literati painting”, the entries in the Dictionary of Literary Aesthetics are interpreted as “referring generally to the paintings of ancient literati doctors, indicating morale”. Different from the traditional methods of classifying flowers, birds, figures and landscapes by describing objects, the concept of “literati painting” is different from “courtyard painting” and “craftsmen painting”. It is classified by the subject of painting and the difference of the status of the painter. Zhang Yanyuan in the Tang Dynasty once said in The Records of Famous Paintings of All Dynasties: “From ancient times, good painters are all of noble birth or the skilled”, and this statement has a great influence. During the Northern Song Dynasty, Su Shi clearly put forward the concept of “scholar painting”: “to observe scholar painting just like reading the horse in the world”. Dong Qichang of Ming Dynasty began to use the term literati painting formally. He mentioned in his Purpose of Painting that “literati painting began with Wang Yuanhong, then Dong Yuan, Juran, Li Cheng and Fan Kuan”. Dong Qichang here proposed Wang Wei as the founder of literati painting and the ancestor of Nanzong. Therefore, “literati painting” has a special guide to painting in the inheritance of painting style. Mr. Yu Jianhua gave two conditions to literati painters in Talking about Literati Painting Again: “Rich Literary accomplishment” and “Skillful professional training”. From this, it is seen that “literati painting” can refer to: literati, scholar-bureaucrat painting; literati origin, paintings of artists with comprehensive artistic accomplishment with skilled professional skills and dedicated to the cause of painting; Nanzong paintings. Mr. Chen Heng said: “the so-called literati painting, that is, painting with literati nature, containing the interest of literati, not on the basis of art in painting, but to see the feelings of many literati outside the painting”.

4. Result analysis and discussion

4.1. Enlightenment of Chinese painting on contemporary residential landscape design

The idea of Chinese painting is the embodiment of the painter’s philosophy and social outlook on painting concept and idea, which runs through the whole process of painting. Ancient painters, deeply influenced by Confucianism, Taoism and Zen, showed different personality traits and spiritual will. For the design of residential landscape, the designer’s personality traits and spiritual will directly affect the concept, intention and style of the scheme. Different designers have different ideas and opinions about the design.

Residential landscape is different from complex system planning such as factories, streets and squares. There are many factors besides aesthetics and life that need to be considered. The biggest characteristic of residential landscape is to pursue high-quality life, and create ecological, healthy and open space effect is the most important content. Chinese society is in the transitional period of development of various undertakings. The style of residential areas is influenced by ideas and opinions from all over the world. Especially in today’s material prosperity, people’s spirit is in an unprecedented state of contradiction. Tradition and modernity are constantly struggling and contrasting, gradually losing the strong idea of the designer’s main body, without the “self-entertainment” of ancient painters, and without the bold and unconstrained general subjective feelings, and even losing the belief and integrity of the national culture.

In fact, the image of Chinese painting observes the natural scenery or artificial things around with aesthetic eyes, and presents in the picture with the help of the painter’s hand. It has the label of graphical, expressive, abstract and emotional. The image of Chinese painting is divided into two parts: natural image and painting image. The natural image is the objective object that the painter wants to express, such as flowers, forests, rivers, etc. While the objective image is the emotional image of the painter, and the two have great differences in form, which is also the essential difference between painting and other arts. In the design of residential landscape, designers often need to use natural elements such as plants, stone, water to create an environment to show a more natural scene. The organization of these natural elements is the product of the subjective consciousness of landscape architects, with a strong form of refinement, fully reflecting the theme of the design and the ability to adapt to the site. Therefore, the image of residential landscape is that designers need to use the means of form refinement to shape a certain scene, and the material is the most basic elements of terrain, plants, water, stone and so on.

The artistic conception of Chinese painting refers to the way of expression and layout of the picture presentation, and it is the technical embodiment of the artist’s realization of the image of the picture. After surveying and analyzing the base of residential landscape design, it is necessary to make a preliminary conception of the overall project. From this point on, the design techniques and conceptual layout begin to be integrated into the scheme, which runs through the whole process from the conception to the realization of the landscape intention. Painting artists use water, ink and mineral pigments as basic materials to express rich content and changing levels by means of pen, ink and color rendering, while residential landscape design uses landscape elements such as garden roads, small squares, water bodies, green spaces, stones, buildings and sketches to express landscape images. These landscape elements are abstracted into point, line, surface, body, color, texture and other pure form elements, as a plane form and vertical form of composition elements, conforming to the basic principles of beauty, comfort, etc. under the premise of meeting the function of residential areas.

Artistic conception first appeared in Buddhist sutras. Buddhists believe that the highest realm of Buddha is realized by self-consciousness, which is objective and subjective feelings. Different from...
imagery and artistic conception, the artistic conception of Chinese painting actually exists in the imagination space of the viewer’s mind. It is the abstract aesthetic essence of the former three formed in the viewer’s mind through mutual connection and interaction, that is, the so-called “only understandable, not utterable” wonderful realm. Traditional gardening art and Chinese landscape painting have the same aesthetic essence of artistic conception, but they adopt different ways of expression.

4.2. Method of creating Chinese paintings in landscape design of Chinese residential areas

In residential landscape, the interface includes vertical elements such as landscape walls, doors and windows, as well as plane elements such as paving, planting and matching. The interface is an important surface element of space. The industrialized production of contemporary landscape materials leads to the uniform feeling of rigid landscape interface, losing the decoration and difference of traditional landscape materials and handicraft technology. Painting conveys the image thinking in the brain through the hand. It has a variety of uncertain forms and unique creativity, which is called handicraft. Handicraft is the best way to embody the creator’s imagination. The Chinese painting of residential landscape should be good at creating decorative interface by using the differences and expressiveness of materials, so as to make it have the visual impact and artistic charm of painting.

In the construction of landscape vertical elements, walls and steps are the most important performance elements, among which brick and stone masonry technology can best reflect the handmade decorative aesthetic feeling. Masonry blocks need to follow the building rules of masonry structure in construction. They can display a variety of visual images in accordance with the logic of material construction. From the overall effect of the distance to the close-up of details, the traces of their handmade construction can be seen, such as the ink lines in Chinese paintings, which are exquisite and simple. For the decoration of doors, windows and other holes, it is required to be good at using exquisite design patterns and natural materials for construction, such as wood, stone, less and more precise materials, reasonable layout, reflecting the artisan craftsmanship of designers and builders, just as Chinese painting pays attention to the taste of “cherishing ink as gold” pen and ink.

In composition, Chinese painting pays attention to “laying out the potential”, that is to say, the images to be displayed are arranged according to the law of beauty, and the primary and secondary structures are arranged through the size, color and component of the objects in order to conform to their own ideas and concepts. Chinese painting is a plastic art, its composition is essentially for the expression of the content of the picture and services. Chinese landscape painting takes natural landscapes, rocks, waterscapes, buildings and other natural objects as the image of painting, which makes the form of points and lines appear larger than that of natural objects themselves. It is also different from western painting in the form of color modeling. The brush and ink of natural objects in paintings are mostly natural lines, such as the rubbing of mountains and rocks, the curvature of plant branches, the curve shape of waves and currents, etc., which form a lively and flexible line painting.

Chinese painting pays attention to “charm” and “momentum” in spatial form, which is dominated by the operation of “heart” to pen. Western painting pays attention to “shape” in the space it paints, which is reflected in the pursuit of “rhythm” in western landscape design. Rhythm is equivalent to charm and momentum, while “rhythm” is the pursuit of quantitative proportion. Therefore, western gardens pursue geometric spatial rhythm, and so-called geometric rhythm is the spatial form, spatial scale, path to be quantified, proportional graphics to reflect. Chinese painting intends to be represented by graphics in residential landscape space, but this kind of graphics should not have quantitative and proportional relationship, so that the rhythm of space can be expressed by uncertain, vague or even more complex relationship.

Chinese traditional courtyard space is composed of buildings, pavilions, silk walls, shadow walls, ancient wood, strange stones, waterscape and so on. The construction of courtyard as a form of architectural art, the ultimate goal is to pursue artistic conception. The landscaping elements of traditional courtyard are not only natural objects, but also painting images presented by ink and wash paintings, which make people in the courtyard as if they were in painting. As the outer space of people’s living activities, the courtyard is enclosed, giving people a certain sense of privacy. With the vivid scenery, people can enjoy their personal time quietly and comfortably.

5. Conclusions

Starting from the “Chinese painting” concept, the landscape design of residential areas in China is studied, which is of great significance to the artistic heritage of the Chinese nation. According to the characteristics and development history of Chinese painting, the meaning of Chinese painting is understood as four aspects: idea, image, artistic conception, and abstract aesthetic conception, which is the starting point of the research. The relationship between Chinese painting idea and traditional ideal living environment is expounded from four aspects: classical philosophy idea, natural landscape image, brush and ink composition artistic conception, and abstract aesthetic conception. And the expression of painting idea in Chinese traditional gardening is discussed, which includes the following contents: gardening idea under the influence of Confucianism, Buddhism and Taoism, the appropriate conception, the landscaping elements of humanized nature, the business location and spatial layout, and the creation of an artistic conception.
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APPLICATION OF HYBRID ANT COLONY ALGORITHM IN URBAN TRAFFIC PATH PLANNING.

Yu Zhou

Abstract
To plan the urban traffic path using the ant colony algorithm, the composition and functional division of the mobile robot are analyzed. The TSP (Traveling Salesman Problem) is used to deeply understand the traditional ant colony algorithm. Then, based on this, the improvement scheme of the traditional ant colony algorithm is analyzed. The results showed that the artificial potential field method and the A* algorithm improved the performance of the ant colony algorithm. At the initial stage of the search path, the blindness and randomness of the ant colony algorithm due to insufficient pheromone concentration in each path were solved. The local optimal path is avoided with the development of algorithm iteration. Therefore, the improved ant colony algorithm is superior to the traditional ant colony algorithm.

Keywords: Ant Colony Algorithm, Congestion, Optimal Path, Urban Traffic.

1. Introduction
With the rapid development of the economy, the exchange of various resources is increasingly dependent on smooth urban traffic (Wang, Chu and Mirjalili 2016). According to some statistics, 5% to 8% of China’s GDP loss is caused by traffic congestion. With the increasing number of private cars, traffic safety and traffic congestion are becoming more and more serious. How to induce a vehicle to choose a “high quality” route when traveling is a common problem. Extreme traffic jams have turned the region into a huge bottleneck during peak hours, which has caused enormous pressure on the roads every day (Chen et al. 2016). Therefore, the traffic route needs to be reasonably planned to actively prevent problems caused by traffic congestion. Since the introduction of the vehicle routing problem in 1959, a large number of scholars have studied the vehicle routing problem.

Based on the above analysis, the ACO (ant colony algorithm) is used to select the best route plan to avoid congestion in complex and variable traffic information. The main congestion impact conditions are considered. The impact condition is used as the basis for path selection, and a suitable search mechanism is obtained. The algorithm is used to select a route that more satisfies the driving requirements. The aim is to provide a way for the driver to avoid congestion, and thus avoid urban traffic congestion and traffic accidents. Therefore, the traffic route planning scheme makes travel more convenient and safer. Resources are saved, and the waste of human and financial resources is reduced.

2. State of the art
Genetic algorithms are also used to study the best path. Because of the parallelism and global search ability of genetic calculations, it has been widely used by domestic and foreign scholars to solve path planning problems. In 1975, Holland proposed concepts and methods. The core concept of the genetic algorithm is the chromosome, and then the required solution or objective function is coded (Kim and Pineau 2016). The last symbol of the code symbol is the chromosome, and the gene is expressed by the symbol string. The length of the chromosome is equal to the number of bits in the symbol string. One solution to the problem is represented by a chromosome, and each chromosome is also called an individual. A population is made up of the total number of chromosomes produced by each generation, and each generation is a collection of partial solutions. Therefore, a group is a collection of all solutions. The solution is equivalent to the individual, and the solution is equivalent to the function value. The value of this function is the adaptive function, which is the index that measures the fitness of the chromosome to the environment, and is also the objective function corresponding to the actual problem. The best algorithm for calculating the genetic algorithm is to find the largest or smallest solution among the many results (Yazici et al. 2014).

The SA algorithm, like the ACO algorithm, can continuously approximate the optimal solution. In theory, the SA (Simulated Annealing) algorithm is indeed a global optimal algorithm. However, it also has problems: one is slow operation. The longer the running time, the more likely it is to get a better solution. A better solution is obtained at the cost of running time. If the search space is larger, the running time of the algorithm grows exponentially, that is, it cannot get better results in linear time. Second, the search is completely random. If the number of searches is too small, a better solution may be missed. Such a large randomness needs to increase the running time to make up for it. When traffic is congested, the current path of the above algorithm is difficult to replace, which can lead to serious consequences (Ji et al. 2017). In addition, especially for those driving trav-
elers who are unfamiliar with the road, when there is congestion or interruption of the selected road, they often have no way to change the road in time. Ant colony algorithm can simulate road congestion very well (Jeong, Simeone and Kang 2018). In summary, the ant colony algorithm is another algorithm applied to the optimization problem after the algorithms such as the artificial neural network algorithm, the GA algorithm and the SA algorithm. In practical applications, the ACO algorithm has been able to successfully handle scheduling and TSP. A large number of experiments also show that the ant colony algorithm is very good when looking for a better solution. However, the algorithm itself has some disadvantages, such as easy stagnation and slow convergence.

3. Methodology

3.1. Ant colony algorithm

The flow chart for solving the TSP problem using the ant colony algorithm is as follows:

Before the operation of ant colony algorithm, all parameters used in the algorithm need to be set, such as ant number m, pheromone importance factor, pheromone volatility factor rho, importance factor of heuristic function, total pheromone release Q, initial iteration number iter=1, and maximum iteration number iter_max. Individual ants are randomly placed at different starting points. It is worth noting that each ant can be at a different starting point or at the same starting point. Each ant K (K = 1, 2, 3...) is calculated to arrive at the next city to be visited. Then, according to this method, it is calculated until all the ants in the ant colony have visited each city. After the ants have traversed each city, each ant should traverse the length of the path that all cities have traveled. At the same time, the optimal path in this iteration is recorded, which is the shortest path. The pheromones on the path connecting all cities are updated once. It is judged whether the current iteration number iter is less than the maximum iteration number iter_max. If iter<iter max, iter=iter+1. The record table for each ant walking is emptied and re-entered the next iteration cycle. If iter>=iter max, the loop is terminated and the optimal solution is output.

3.2. Overview of artificial potential field method

The artificial potential field method was first proposed by Dr. Khatib. It imposes a virtual force on the environment of the mobile robot. This method is to virtualize a mixed potential field in the environment of the mobile robot. In this mixed potential field, one is a gravitational potential field centered on the target position, and the other is a repulsive potential field centered on each obstacle. The field environment is mainly subject to the attractive force Fg from the target location and the repulsion Fo from the obstacle location. In the artificial potential field, the mobile robot moves towards the target position mainly depending on the gravitational force and repulsive force F. The structure of artificial potential field algorithm is mainly composed of gravity function and repulsion function. It corresponds to the source of the gravitational potential field acting on the object and the repulsive potential field. The formula of the gravitational potential field function is:

The corresponding gravity formula is as follows:

As the mobile robot approaches the obstacle, the repulsive force of the mobile robot gradually increases. As the mobile robot moves away from obstacles, the repulsive force of the mobile robot is gradually reduced. The formula for the mixed potential field of a mobile robot in the environment is:

The corresponding resultant force formula is:

In the environment where the mobile robot is located, the mobile robot receives only one gravitational force. However, every obstacle has the potential to repel it. Each repulsive force needs to be found one by one, and the total repulsive force of the mobile robot is obtained. Through the parallelogram rule in mechanics, the resultant force of the mobile robot in the environment is obtained. Then, the direction of the path of the movement is determined, and the specific path of the mobile robot to the target position is obtained.

4. Result analysis and discussion

4.1. Improvement of ant colony algorithm based on A* algorithm

The ant colony algorithm is a heuristic intelligent optimization algorithm. Because of its self-organization, parallelism and positive feedback, the ant colony algorithm has strong robustness. In the early stage of the operation, the traditional ant colony algorithm has a long running time and consumes a lot of resources, which greatly reduces the performance of the ant colony algorithm. The improvement of the ant colony algorithm using the A* algorithm is mainly aimed at the problems existing in the early stage of the ant colony algorithm.

The A* algorithm is a relatively fast heuristic search algorithm. The valuation function of the core of the A* algorithm is:
A* algorithm, the improved ant colony algorithm is based on the initial pheromone concentration of the ant colony algorithm. The core principles of the improvement are as follows: In the traditional ant colony algorithm, many scholars and researchers use uniform standards when setting the initial pheromone concentration. Each possible walking path is set to a relatively small initial value. Since the initial pheromone concentration on each feasible path is the same and relatively small, the initial computational speed is greatly reduced. Therefore, the A* algorithm is used to improve the initial pheromone setting criteria. A simplified A* algorithm is used to first find a path that is relatively short from the initial position to the target position. The initial pheromone concentration on this path is increased by a factor of $W$. Among them, $W > 1$. On the basis of the above steps, the simplified A* algorithm removes the steps of setting the parent node, the first step, the second step, the third step and the fourth step, and the process of retrieving the initial position through the parent node after reaching the target position in the fifth step. In this way, the setting of initial pheromone concentration in the ant colony algorithm is improved, and the operation efficiency of the whole ant colony algorithm is improved.

4.2. Application of improved ant colony algorithm based on artificial potential field method in path planning

The ant colony algorithm and the artificial potential field method are used to complete the path planning. The first is to build a model space. On this basis, the obstacle position is initialized. The second is to set the relevant parameters used in the program. After that, the algorithm starts running. The next step is to select the path based on the improved formula. The following steps are basically consistent with the traditional ant colony.

The two-dimensional space used by the traditional ant colony algorithm in mobile robot path planning is a 100*100 two-dimensional space. To find a relatively good path from the initial position to the target point, some of the placed obstacles need to be bypassed. There are six obstacles in the simulated two-dimensional space. The coordinates of the starting point are $(1, 1)$, and the coordinates of the target position are $(69, 60)$.

The simulation results show that the improved ant colony algorithm can be applied well in 2D path planning. Moreover, when the number of iterations reaches 320, the entire system tends to be stable, and an optimal path is determined. It can also be seen from the simulation results of the graph that there is no problem of any local optimal solution, and the path of the planning is relatively smooth. This further shows that the improved ant colony algorithm can allow the mobile robot to select a better path to move toward the target position after the introduction of the potential field force. Potential field forces are added. In the early stage of path searching, ant colony algorithm and potential field force interact with each other. When the mobile robot moves toward the target position, the gravitational force from the target position and the repulsive force from the obstacle are simultaneously reduced until reaching zero. The initial randomness and blindness of the algorithm are effectively avoided, and the search efficiency of the ant colony algorithm is greatly improved.

4.3. Application of improved ant colony algorithm based on A* algorithm in path planning

The simulation experiment of the ant colony algorithm based on the improved A* algorithm is carried out by MATLAB program. It can be seen from the model that the establishment of this simulation model is random, and the shape of the child is different, which enhances the persuasiveness of the program results.

The A* algorithm improved ant colony algorithm is used. This model can be used multiple times. During the experiment, different starting positions and target positions were selected to continuously receive the complexity of the planning path. Furthermore, the feasibility and robustness of the A* improved ant colony algorithm is verified. The specific experimental results are as follows:

In the case where the starting position and the target position are simple, the ant colony algorithm integrated into the A* algorithm can plan a safe route to the specified position and realize the path planning requirement. The feasibility of the improved ant colony algorithm was verified. On the basis of the above situation, the two obstacles were crossed between the end point and the starting point, and the program reached the expected level. Therefore, the improved algorithm has certain feasibility in the case of simulation.

As the starting point position and the end point position are gradually complicated, the robot in the simulation environment can still safely reach the target position and complete the path planning, which further verifies the feasibility of the algorithm. More importantly, the stability and robustness of the improved algorithm are verified by increasing the complexity of the starting point and ending position settings.

5. Conclusions

First, the origin and development of the ant colony algorithm was introduced. Next, the principle of the ant colony algorithm is described in detail. Through the simulation results, the principle of the ant colony algorithm is further analyzed. Several systematic features of the ant colony algorithm are described. The TSP problem of the basic prototype of the ant colony algorithm is simulated and explained. The artificial potential field method and the A* algorithm were introduced. The improvement scheme of the traditional ant colony algorithm is discussed, and the key theories and formulas involved are analyzed in detail. The improved ant colony algorithm was used to program in MATLAB simulation software. The feasibility of the improved ant colony algorithm was verified.
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INNOVATIVE PLANNING AND DESIGN OF SPORTS TEACHING VENUES UNDER AUDIENCE’S EMOTIONAL EXPERIENCE.

Hua Yan, Zhonghui Huang

Abstract
In order to solve many new problems in the planning and design of university sports venues, in this study, the planning and design of university sports venues in China with the method of audience emotional experience are mainly studied. Based on the existing theories and practices of campus planning, in this study, the ideas of meeting the needs of university sports activities, shaping the campus environment and exploring the development of planning and design of university sports venues is put forward. At the same time, the theory and specific practices of the overall planning and design of university sports venues is also proposed. The original intention of the planning and design is to expect that the planning and design of university sports venues can be implemented and reflected in the construction, use and operation of the project. Therefore, it is helpful to build a harmonious and complete space environment on the campus, to integrate the campus into the urban environment organically, and to achieve the goal of sustainable development of university sports venues through resource sharing.

Keywords: University Sports Venues, Audience’s Emotional Experience, Planning and Design.

1. Introduction
Although the development of the times has already put forward the problem of the function of university sports venues, the recognition of the importance of research on university sports venues in China has not reached the height it should be (Rinchen, Ritchie and Belloccchi 2016). In fact, the construction of university sports venues and supporting facilities has been far behind the development requirements of university sports reform and is facing great challenges, which has become a very important factor restricting the development of university sports (Su and Yang 2015). Therefore, how to better carry out the construction of university sports venues is an important issue that needs to be actively explored in the current reform of university sports (Päynynen and Lokki 2016).

On the basis of the existing theory and practice of campus planning, in order to meet the needs of sports activities of colleges and universities, in response to the construction of campus site, better shape the college atmosphere, the idea of the development of the planning and design of university sports venues is explored, and the theory and the practical approach of the overall planning and design of campus sports venues are put forward.

In view of the requirements of a gymnasium, a sports field and a swimming pool that must be met in the construction of stadiums in many universities, the theory of the overall development and construction of university sports venues is proposed. Its core content is to fully consider regional culture, economic environment and natural geographical resources conditions on the basis of comprehensively improving the physical and mental health quality of all students, meet the requirements of extensive national fitness activities, and meet the needs of sports and cultural exchanges at home and abroad. At the same time, considering the needs of future human and social development, it analyzes and optimizes the natural resources, cultural resources and social resources as a whole to make full use of them in the running process of college sports and even sport for all. In this study, based on the analysis of the current situation of the construction of university sports venues, the theory of the overall development and construction of university sports venues is discussed in order to provide reference for the planning and construction of university sports venues.

2. State of the art
The planning and design of colleges and universities in China is becoming more and more mature. However, there is no systematic professional research on the planning and design of university sports facilities in China. Some of the existing researches are made by sports workers, and most of them are theoretical discussions, and they are not professionally practical. Research papers related to this research topic include the research of Rutledge et al. and Fu et al. (Rutledge et al. 2017; Fu et al. 2015). In addition, Alexander et al. comprehensively and systematically discusses examples of school sports facilities at home and abroad (Alexander, Taylor and Innes 2008). From the perspective of professionals in sports facilities construction, they discussed the school sports facilities from the aspects of school sports facilities’ concept, design idea, construction management and operation management. All of the above basically reflect the current situation and problems existing in the planning and design of university sports venues in our country at the present stage, and put forward corresponding views and solutions from different perspectives and levels.
3. Methodology

3.1. The difference and connection between feeling and emotion
Feelings and emotions are related to a person’s particular subjective desires or needs. However, it is difficult to fully express all the characteristics of this psychological phenomenon with a single concept of emotion. In contemporary psychology, people use individual feelings and emotions to more precisely express different aspects of emotions. Feelings mainly refer to the process in which the individual needs to interact with the situation, that is, the process of neural mechanism activity of the brain. Feelings are situational, mobile and temporary, and often weaken or disappear with the change of situation and the satisfaction of needs. Feelings represent the primitive aspects of the phylogenetic development of emotions. In this sense, the concept of feeling can be applied to both humans and animals. And emotions are often used to describe those feelings that have stable and profound social significance, such as the love of the motherland and the appreciation of beauty. As a kind of experience and feeling, emotion has greater stability, depth and durability. Feelings and emotions are different, but they are interdependent and inseparable. Stable emotions are formed on the basis of feelings, and they are expressed through feelings. The changes of feelings reflect the depth of emotions, and emotions are contained in feelings.

3.2. The elements of feeling and emotion
Feeling and emotion are composed of subjective experience, external performance and physiological arousal. Subjective experience is the individual’s self-perception on different feelings and emotional states. Each feeling has different subjective individual experience, which represents people’s different feelings, and it constitutes the psychological content of feeling and emotion. The outward manifestations of feelings and emotions are often called expressions. It is the quantified form of movement of various parts of the body, including facial expression, gesture expression and intonation expression. Physiological arousal is the physiological reaction of feeling and emotion. Physiological arousal is a physiological activation level. The physiological response patterns of different feelings and emotions are different, for example, when people are satisfied and happy, their heart rates are normal; when people are fearful or angry, their heart rates are increased, their blood pressures are increased, their breathing rates are increased and they even have pauses; when people are in pain, the blood vessel volumes are reduced.

3.3. Factors affecting students’ emotional experience
The establishment factors of the stimulus situation: students have different knowledge and experience, and their judgment and evaluation of the same thing are different, so their feelings and emotions are also different. For example, people will panic when they see a bear in the wild, but they will be happy instead of afraid when they see a bear in a zoo. This is because the judgment and evaluation of the stimulus situation are different, and the cognition of the stimulus situation is the direct cause of the feelings and emotions.

3.4. The design principle of general layout of the stadium
It should form a uniform design and leave room for possible alteration and development; the layout should be compact, occupy less land, with reasonable functional zoning, convenient traffic, convenient management and maintenance, and meet the relevant regulations and indicators of the local planning department; meet the requirements of orientation, light, wind direction, wind speed, safety and protection of all sport items; all sports facilities, especially outdoor venues, should have a good orientation (the direction of movement is generally north-south) to avoid the glare of daylight; pay attention to wind protection to avoid the impact of wind speed on the use of outdoor venues; the traffic organization between each part should be convenient, the traffic flow and people flow don’t interfere with each other, the net width of the road is not less than 3.5m, and the net height is not less than 4m; reasonably arrange the entrance and exit of the sports area, which is conducive to evacuating people and traffic. There should be enough squares and open spaces at the entrance and exit; design a certain parking area, motor vehicle field can be located in the base, it can also be combined with the designated parking lot in the campus. The characteristics of the campus should also be taken into account, and a certain number of non-motor vehicle parking places should be set up within the base, and the underground space could be utilized; the engineering pipeline design should be complete and in accordance with the surrounding municipal system; in the base, the environment should be optimized, and increase the green area should be increased.

4. Result analysis and discussion
University sports stadiums and gymnasiuims are places where teachers and students communicate with each other. Despite the distinctive architectural features, its external image should be integrated with the campus environment as much as possible, which is quite different from social sports stadiums and gymnasiuums. The latter is often the landmark building of a certain area, and its external image is often emphasized and deliberately expressed. In addition, university sports venues can be divided into sports space and auxiliary space, while social sports venues are composed of audience hall and other rooms. Therefore, different from social sports venues, university sports venues don’t need to set up too many auxiliary rooms and equipment rooms; and the sports teaching and research room, the sports audio-visual education room, the data room and other rooms are unique to the university sports stadiums. These are the key points to be paid attention to in the design of university sports venues.

Outdoor sports facilities in schools refer to outdoor sports venues and ancillary facilities or sports venues and facilities with covered roofs but without maintenance structures. School outdoor sports facilities mainly include: track-and-field ground; football field; covered sports field; basketball, volleyball, tennis, baseball, softball, badminton and other ball courts; swimming pool; equipment activity space; extreme sports space; other outdoor activities spaces; related ancillary rooms, facilities and equipment, etc. The athletic field and field facilities are mainly used to meet the requirements of physical teaching and activity training. According to the requirements of the col-
College physical teaching syllabus, the teaching of track and field mainly includes sprint, middle-distance running, long jump, triple jump, and high jump. However, college sports teams have higher requirements for the facilities of track and field, especially for the reform of China’s competition system and athlete training system. Therefore, colleges and universities are bound to be the cradle of “high-level athletes”. Hurdle running, obstacle running and other items also should also become an important part of the university track and field facilities. On the one hand, the university’s athletic field is basically the same as the athletic field for competition in the use of training projects, covering almost all the content of track and field events. On the other hand, due to the characteristics of low ability, multiple grouping and multiple repetition in college students’ physical teaching, it is necessary to focus on positioning in the design of university track and field facilities.

At present, due to the limitation of investment and design concept, the construction of university gymnasium in China is small in scale and monotonous in function, which makes it difficult to meet the needs of various aspects of social sports and school sports. Especially the needs of emerging sports items favored by the majority of young people. The school gymnasium belongs to the indoor sports facility, mainly satisfies the request of school sports teaching, the training and the extracurricular sports activity, as well as the sports competition. In addition, it is also an important place to cultivate students’ life-long physical concept, to activate extracurricular life and to satisfy students’ social communication. According to the current concept of domestic school sports facilities, school indoor sports facilities include gymnasium, covered sports field and other indoor sports facilities. School’s indoor sports facilities, such as gymnasium and covered sports field, are actually large-span public sports buildings. They are different in function and structure form, focusing more on the characteristics of school. The following aspects should be paid attention to: in the design of university gymnasium in China: the school gymnasium shall meet various functions and become an important facility for the school to hold gatherings and large-scale indoor activities. In the design of school gymnasium, the function of sports field should be given full play to provide maximum sports field for physical teaching, extracurricular physical training and extracurricular athletics. The school gymnasium building should adopt simple structure as far as possible, the composite entity should be concise to reduce the investment of construction structure.

Therefore, the school gymnasium should be a combination of square and rectangular planes, and the structure should be square or rectangular; indoor fixed seats should be controlled as much as possible, and more active seats can be used, which can be put away at ordinary times, and the area of the venue that can be used for physical teaching should be increased. Due to the shortage of school land in China, the utilization of school gymnasium space should be emphasized. In the design, the characteristics of school physical teaching should be fully considered to understand the psychological feelings of athletes and create a colorful and varied indoor sports building space; school gymnasiums should take into account the needs of social sports. School sports is an integral part of social sports. The popularity of social sports also depends on the development of school sports facilities. Therefore, when designing school gymnasium, it is particularly important to study the development trend of social sports. For example, to set up a fitness center in a school gymnasium, it is necessary to have a good understanding of the project content, address selection, service requirements, opening hours, service radius and surrounding customers of the fitness center. If the school sports are better integrated into social sports, it can create good conditions for the smooth implementation of the management of school gymnasium; wooden floors shall be used in sports grounds in gymnasiums. At present, some schools are laying synthetic surface layer of polyurethane material in indoor gymnasium, which has certain toxic pollution. The area of a basketball court is less than 450 m2, and the difference between the price of wooden floor and polyurethane synthetic surface is only 40,000 - 60,000 yuan, which is only 1% to 3% of the cost of college gymnasiums. Therefore, wooden floor can be completely adopted as the sports ground; the school infirmary had better be set in the sports facility, in order to deal with the emergency nearby and ensure that the injured get timely treatment; shower facilities should be the necessary condition of school gymnasium in the future to ensure the health of students after physical education; toilets for men and women shall be designed separately in gymnasiums.

5. Conclusions
As a university, it should first have a relatively standard and modern university stadium with a certain size of stands. Such standardized modern university sports venues facilitate the organization and implementation of large-scale formal sports games and various campus activities, and contribute to the integration of school sports and competitive sports. This also makes it easier to rent out to the public, facilitate the holding of large-scale activities, more effectively integrate into the community and the city’s sports network, and combine school sports with mass sports. Second, there needs to be a large number of places for students to do daily physical exercises. This kind of daily physical exercise, physical activity inside and outside class don’t need to have the venue facilities of international standards and large-scale grandstands and ancillary rooms, what is needed here is the venue that meets the requirements of students’ exercise, the facilities that meet the needs of students’ fitness and entertainment, as well as a good environment and management.

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1. Introduction

Economic globalization is accelerating and international competition is becoming increasingly fierce. In driving sustainable economic and scientific growth, promoting all-round progress of a friendly society and safeguarding national security, the role of national independent innovation capability is becoming more important. The urban regional innovation system is the extension and embodiment of the national innovation strategy in the urban perspective. The vigorous construction of the urban regional innovation system is conducive to the realization of the national innovation strategy. Therefore, the model provides an important evidence for the urban innovative development. The proposed targeted innovation development strategy is conducive to grasp the advantages and disadvantages of the typical urban regional innovation system construction as a whole. The analysis of the structural change layers and sub-distribution of urban regional innovation effectiveness helps to clarify the stage of urban development.

2. Related work

After the research boom of the national innovation system swept the world, foreign scholars began to focus on the structural dimensions of the regional innovation system, and carried out targeted research on macro, meso and micro regions. Domestic scholars quickly responded to international research on regional innovation systems. Domestic and foreign scholars’ research on the evaluation of regional innovation systems focuses on the efficiency of the operation of the innovation system. Most of them are constructed by using an index system and quantitative or qualitative research methods.

Gkypali et al. combined the EIS and DEA methods to evaluate the European regional innovation system. Indicators such as education, employment, R&D expenditure, and number of patent applications are used as input indicators. With the per capita GDP as the output indicator, the coordination of the European regional innovation system was evaluated (Gkypali et al. 2016).

Coenen et al. evaluated the status of regional innovation systems in nearly 200 regions of the European Union by principal component analysis. Four main component impact factors of technological innovation, human capital, economic structure and labor market conditions were obtained (Coenen et al. 2017).
Chen et al. constructed a two-stage model for regional innovation system operation evaluation based on DEA. Input and output are made from two aspects of technical effectiveness and economic effectiveness. The regional innovation system is summarized into the technical output stage and the economic output stage through the invention patent, utility model patent and design appearance patent status (Heng et al. 2017).

Under the framework of the regional innovation system, Lau et al. proposed the three modes of operation of the short-chain linear structure of the regional innovation system—enterprise participation, government participation, enterprise autonomy, and government advocacy—enterprise participation. The complex mechanism between universities, research institutes, enterprises, governments, and intermediaries of the regional innovation system network structure was investigated (Lau and Lo 2015).

3. Methodology
3.1 Main research method
Literature research methods, empirical research methods, comparative research methods, quantitative analysis and qualitative analysis are combined to carry out research. A large number of research literatures on the concept, structure, operation, demonstration and stage identification of regional innovation capability systems have been reviewed. At the same time, the statistical yearbooks, national economic development bulletins, and website statistics of many cities were reviewed as data samples for empirical research. According to the established urban regional innovation system model, cities in large urban agglomerations were selected as samples for empirical research.

Through the construction of the evaluation index system, an empirical study of four-dimensional evaluation is conducted. The innovation investment, innovation subject, innovation content and innovation output of typical cities and the operation status of urban regional innovation system are compared, and their internal differences are reviewed. Through the combination of quantitative and qualitative indicators, the typical cities are analyzed to grasp the operation status of the city’s regional innovation system.

3.2 Construction of evaluation model
Hu Shuhua believes that the top-level structure of the regional innovation system includes four dimensions: innovation input, innovation content, innovation subject, and innovation output. Each dimension includes three components. The operational evaluation model of the urban regional innovation system is constructed.

3.3 Research sample
The research object is selected according to the national urban spatial structure planning of the National Urban System Planning Outline (2005-2020) and the spatial structure distribution of China’s urban agglomerations and their economic status. The convenience and scientific of data selection are considered comprehensively. First, representative urban agglomerations of 12 urban agglomerations such as the Yangtze River Delta, the Pearl River Delta, and the Shandong Peninsula were selected. In addition, one city was selected as the research sample in other cities of each urban agglomeration, with a total of 24 cities. The representative cities selected by each city group are shown in Table 1.

3.4 Empirical research
After evaluating the four dimensions of innovation investment, innovation subject, innovation content and innovation output of typical cities, the evaluation index model is used to analyze the comprehensive operation of regional innovation systems in typical cities. The calculation results are shown in Table 2.

Among the 24 typical cities, the top five cities in the regional innovation system are Beijing, Shanghai, Xiamen, Shenzhen and Nanjing. The five cities at the end of the ranking are Nanchang, Dandong, Xianning, Jiujiang and Tongchuan.

First, the innovation content and the innovation subject dominate the regional innovation of the city. The contribution of innovation subjects, innovation inputs, innovation content and innovation output to urban regional innovation were 29.46%, 17.86%, 36.31%, and 26.37%, respectively. The innovative content and the main body of innovation contributed 65.77%. The innovation content and the innovation subject dominate the regional innovation of the city, which conforms to the logic that the innovation subject carries out innovation around the innovation content.

The direction and content of expression innovation should become the key point of urban innovation development.

Second, coastal cities are ahead of inland cities in innovation.

The top 12 and the last 12 cities were compared. There are 7 inland cities and five coastal cities in the top 12 cities. There are 9 inland cities and only 3 coastal cities in the last 12 cities. In general, regional innovation in coastal cities is generally ahead of inland cities.

Table 1. List of sample urban agglomerations.

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<th>Urban agglomeration</th>
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<th>Other cities</th>
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Third, the state of urban innovation is declining to the periphery with the central city as the core. In the 12 central cities in the identified 12 urban agglomerations, the central cities of most urban agglomerations are far ahead of other cities within the urban agglomeration.

4.2 Cluster analysis of typical urban area innovation

By using fuzzy data of four dimensions of innovation subject, innovation input, innovation content and innovation output of 24 cities, clustering analysis of 24 cities was conducted. The clustering status is shown in Table 3.

According to this classification, the regional innovation system operation status of 24 typical cities can be divided into four categories: domestic leading layer, fast catching layer, steady development layer, and exploration starting layer. Shanghai and Beijing, at the leading level in China, are the cities with the best performance of regional innovation system. They are examples of regional innovation for other cities. Nanjing, Yantai, Xiamen and Hangzhou are in the fast-catching layer of regional innovation system operation. The dimension of innovation investment and innovation has developed rapidly. They quickly catch up with Beijing and Shanghai. Twelve cities such as Guangzhou and Tianjin are in a stable development layer. Through the exploration of regional innovation, these cities have stable development direction and prominent points of regional innovation. Dandong and xianning are still at the initial stage of exploration, and the construction of regional innovation system is still at the exploratory stage. Twenty-four cities are divided into four stages. Assuming that similar cities are at the same stage, discriminant analysis is used for error discrimination. The classification of specific cities is shown in Table 4.

4.3 Discrimination of the stage of urban regional innovation system

After the classification is completed, Bayesian discrimination is used for analysis (Harman and Prus 2018). In the analysis results, the three hypothetical cities are inconsistent with the discriminating results, namely Nanjing, Xinxiang and Fuzhou. The discriminating results of the other 11 cities are accurate. The accuracy of the hypothetical category is 73%, which is higher than the general standard. The classification of cities and the status of urban agglomerations after discrimination are shown in Table 5:

5. Conclusions

Based on domestic and foreign scholars’ research on the concept, structure, operation evaluation, empirical research and stage identification of regional innovation system, Bayesian discriminant method is introduced to judge the operation of urban regional innovation system. An urban regional innovation evaluation system was proposed. An evaluation model of urban regional innovation system based on fuzzy comprehensive evaluation and Bayesian discriminant is established to verify the discriminant result. The main research conclusions include the following aspects: First, an operational evaluation model for urban regional innovation systems was established. The logic of index selection is briefly introduced, which enriches...
the research theories of urban regional innovation systems. Secondly, the four dimensions of innovation investment, innovation subject, innovation content and innovation output of the selected twenty-four typical cities and the overall operation of the regional innovation system were evaluated. According to the indicator system, the focus of urban innovation in regional development is pointed out. According to cluster analysis, typical cities are divided into domestic leading layer, rapid catch-up layer, steady development layer and exploration starting layer. Thirdly, Bayesian discriminant effectively solves the fuzziness involved in the evaluation process, and combines qualitative evaluation with quantitative calculation. It can not only reduce the limitations and drawbacks brought about by personal subjective judgment, but also fully reflect the ambiguity of the evaluation process. The judgment results are more consistent with the objective reality. The evaluation results are reliable and credible.

The research results show that the Bayesian discriminant method is accurate and efficient. The urban regional innovation system can be effectively discriminated, so that the operation of the urban regional innovation system can be specifically implemented.

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MODERN URBAN PLANNING AND DESIGN BASED ON LOW CARBON ECONOMY CONCEPT

Wenwen Wu

Abstract
To accelerate the development of low-carbon industry in Zhaoqing City, transform the mode of economic growth, and promote industrial transformation and upgrading, the SWOT analysis method was applied. From the four aspects of strengths, weaknesses, opportunities and threats, the feasibility of developing a low-carbon economy in Zhaoqing was systematically analyzed. From the adjustment of industrial structure, the optimization of energy structure, the promotion of low-carbon tourism, the development of circular economy, and the enhancement of carbon sink capacity, the development path of low-carbon economy was explored. Based on the above analysis, a low-carbon development plan was prepared. From the implementation of low-carbon development strategy, the choice of low-carbon economy pilot, and the low-carbon economic security system, the implementation steps of Zhaoqing’s low-carbon economy were discussed in detail. The results showed that the low-carbon economy concept provided some ideas for Zhaoqing’s economic development. Therefore, Zhaoqing is still in its infancy. The city’s transportation system is not perfect. To develop a low-carbon economy, governments, enterprises, and individuals need to participate actively.

Keywords: Low Carbon Economy Concept, Urban Planning, Swot Analysis, Environmental Awareness.

1. Introduction
The low-carbon economy is a means to cope with greenhouse gas emissions, sustainable development, rational and efficient use of energy resources, and sound operation of environmental protection. Guangdong Province is the vanguard of the low-carbon pilot. The Outline of the Plan for the Reform and Development of the Pearl River Delta Region (2008-2020) clarified Zhaoqing’s strategic positioning as a “Traditional Advantageous Industry Transformation and Upgrading Zone” and “National Tourism Comprehensive Reform Demonstration Zone” (Han 2016). This puts forward requirements for the development of low-carbon economy in Zhaoqing and creates a good environment.

Based on the above analysis, the significance and necessity of developing a low carbon economy are proposed. The strengths, weaknesses, opportunities and threats of developing low-carbon economy in Zhaoqing are systematically analyzed by SWOT analysis method. The general idea of developing a low-carbon economy was proposed. On this basis, the main path to develop a low-carbon economy in Zhaoqing is summarized.

SWOT analysis can be used to analyze the opportunities and advantages of Zhaoqing. At the same time, comprehensive consideration of disadvantages and risks has great guiding significance and reference value for investigating Zhaoqing’s low-carbon development ideas.

2. State of the art
Foreign scholars have started early on the study of low-carbon economy. As early as 1999, famous American scholars proposed the term low-carbon economy. It believes that the foundation of a sustainable economic development is the revolution of the energy economy. In 2003, the British government first proposed the concept of a low-carbon economy, which caused widespread concern in the world (Yip 2016). In terms of theoretical research, Harvard University economics professors research and improve the calculation method of urban carbon dioxide emissions (Dou et al. 2016). Furthermore, on this basis, from the perspective of economics and political science, it provides policy recommendations for the development of low-carbon economy in large and medium-sized cities in the United States. Some researchers have used the scenario analysis method as a research method, and studied the big Brazilian cities such as Rio de Janeiro, and conducted empirical research on how to build a low-carbon city. Through the development of renewable energy, adjustment of energy structure, increased protection of wetlands, forests and other policy recommendations, the construction of low-carbon cities in Brazilian cities has been promoted (Tan et al. 2017).

China’s research on the support of low-carbon urban development policies generally follows the research ideas and methods of foreign scholars. Different scholars have put forward their own views on the connotation of low-carbon cities from their respective perspectives (Topi, Esposto and Govigli 2016). In recent years, domestic theoretical research on low-carbon cities has made great progress and has gained a lot of experience. However, there are still some shortcomings in the more developed countries. It mainly includes the following two aspects: On the one hand, most of the research still remains in the analysis and understanding of the concepts of low-carbon economy, low-carbon industry and low-carbon cities, while the literature on the generalization and induction of international experience is relatively rich. On the
other hand, the breadth of research is still insufficient, most of the research is still at the national level, and there is a relative lack of research on a certain region or specific local (Wang 2016).

3. Methodology
3.1. SWOT method
The results of SWOT analysis of various aspects of Zhaoqing are as follows. According to SWOT analysis, Zhaoqing’s development of low-carbon economic opportunities and challenges coexist. The development of low carbonization is an inevitable trend. From the perspective of its own advantages and disadvantages, Zhaoqing’s low carbon development has started. The economic development has advanced by leaps and bounds, infrastructure has been gradually improved, and energy monitoring has become increasingly mature. A good development trend has been formed. Therefore, Zhaoqing has the feasibility of developing a low-carbon economy.

3.2. Optimization of industrial structure and development of low carbon industry
First, the industrial agglomeration development has been vigorously promoted, and carbon productivity has been improved. All localities should speed up the cultivation and development of leading industries with local characteristics and upgrade their industrial level.

Table 1. SWOT portfolio strategy matrix for low carbon development in Zhaoqing city
Industrial links between enterprises and external enterprises are strengthened. Enterprises are being guided to adopt ecological recycling technology. The development of the downstream veinous industry is fostered, and waste is recycled. Second, the energy-saving industry has been vigorously developed and the upgrading of the industrial structure has been promoted. High-tech industries and strategic emerging industries were introduced. Traditional industries have been upgraded and transformed. While developing strategic emerging industries, Zhaoqing should transform and upgrade its traditional industries, improve the exit mechanism of backward production capacity, promote technological energy conservation, and innovate process design. High-tech and advanced applicable technologies are used to transform and upgrade traditional industries. The scale of high-energy-consuming industries is controlled, and market access for high-carbon industries is limited. The energy conservation assessment and review system for fixed asset investment projects is strictly implemented. Energy waste is eliminated from the source.

3.3. Energy structure optimization and low carbon clean energy security system

Up to now, coal is still the main energy fuel for Zhaoqing City. In 2011, Zhaoqing consumed 8,395,100 tons of standard coal. Compared with last year, it has increased by 10.44% (Chaolin 2017). The specific proportion of various energy consumption is as follows. Therefore, the change of energy utilization structure, the application of clean energy, and the development of clean coal technology are effective ways to establish a clean energy system. The first aspect is to vigorously develop clean energy. Renewable clean energy such as wind, water and solar energy is actively exploited. Natural gas is the focus of energy structure upgrade to promote the application of clean coal technology. The second aspect is to improve energy efficiency. Based on the actual situation of Zhaoqing, the construction of the cogeneration project has been accelerated, and the central heating of industrial gathering places in the city has been scientifically planned. Smart grid and smart meter technology are being promoted. Low-carbon energy has been developed. The development of renewable energy such as wind and water power has been accelerated. The application of public transport, official business and passenger service industry is the focus. The demonstration project for the promotion and application of new energy vehicles was implemented.

3.4. The promotion of low-carbon tourism

The concept of low-carbon tourism has been popularized, low-carbon tourism knowledge education has been strengthened, and people’s understanding of low-carbon tourism has been enhanced. Travel agencies are encouraged to launch more low-carbon travel routes to meet the market’s demand for low-carbon tourism. The habit of low-carbon tourism was formed. Low-carbon tourism education has been strengthened, and people’s understanding of low-carbon tourism. At the same time, low-carbon tourism facilities have been improved and low-carbon tourism products have been developed. Low-carbon tourism consumption patterns have been promoted. Low-carbon tourism with local characteristics in Zhaoqing was developed.

3.5. The development of circular economy and new industries

The circular economy pilot was selected and the regional recycling system was constructed. Clean production is fully developed. The development of the vein industry has been accelerated and the industrial cycle chain has been constructed. According to the principle of “3R” (reduce, reuse and recycle), a circular chain is established to realize the recycling of various resources inside and outside the city. Clean production is implemented within the company. Through the construction of information networks and infrastructure, a common platform for the use of basic energy and resources between enterprises is built. The utilization efficiency of resources and energy is improved. In addition, at the city level, through the construction of a horizontal comprehensive utilization chain of waste, the zero-emission of external waste in the entire high-tech zone was realized.

3.6. Increase of vegetation cover and carbon sink capacity

With the acceleration of urbanization in the province, the level of urbanization in Zhaoqing will reach 55% or even higher. The population is growing and energy consumption is increasing. At present, the carbon sink of Zhaoqing carbon dioxide is mainly from forestry, and the total carbon storage is about 5 million tons. The further increase in carbon sinks and the reduction of carbon dioxide emissions have become one of the important tasks for the city’s sustainable development.

4. Result analysis and discussion

4.1. Preparation of low carbon planning and implementation of low carbon development strategies

The principle of planning first is adhered to and the low carbon development plan of Zhaoqing City is compiled as soon as possible. The concept and importance of a low carbon economy was proposed. The necessity and feasibility of developing a low-carbon economy in Zhaoqing is clearly defined. The low-carbon economic theory is fully utilized and a low-carbon economic planning system is prepared. Local resources have been rationally utilized and low-carbon economy pilots have been built. The low-carbon development plan for key industries was formulated and the promotion schedule was arranged. The corresponding safeguards were proposed. The development of low-carbon economy is used as an important indicator to evaluate the economic development of each region. The low carbon economy is included in the annual plan for national economic and social development. The low carbon economy in the post-financial crisis era is understood. The improvement of economic operation quality and structural optimization are realized. The application of green GDP accounting was studied. The low-carbon urban planning system in line with Zhaoqing’s reality was constructed and the concept was transformed. Urban planning must reflect the low carbon concept. The low carbon development model was explored. The construction of a low-carbon urban planning system should include low-carbon industries, low-carbon energy, low-carbon transportation, low-carbon construction, and low-carbon waste treatment.

4.2. Active implementation of the low carbon economy pilot

In order to adapt to local conditions, and aiming at
the construction of low-carbon cities in Zhaoqing, the urban functional layout was rationally planned, industrial planning was formulated, and the economic structure was adjusted. Low carbon buildings were built. It not only meets the requirements of life for temperature, humidity, airflow, brightness, air quality, but also achieves energy conservation and efficient use. In addition, it is necessary to popularize green lighting, improve the financial subsidy policy for energy-saving lighting products, and encourage the masses to give priority to LED energy-saving lamps. The development of low-carbon transportation is valued. At present, Zhaoqing still lags behind in the promotion of public transportation, logistics and new energy vehicles. The construction of public transport infrastructure needs to be accelerated. Intelligent transportation and modern logistics are adopted. The use of new low-carbon vehicles has become popular. The development environment for new energy vehicles has been further improved. Policies to encourage the development of new energy vehicles and industrialization have been implemented.

4.3. Construction and development of low-carbon economic security system

Preferential policies suitable for the development of low-carbon economy in Zhaoqing City were formulated, which created a good external environment for enterprises that meet the requirements. The price policy has been improved. Price leverage is actively used to eliminate natural resource price subsidy policies that are not conducive to resource conservation and environmental protection. According to the pollution degree of sewage discharged by users, the method of graded pricing and charging is implemented. Various financial institutions are fully utilized to play the role of fiscal credit. The enterprise management system was clarified, corporate behavior was regulated, and on-site inspections were done. The regulation of pollution discharge behavior has been strengthened. A quota management system has been established for resource conservation and recycling in key industries and enterprises.

Technological innovation is encouraged, and the cultivation and introduction of scientific and technological talents is strengthened. Companies are encouraged to innovate on the basis of applying low-carbon technologies. Energy efficiency has been improved. Enterprises should carry out technical cooperation with well-known universities and research institutes at home and abroad to accelerate the industrialization of the introduction of high-tech achievements. The strategy of introducing talents was carried out. The talent cultivation and use mechanism has been innovated to attract specialized talents inside and outside the province and at home and abroad. The promotion of education is emphasized to strengthen the communication and cooperation. Various communication tools such as the Internet and television have been used to promote the importance and necessity of implementing a low-carbon economy. Community ecological culture is built to guide the public’s green consumption. The public participation mechanism was improved. The development of low-carbon economy exchanges and cooperation was carried out. The decision-making and management capabilities of low-carbon economic development have been enhanced.

5. Conclusions

The feasibility and necessity of Zhaoqing’s low carbon economy were analyzed. Zhaoqing’s low-carbon economy must be planned first. Factors such as its own advantages, industry status, and industrial structure of surrounding cities are fully considered. In the next few years, the overall development ideas in industrial development, urban construction, policy formulation and other aspects are proposed. The organic development path of tourism economy and industrial economy should be further explored. While industrialization and urbanization promote economic and social development, improve the overall competitiveness of cities and improve people’s living standards, the environment is protected. Agricultural tourism resources were continued to explore. Low-carbon tourism development system is constructed. In addition, the development of low-carbon economy requires the active participation of the government, enterprises and individuals, the formulation and implementation of policies, the improvement of low-carbon consciousness, the change of consumption concept, the development of low-carbon technology and other aspects of joint efforts.

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THE ACCESSIBILITY OF NANJING URBAN PARK BASED ON GIS.

Kai Xie, Hao Xu, Jing Wu

Abstract
The density and pattern of urban parks, traffic conditions are the main factors affecting urban park accessibility. To clarify the influence of traffic mode and urban road network on urban park accessibility, we examine downtown area of Nanjing, China, and based on GIS network analysis, analyze urban park accessibility under different traffic modes in the current year (2017) and the Nanjing master planning target year (2030). The results show: Using automobiles takes the shortest time to get to urban parks in 2017 and 2030 (if the problem of parking is ignored). Comparing the results of 2030 and 2017, by when the ground transportation network in the study area will be further improved, urban park accessibility was improved by a small margin under walking and automobile traffic modes, however, the density of rail traits increased fastest, urban park accessibility is improved most under this mode of transportation, rail transit route development becomes the dominant factor in improving park accessibility in downtown area of Nanjing. To a certain extent, this study reveals the leading factors of improving the accessibility of urban parks on the premise that the system of urban parks tends to be stable, and provides a reference for improving urban park accessibility.

Keywords: Accessibility, Downtown area of Nanjing, Urban Park; Mode of transportation.

Highlights:
- Urban park accessibility analysis
- Urban sustainable development
- A basis for urban green space planning.

1. Introduction
Urban parks are an important ecological infrastructure in cities and play an important role in improving the quality of the urban environment, including protecting the physical and mental health of citizens, enriching the diversity of the urban ecological environments. However, with the rapid development of urbanization and the increasing intensity of urban construction, the green space system cannot properly fulfill its ecological and recreational functions. People have come to realize the important role of parks in urban development, and the need to increase the number and size of parks to provide enough green space for the public. In this context, while paying due attention to the number of urban parks and their size, whether urban residents can use urban parks conveniently and equally has also become an important index to evaluate the sustainable development of urban ecological environments.

The accessibility of urban park refers to how convenient it is for residents to reach a certain urban park for recreational activities by overcoming resistance values such as distance, travel time, and travel expenses. Previous studies on the accessibility of urban parks have focused on the relationships between park accessibility and calculation methods, population size, green space distribution, residential area distribution, single mode of transportatio. In recent years, with the rapid development of the city, the situation of urban land use is tense, and the green space system network pattern in downtown area of city tends to be stable. Therefore, this paper analyzes the impact of urban traffic network changes and different traffic modes on the accessibility of urban parks in downtown area of city based on GIS network analysis technology, and puts forward some suggestions on the development of urban road networks in order to improve the accessibility of urban parks assuming the ongoing stability of urban green space provision.

2. Related research progress and definition
W. G. Hansen first proposed the concept of spatial accessibility and defined it as the opportunity of interaction between nodes in network. Following on from this, research into such accessibility divides itself into three aspects (Hansen 1959).

In the application of accessibility theory, Mitchell explored the layout of urban public facilities by putting forward the “Central place theory”, and then considered the social and economic factors involved in the location and layout of green space, he concluded that the lower the regional social and economic scale, the greater the density of green space.

At the level of accessibility measurement, Coine compares the “Two-Step Floating Catchment Area (2SFCA) method” with “A Variable-width Floating Catchment Area (VFCA) method”, finding that the latter can be
used to analyze the accessibility of urban parks under different parameters and improve the accuracy of the analysis (Dony and Delmelle 2015). In 2007, Oh and Jeong used network analysis of GIS to study the accessibility of Seoul urban park in South Korea. They conducted a comparative analysis of the park in five districts of Seoul from aspects such as spatial distribution, service population ratio, and service area ratio, proposing the idea of spatial layout optimization considering the relationship between park, population, and land use (Oh and Jeong 2007). Since then, the network analysis of GIS has been widely used in the field of urban park accessibility.

Once theories of accessibility and methods of measuring it had reached a certain point of development, some scholars used this foundation of research to analyze and study a variety of different factors affecting park accessibility. The results point to various important factors that affect urban park accessibility, including park distribution and size, urban road network and traffic mode, population distribution density, and the psychology of residents (Ekkel and de Vries 2017).

From the perspective of park distribution, Reyes, Mario et al. assessed the relationship between Montreal’s child population distribution and accessibility to urban parks based on age, sex, income class, family structure, and geographical location in 2008 (Reyes and Páez 2014). Xiaokun Gu, Siyuan Tao studied the spatial accessibility of Shanghai country parks in terms of population distribution and park distribution based on the Two-Step Floating Catchment Area (2SFCA) method, finding that spatial differences in accessibility in urban country parks are significant (Gu et al. 2017).

In the past 20 years, research into accessibility has paid more attention to human nature, considering accessibility in relation to issues such as race, population type, population structure and its spatial distribution, and residents’ mindsets (Abercrombie et al. 2008; Coombes and Jones 2010; Tan and Samsudin 2017). Comber and Miyake were among the first to take ethnic, religious, and population density factors into account in their accessibility evaluation of green space in Leicester (UK) and the parks in New York, finding and identifying a certain relationship between the types of residents, population distribution, and the accessibility of parks (Comber and Brunsdon 2008). Seo Hyun Jin investigated the environmental equity and accessibility of urban neighborhood parks in the city of Daegu and found that the age percentage of the urban population, the proportion of poor, and the percentage of free rental housing were closely related to urban park accessibility (Seo and Jun 2011). Focusing attention on the human element gives the study of park accessibility a certain social significance and plays a role in improving the quality of the city.

Taking traffic mode and urban road networks into account, Fan Yong carried out a quantitative analysis of the accessibility of park spaces in Nanjing and the travel convenience for residents under different traffic modes based on Nanjing’s urban road network and population distribution data. This paper presents a method based on GIS to study the accessibility and rational layout of urban green spaces (Fan et al. 2016). Liang Huilin proposed that the public transport travel mode should be included in urban park accessibility assessments, taking Shanghai as the study area, the travel time between the family and the park was calculated using multiple equations on a multi-modal transport network, and the accessibility of different regions was compared, thereby providing a yardstick for assessing public transport services to urban parks (Liang and Zhang 2017).

At present, most scholars study the accessibility factors of urban parks from the above three angles. However, there is no research on the accessibility of urban parks in the context of the development direction of road networks. Omitting religion and population as factors, the research scope of this study is the downtown area of Nanjing, using the network analysis method, and compares the current year (2017) with the year of the Nanjing City Master Planning Target (2030), analyzing and evaluating the influence of different traffic modes on the accessibility of urban parks in central urban areas.

3. Materials and Methods

3.1. Research area

Nanjing is the capital of Jiangsu Province, located in southeast China, at the western end of the Yangtze River Delta, with a total area of 6,582 square kilometers. Nanjing is an ancient city with a history of urban construction spanning more than 2500 years. During the period of the Republic of China, Nanjing was the capital of the National Government, and the name of Nanjing was thus determined. After the founding of the People’s Republic of China, Nanjing was designated as the capital city of Jiangsu Province. Since the 1980s, urbanization has developed rapidly, and its population has reached 8.27 million, Nanjing has developed into a regional mega-city and a central city in the Yangtze River Delta. The scope of this study is the central area of Nanjing, the Nanjing City Master Plan (2013–2030) defines the central urban area as the main city and the three sub-cities of Dongshan, Xianlin, and Jiangbei, a total area of about 920 square kilometers (Figure 1).

3.2. Network analysis method

Network analysis is the geographic analysis and modeling of transportation networks, power networks, and other similar structures. A network analysis model is an abstract representation of a complex network system, consisting of links, nodes, a center point, resistance, and other basic elements connected according to a certain topological relationship (Figure 2).

The Network Analysis method used in this study is based on Mathematical Graph Theory, using statistics to establish a model, and then, depending on the spatial relationship of the network, using mathemat-
matical methods to achieve this model, and finally get the results, thus guiding the practical application. In this paper, we will adopt the accessibility analysis method based on minimum impedance proposed by Allen (1995). This method uses the average minimum impedance from the center point to all destination points as the index of the accessibility of the center point (source point), residents’ travel purposes are not generally considered. As shown in formula (1) and formula (2):

Formula (1) shows that the accessibility of node $i$ is the average of the minimum impedance of the node to other points on the network, and the minimum impedance can be the shortest distance, the shortest time, the least cost, or other factors. Formula (2) shows that the accessibility of the whole network is the average of the accessibility of each node.

In this paper, the impedance is set as the minimum travel time, all the road junctions in the study area are taken as the starting point, the entrance of all urban park green spaces is taken as the destination point, and the average minimum traffic time from the starting point to the entrance of the urban park is calculated, as an index of accessibility, the degree of accessibility of urban parks is measured.

3.3. Research data processing

The data relating to urban parks and traffic are mainly derived from the Google Landsat image of Nanjing in 2017. First, data was registered using the geometric correction tool in ERDAS 8.7, then, the information on urban parks and road networks in the study area was extracted by field survey and ArcGIS10.3, and the respective databases for urban parks and the road network drawn up. At the same time, with reference to the Nanjing Master Plan (2013–2030), the vector database of aspects such as urban roads and urban park green space for 2030 was obtained digital(Figure 3).

After obtaining the traffic network information, it was necessary to construct topological relations, add the network data set to the new geographic information database, unify the geographic coordinate system, and then import each item of grade road vector data into the element data set, set up common rules and resistance models. Individual travel speed is affected by transportation and traffic conditions, so three different resistance models were created: network analysis and calculation of walking mode, automobile traffic mode, and rail transit mode. The cumulative time cost of the starting point to the urban park under different traffic modes was calculated, and the range of accessibility grade of the urban park analyzed. By comparing and analyzing the evaluation maps of the accessibility of urban parks in 2017 and 2030, this paper explores the influence of traffic mode and traffic network on the accessibility of urban parks.

4. Results

4.1. Urban parks accessibility analysis (2017)

As shown in Figure 4 and Table 1, the time required
for residents of downtown area of Nanjing to get to a specific park is divided into four levels: 0–5 minutes, 5–10 minutes, 10–15 minutes, 15–30 minutes. The ratio of urban park service scope to the area of construction land in the study area is taken as the basis to measure the degree of accessibility. Of these, areas that take more than 30 minutes to reach the nearest urban park are considered service blind area (Figure 4, Table 1).

In the walking mode of transportation, areas that can reach an urban park in 5 minutes account for 4.2% of the total area, those that can do so in 5–10 minutes for 7.1%, and those 10–15 minutes away for 12.3%. Figure 4 shows that most of the areas that can reach an urban park within 15 minutes are located in Xuanwu, Gulou and Jianye district, the degree of accessibility is positively correlated with the area and density of the urban parks. Areas that can reach urban parks within 15–30 minutes account for 30.7% of the total area. It takes more than 15 minutes to reach an urban park in more than half of the area, of which the Jiangbei area and part of Yuhuatai District account for a large proportion. Due to the imperfect urban transportation network and uneven distribution of parks, some areas, accounting for 45.7% of the total, cannot reach urban parks effectively within 30 minutes.

Under the automobile traffic mode, the 5-minute coverage rate of urban parks accessibility in the downtown area of Nanjing accounts for 20.1% of the total area, while 5–10 minutes covers another 36.3%. Among them, a large proportion of those in Gulou, Xuanwu, Qinhuai, Jianye, Qixia, and Jiangning Districts reach the urban park within 10 minutes. Pukou and Yuhuatai Districts and a smaller proportion of Liuge District reach urban parks within 10 minutes. The areas reaching an urban park in 10–30 minutes is about 33.9% of the total area, and the proportion of service blind area (over 30 minutes) is only 9.7%. Compared with the walking traffic, the service blind area is reduced by 35.5%.

With the rapid development of Nanjing rail transit and the promotion of the concept of green travel, the possibility of residents choosing rail transit is gradually increasing. When using this means of transport, 5.1% of the total area can reach the nearest urban parks within 5 minutes, 8.2% of the total area can reach the nearest urban parks within 5–10 minutes, and 15.6% within 10–15 minute, a further 48.3% of the total area reach the nearest urban parks within 15–30 minutes. The range reach an urban park within 30 minutes is distributed outwards with the increase of accessibility time class, mainly spread linearly along the subway station and park entrance points, as well as along the subway line. The range of the service blind area that reaches the urban park for

<table>
<thead>
<tr>
<th>Mode of transportation</th>
<th>Time (min)</th>
<th>Area of service (km²)</th>
<th>Service area ratio (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking</td>
<td>0–5</td>
<td>30.06</td>
<td>4.2</td>
</tr>
<tr>
<td></td>
<td>5–10</td>
<td>51.84</td>
<td>7.1</td>
</tr>
<tr>
<td></td>
<td>10–15</td>
<td>89.80</td>
<td>12.3</td>
</tr>
<tr>
<td></td>
<td>15–30</td>
<td>224.14</td>
<td>30.7</td>
</tr>
<tr>
<td></td>
<td>&gt;30</td>
<td>333.66</td>
<td>45.7</td>
</tr>
<tr>
<td>Automobile traffic</td>
<td>0–5</td>
<td>146.75</td>
<td>20.1</td>
</tr>
<tr>
<td></td>
<td>5–10</td>
<td>265.01</td>
<td>36.3</td>
</tr>
<tr>
<td></td>
<td>10–15</td>
<td>171.03</td>
<td>25.7</td>
</tr>
<tr>
<td></td>
<td>15–30</td>
<td>74.47</td>
<td>10.2</td>
</tr>
<tr>
<td></td>
<td>&gt;30</td>
<td>59.87</td>
<td>8.2</td>
</tr>
<tr>
<td>Rail transit</td>
<td>0–5</td>
<td>37.24</td>
<td>5.1</td>
</tr>
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<td></td>
<td>5–10</td>
<td>206.55</td>
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<tr>
<td></td>
<td>10–15</td>
<td>90.37</td>
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<tr>
<td></td>
<td>&gt;30</td>
<td>390.07</td>
<td>41.1</td>
</tr>
</tbody>
</table>
4.2. Urban park accessibility analysis (2030)

By 2030, the distribution density and pattern of urban parks in the downtown area of Nanjing is expected to have changed little. However, the traffic conditions will have changed greatly, the ground network will have gradually improved, density increased, and rail transit significantly developed. By 2030, the number of rail transit routes will have increased to 17, and the coverage and density of rail transit routes increased, especially on the south side of the Yangtze River.

As shown in Figure 5 and Table 2. By 2030, compared with 2017, for walking traffic, with the improvement of the urban road network, the area can reach the park urban within 30 minutes increased significantly, from 54.3% to 63.9%. Areas reach the urban park within 15 minutes remain unchanged, it is the range of access in 15–30 minutes that has significantly increased, mainly in Jiangning, Yuhuatai, Qixia, Pukou, and Liuhe Districts and other old urban areas with relatively small growth rates. The number of service blind areas without access to urban parks falls from 45.7% to 36.1%. This means that with the improvement of the transportation network, the time cost to residents to reach urban parks by walking will be reduced, and accessibility will have improved in 2030.

Compared with 2017, the amount of automobile traffic arriving in urban parks in 5 minutes in 2030 increases from 20.1% to 26.6% of the total area, more than 40% of the areas in Gulou, Xuanwu, and Qinhuai Districts can reach the nearest urban park in 5 minutes. The percentage of areas within 10 minutes to reach urban park in the downtown area of Nanjing would now be as high as 66.9%. There is also a significant reduction in the number of service blind areas, from 9.7% to 2.1%. This shows that the improvement of the road network will have improved the accessibility of the whole region.

When using rail transit, the area that reaches the urban park within 10 minutes increases obviously from 13.3% in 2017 to 21.6% in 2030, distributed in Xuanwu, Gulou, Jianye, Qinhuai, Jiangning, and Yuhuatai Districts. The area that can reach an urban park in 30 minutes increases significantly, from 58.9% of the total area in 2017 to 78.1% in 2030, more than 90% of the Xuanwu, Gulou, and Qinhuai Districts reach the urban park area within 30 minutes. In 2030, the extent of service blind areas is reduced significantly, representing only 21.9% of the total area, the urban park accessibility is clearly improved.

5. Conclusion

By comparing the accessibility of urban parks in 2017 and the projections for 2030 for three modes of transportation, a number of issues present themselves. First, in 2017, when choosing ground transportation, that is, walking or automobile traffic, the accessibility of urban parks is higher than when walking. When the rail transit mode is factored in, due to the thin track, it cannot completely cover the whole research area, so the accessibility of urban parks under this mode of transportation is relatively poor. Second, in 2030, When we examine the rail transit mode, the area serviced by urban parks in downtown area of Nanjing is greater than that accessible to walk-
ing traffic in 30 minutes, this is similar to the area served by urban parks within 30 minutes when travelling by automobile traffic transport.

Third, comparative analysis shows that by 2030, the traffic conditions of downtown area of Nanjing will have been greatly improved. It is possible to improve the accessibility of urban parks through walking and automobile traffic transport by dredging and improving urban transportation, but the increase is relatively small. The rapid development of rail transit will have greatly improved residents’ access to urban parks. It can be seen that with the rapid development of urban renewal, improved urban traffic conditions, especially rail transit, can reshape the citizens’ experience, accessibility and comfort requirements for the park in certain extent.

Based on the GIS network analysis method, this paper compares the influence of three different traffic modes on urban park accessibility in downtown area of Nanjing, the quantitative analysis data are obtained, and the relationship between different modes of transportation and the accessibility of urban parks is studied and expounded in detail, which provides a new method to approach the study of urban parks. However, this study was limited to the single issue of urban park accessibility, there are other key factors that also need to be taken into consideration. How to evaluate the accessibility of urban parks under different traffic modes needs further study.

Acknowledgments:
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ARCHITECTURAL SPACE ALLOCATION IN THE RENOVATION OF URBAN VILLAGES: USERS DEMAND

Jing H, Zhimin I., Ying S.

Abstract
Renovation philosophy and residential construction mode are key problems encountered in the renovation of urban villages in China. Existing research fruits on renovation philosophy, and policies consider fairness and efficiency and cover-sharing research consensus. However, research on residential construction mode in renovation still faces challenges, such as weak relevant policy pertinence, insufficient objective references, and poor universality. In this study, the changes of the architectural spaces of a typical urban village community in Xi’an City from the beginning to the end of the renovation were discussed. The space requirements of different user groups were analyzed and summarized, and then adapted to the different types of building spaces. In addition, the residential construction model applicable to the inclusive renovation philosophy was established. Research results corroborated that the renovation of urban village should refer to its functional orientations in the community. The community-centered renovation residential district should also meet the requirements of different user groups in the community, including residential, living, and entertainment functions. Community-subordinated residential district should meet the space demands of residential and living functions. Community-subordinated residential district meets space demands of internal residents for residential and living. Moreover, residential district space is relieved by combining practical and certain spatial factors. In this research, the building space compositions of different user groups were reviewed and refined in the “bottom-up” pattern. Research conclusions provide design references for the practical renovation of urban villages.

Keywords: Renovation Community of Urban Village, Architectural Space Allocation, Urban Village Community, Demands of User.

Highlights:
* The contrast in architectural spaces and users.
* Urban village community.
* Functional orientations for the renovation.

1. Introduction
Urban village is a special phenomenon that occurs in the process of economic development and urbanization in China. Urban village is surrounded by a city. Influenced by the urban–rural dual system, urban village significantly differs from urban space in terms of living environment, building space, lifestyle, and composition of residents. Therefore, renovating urban village to improve living environment and urban appearance has been emerging since the beginning of the 21st century. Nowadays, nearly 600 renovation projects of urban village have been completed in major cities in Midwest of China, represented by Xi’an, Wuhan, Taiyuan, Zhengzhou, and Kunming. This renovation proportion is higher than 50% of the total renovation projects of urban village and involves nearly 2.408 million residents (Jing et al. 2015). However, the construction and use of renovated urban village districts bring a series of urban problems, such as the formation of a new urban village, the difficult transition of villagers into citizens, and the difficult survival of migrants. Viewed from the architectural perspective, these problems are mainly manifested in two aspects regarding the construction of the urban village community. First, the function orientation of building spaces in planning urban village community deviates from the orientation of user groups to an extent (Bartłomiej et al. 2015). Second, the spatial design of modern urban settlement areas is significantly different from the building space of urban villages, which is formed by the evolution of traditional villages and further causes the insufficient spatial adaption and subsequent problems of use.

The composition of the construction space in renovated urban village districts should be determined by the types and demands of user groups. The inclusive renovation of urban village emphasizes on the improvement of residential and living facilities for different user groups in the original urban village (Yumin 2015). Therefore, surrounding urban residential areas, which have spatial correlation with urban village, must be included in studying the types and demands of the different user groups of building space. This scope is called the urban village community.
The types and demands of different user groups are summarized by investigating the status of building space in urban village districts. Residential, business, and entertainment spaces are further refined. Their service objects and scopes are analyzed by combining industrial standards. The types and demands of different user groups are adapted to building space. The composition factors of building space in renovated urban village districts are also summarized. In addition, the corresponding design mode is further disclosed. Thus, objective design references are provided to residential area planning and construction in the renovation of urban village in the future (Fig. 1).

2. State of the art

In the beginning of the 21st century, Peilin (2002) and Xiao (2004) et al. were the first ones concerned about the urban village phenomenon in China’s urbanization process. They studied the relevant development background, building space changes, and component of migrants. With the first round of the large-scaled renovation of urban villages in major cities in China from 2005 to 2008, associated academic studies have shifted from phenomenon analysis to law summarization, from removal and construction of material space to integrated environmental improvement, and from passive removal to positive updating. Research consensus on the renovation philosophy based on comprehensive consideration and inclusive sharing has been reached. Shuang (2011:65), Xinhong (2007), Conglin and Yaping (2009) investigated the urban space pattern. They emphasized on updating and renaissance in the entire region, including urban villages. They also paid attention to the functional and economic continuity in urban regions before and after the renovation. On the basis of the study of sociology, anthropology, and urbanology in urban villages, Yuyun (2005:51), Ye et al. (2012), Yi (2006:04) concluded that the renovation of urban villages should assure the space construction philosophy of diversity, flexibility, and continuity. Haozhong and Jin (2011), Xiaoqing (2010) conducted a survey study on migrant population in urban village. They also advocated the rights of migrant population in equal living space during the renovation of urban villages.

With respect to the building space in renovated residential areas, certain scholars proposed the design method of diversified building space, continuous functional orientation, and flexible construction mode. However, further studies on functional orientation, space composition, and combination mode in residential areas are still necessary. Considering the renovation practices of urban villages in Shenzhen City, Keshi and Hao (2015) suggested that the renovation of urban villages focus on the mixing and diversity of buildings. Mingfeng et al. (2015) suggested that the goal of the integration of different user groups and spaces be realized by mixing habitation and business spaces. Haozhong and Jin (2011), Hang (2007), Yun et al. (2007) highlighted that the primary goal of renovating urban villages is to assure the continuity of economic life, social functions, and traditional culture before and after the renovation. Referring to the renovation case of Liede Village in Guangzhou City, Ye et al. (2012) advocated to attract user groups with different income levels by high-class apartments and diversified business spaces, thereby supporting the citizenization of villagers. Given the literature review concerning the renovation of urban villages in the world, De and Changchun (2009), Jing et al. (2017) affirmed that space construction in urban residential areas under the quantitative research methodology and the philosophy of equality among different social classes is the major director to deepen research on the renovation of urban villages.

Hence, this study further discusses the construction of architectural space using mainstream reconstruction philosophy considering the existing research shortages. Therefore, the factors of different functional spaces in residential areas are classified and summarized. Thereafter, such factors are combined into renovated residential areas that can meet the space demands of different user groups. Research results provide theoretical references for design practices in renovating urban villages.

The rest of this study is organized in the following manner. Section 3 presents a theoretical analysis on urban village community in Xi’an City. The composition and characteristics of different user groups in the typical urban village district are analyzed, and their space demands are summarized. Section 4 analyzes the allocation of material space after reconstruction according to the space demands of users. In addition, the composition modes of different functional spaces are summarized and combined into the renovation components of urban village with different functional orientations. Moreover, whether such renovation of urban village districts is applicable to most projects is
discussed by combining practical factors. Section 5 provides the conclusions and prospects.

3. User groups and their space demands

3.1. Main composition of user groups

In the urbanization process from traditional agricultural production to modern house rental, urban villages do not exist alone. Nevertheless, the goal of serving for surrounding urban residents and migrant population in the city is realized by continuously evolving building space in such villages. Fig. 2 illustrates an urban village community. In this community, stable “demand–supply” relationships among native villagers, migrant workers, and surrounding citizens are formed by using the local building space as the carrier. These relationships are the framework of the urban village community. (In China, the construction of commercial and service spaces in communities is behind the residential area construction. Thus, urban villages share commercial and service facilities with surrounding residential areas in the process of urbanization. A combined region is also developed. In this study, the geographical scope of this combined region is defined as urban village community.) On the basis of this system, house owners in urban villages (native villagers) are called internal users, whereas migrant population and urban residents who use the building space such villages are called external users.

3.2. Space status survey

A typical case of renovation of urban villages in Xi’an City (China) was investigated by combining quantitative and qualitative research methods. On the basis of the analysis of basic data (location, number of residents, land area, residential form, and area index) of 90 urban villages in Xi’an City, Jitai Village, which is close to the downtown area and Huyi Village, which is close to the commerce market were investigated. Jitai Village is next to the Second Ring Road in Xi’an City. And it’s surrounded by the city, possessing perfect residential, education, public service, and business facilities. Hujiamiao Region where Huyi Village is located has been the core region of the commodity transaction market in Xi’an City since the liberation. Huyi is a complicated urban village composed of the different types of migrant population. The investigation focused on building space and user groups. The former covered statistical analysis on the quantitative index data of building space, including residential, business, and entertainment spaces (Lytridis and Tsinakos 2017). The space demands of different user groups were mainly analyzed by questionnaire survey and behavior tracking of internal and external users.

The compositions of residential and business spaces and the current living status of villagers, lessees, migrant population, and surrounding citizens in renovated Jitai and Huyi Village were investigated. Table 1 presents the results of before and after comparison of both cases with these factors. Contradictions between space demands and the use of internal and external users in typical urban villages were mainly manifested in the following two aspects.

1. Disagreements of business and service spaces with actual demands

In view of business patterns, urban villages were mainly occupied by spontaneous businesses before the renovation. However, business spaces after the renovation were mainly nurturing business spaces that were constructed for specific purposes and organizations. Business spaces in Jitai and Huyi Village after the renovation were oriented at the home furnishing industry and the tea market, both were business spaces deviated from daily living demands. Consequently, spontaneous service facilities, such as vegetable and commodity markets, were formed after both renovated urban villages were put into service to meet the daily living demands of locals. For the design mode of business space, the nurturing business space of commercial–residential space combination and shops along streets contradicted the flexible and diversified spontaneous business space to an extent.

2. “Emphasis on inside and neglecting outside” in the design of residential space

The orientation of the residential space design focused on the housing demands of villagers. Small differences in housing types and areas existed. These housing types and areas disagreed with the temporal and transitional space demands of most migrant populations. The structure, area, rent, and quantity of renting houses changed significantly compared with those before the renovation, driving the changing number and type of tenants. The survival of many migrant residents in the city was affected. For the living environment, village context and spiritual belief were not sufficiently reflected, accompanied with the lack of and single form of public activity space within a residential area and between residential areas. These factors were disadvantageous to the smooth citizenization of native villagers.

3.3. Classification and space demands

Construction space should be refined according to the characteristics of usage and developments. Doing so can offer appropriate spaces for different user groups. Therefore, nine user groups were further divided on the basis of the division of internal and external users. Table 2 presents the characteristics of construction space usage.
### Table 1 fig 1 of 4. Comparison of construction spaces before and after renovation in Jitai and Huyi villages.

<table>
<thead>
<tr>
<th>Main facilities in surrounding regions</th>
<th>Jitai Village</th>
<th>Huyi Village</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent education resources, medical facilities, Greenland, and public activity facilities</td>
<td>Thick atmosphere of education and humanity</td>
<td>Thick atmosphere of business market</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Renovation overview</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jitai Village</td>
<td><img src="Jitai_Before.png" alt="Image" /></td>
<td><img src="Jitai_After.png" alt="Image" /></td>
</tr>
<tr>
<td>Huyi Village</td>
<td><img src="Huyi_Before.png" alt="Image" /></td>
<td><img src="Huyi_After.png" alt="Image" /></td>
</tr>
<tr>
<td>Renovation started in 2009, and residents moved back in 2012. The residential space was reduced six times.</td>
<td>Renovation started in 2009, and residents moved back in 2012. The residential space was reduced five times.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Functions</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jitai Village</td>
<td>Residential + commercial service center; Both spaces were highly squeezed in the urban village.</td>
<td>Residential function + urban business, office</td>
</tr>
<tr>
<td>Huyi Village</td>
<td>Residential space + certain business service functions + wholesale market; Market and residential spaces were independently located in the urban village.</td>
<td>Residential function + tea market</td>
</tr>
</tbody>
</table>

**Conclusion**

After the renovation, the urban village got rid of community business functions. The village also oriented to the basic residential and urban business functions.
Table 1 and Figure 2 of 4. Comparison of construction spaces before and after renovation in Jitai and Huyi villages.

The flexible and diversified small space was reconstructed into an integral unified large space, in which types of residential space and diverse business space were decreased.

Before

<table>
<thead>
<tr>
<th>Spatial changes</th>
<th>Residential + business spaces, diversified types and complicated composition</th>
<th>Residential + service spaces; Business space was separated to surrounding land areas. Diversity of space types decreased to an extent.</th>
</tr>
</thead>
</table>

After

<table>
<thead>
<tr>
<th>Conclusions</th>
<th>The flexible and diversified small space was reconstructed into an integral unified large space, in which types of residential space and diverse business space were decreased.</th>
</tr>
</thead>
</table>

### Service business space and its status

#### Before

- Hotels: 5%
- Education: 5%
- Catering: 27%
- Retail: 10%
- Warehouse and office buildings: 12%
- Entertainment: 15%

Diversified business and service facilities as well as flexible spaces

#### After

- Hotels: 7%
- Entertainment: 6%
- Retail: 5%
- Warehouse and office buildings: 27%
- Catering: 20%
- Wholesales: 18%
- Flowing booths: 11%

Business warehouse and residential function overlap and are compressed in the urban village.

#### Conclusions

Renovation separated the service functions of the district. Urban service-type business replaced the community service-type business. In addition, the utilization rate of residents was decreased.

- Approximately 94% of spaces were used as urban service-type business, and 2% was used as community service-type business. Catering facilities were greatly receding in percentage, whereas market spaces for the convenience of people were spontaneously formed.

- Approximately 85% of spaces were used as urban service-type business, and 15% was used as community service-type business. Catering facilities were greatly receding in percentage, whereas market spaces for the convenience of people were spontaneously formed.

Residential space and village houses

- Approximately 70% of the total residential spaces
- Renting: Approximately 30% of the total residential spaces
- Approximately 50% of the total residential spaces were mainly occupied by core families. Most stem families preferred separated living.
### Conclusions

Per capita living space of villagers slightly changed before and after the renovation. After the renovation, room area for renting was increased four times, renting quantity was decreased by 80%, and rents were increased six times. Living conditions and rents were close to surrounding urban residential areas. Nevertheless, living environment and supporting facilities were perfect, thus influencing the daily life of native villagers.

<table>
<thead>
<tr>
<th>Its status</th>
<th>houses</th>
<th>residential spaces; Most houses had two bedrooms. A high proportion of tenants also used houses as office buildings.</th>
<th>spaces; Most houses had two bedrooms, and most tenants used them for residential purposes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composition of user groups</td>
<td></td>
<td><img src="image" alt="Pie chart showing distribution of users before renovation" /></td>
<td><img src="image" alt="Pie chart showing distribution of users after renovation" /></td>
</tr>
<tr>
<td></td>
<td>Surrounding urban residents, surrounding employees, and migrant workers</td>
<td>Stable- and growth-type new migrant workers and surrounding urban residents</td>
<td></td>
</tr>
<tr>
<td>Facility demands and satisfaction</td>
<td><img src="image" alt="Bar graph showing facility demands and satisfaction" /></td>
<td>No public activity space and high requirements on space for meeting and entertainment</td>
<td>Low satisfaction for meeting activity, medical and education facilities</td>
</tr>
<tr>
<td>Internal and external users</td>
<td><img src="image" alt="Bar graph showing before and after renovation" /></td>
<td>Single communication with neighbors and limited public activities</td>
<td>Decreased communication with neighbors and public activities</td>
</tr>
<tr>
<td>Living conditions of native villagers</td>
<td><img src="image" alt="Bar graph showing before and after renovation" /></td>
<td>Approximate the proportion of migrant workers</td>
<td>Approximately 39.2% of growth-type migrant workers and 24.2% of new</td>
</tr>
</tbody>
</table>

Table 1 fig 3 of 4. Comparison of construction spaces before and after renovation in Jitai and Huyi villages.
Space allocation and composition

Solutions to the space demands of internal and external users can be divided into three types, namely, residential, business, and traditional culture and activity spaces. Architectural space is allocated according to the classification of users.

4.1. Residential space

According to different demands of internal and external users, residential space can be divided into resettlement, rental, commodity, and public housing. Resettlement housing is constructed for replacement villagers to improve living conditions. Rental housing is offered for stable type migrants and continues the minimum standard of living of returning villagers. Commodity housing improves living conditions for surrounding residents and stable type migrants. Public housing is for the survival and settlement of newcomers and growth type migrants in cities.

Given the different land conditions, community status, and location characteristics during the renovation of urban villages, residential space is combined according to the different types of objects. Table 3 shows that the residential construction mode in renovated urban village districts is summarized as basic, renewal, and benefit types. The basic residential mode guarantees living space for native villagers and migrant workers. This mode is also the basic condition to maintain major space users in the community. The renewal residential mode maintains the balance and stability of new and old living systems in the entire urban village community by perfecting residential space. The public benefit residential mode concerns the survival difficulties of migrant workers that arise from the renovation of the urban village. These difficulties are realized by policy guarantee and construction of corresponding living space (Canelo-Perez and Mas-Alique 2018). The public benefit and renewal residential modes are the ideal structures of residential space in renovated urban village districts.

4.2. Business and service spaces

Business and service spaces types are determined in two steps. First, service object and scope are determined. Second, spaces are allocated to different service objects.

(1) Types and division references of business and service spaces

Different from the eight types of public service facilities in Urban Residential District Planning and Design Codes, this study emphasized on the division of business and community service space which is closely related with the daily life of residents. Other types of spaces, such as education, medical treatment, culture and sports, and municipal public utilities, are planned and coordinated on the basis of the current situations of the community. In accordance with the regulations of China's Ministry of Commerce, General Administration of Quality Supervision and Standard Committee (China Standard 2004) in business and service spaces, such space can be divided into four types according to management contents: daily neces-
### Table 2. Classification and characteristic statistics of internal and external users in the urban village community.

<table>
<thead>
<tr>
<th>Type</th>
<th>Concept</th>
<th>Main group</th>
<th>Characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal users</td>
<td>Registered villagers in the urban village</td>
<td>Native villagers</td>
<td>Suppliers of rental housing in the urban village</td>
</tr>
<tr>
<td>Labour type</td>
<td>Registered villagers in the urban village</td>
<td>Native villagers</td>
<td>People offering rental housing and engaging in production, service, and labor industry</td>
</tr>
<tr>
<td>Residential users</td>
<td>Residential-working combination</td>
<td>Migrant workers living in the urban village for a long time</td>
<td>Main operators of business service facilities in the urban village</td>
</tr>
<tr>
<td></td>
<td>Residential-working separation</td>
<td>Migrant workers, students, and surrounding employees</td>
<td>Main service objects of business service facilities in the urban village</td>
</tr>
<tr>
<td></td>
<td>Newcomer</td>
<td>Migrant workers, students, and surrounding employees</td>
<td>Most people in this group are transition families who have emotional belonging to the building space in the urban village and a poorly stable employment.</td>
</tr>
<tr>
<td></td>
<td>Growth type</td>
<td>Managers and workers with stable employment and living in the urban village</td>
<td>The proportion of core and stem families is increasing. They bear heavy pressure of living and have the strong desire to improve living conditions.</td>
</tr>
<tr>
<td></td>
<td>Stable type</td>
<td>Migrant workers living in the urban village for a long time</td>
<td>They are external users who have the lowest degree of identity to the urban village and are easy to transform into the non-residential type.</td>
</tr>
<tr>
<td>Non-residential users</td>
<td>Service type</td>
<td>Surrounding urban residents and surrounding employees</td>
<td>Major service objects of business service facilities in the urban village</td>
</tr>
<tr>
<td></td>
<td>Production type</td>
<td>Different population groups in surrounding areas of the urban village</td>
<td>Users of office building and production space in the urban village</td>
</tr>
</tbody>
</table>

### Table 3. Division of living space and residential mode in renovated urban village districts.

<table>
<thead>
<tr>
<th>Type</th>
<th>Space composition</th>
<th>Living object</th>
<th>Nature and connotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic type</td>
<td>Resettlement housing</td>
<td>Internal users (native villagers)</td>
<td>Given limited renovation conditions, basic residential space for native villagers and migrant workers should be the focus.</td>
</tr>
<tr>
<td></td>
<td>Rental housing</td>
<td>Growth- and stable-type migrant workers</td>
<td></td>
</tr>
<tr>
<td>Renewal type</td>
<td>Resettlement housing</td>
<td>Internal users (native villagers)</td>
<td>Improving and updating residential space in the dynamic balance system is given attention.</td>
</tr>
<tr>
<td></td>
<td>Rental housing</td>
<td>Growth- and stable-type migrant workers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Commodity housing</td>
<td>Non-residential external users and stable-type migrant workers</td>
<td></td>
</tr>
<tr>
<td>Public benefit type</td>
<td>Resettlement housing</td>
<td>Internal users (native villagers)</td>
<td>Based on community development and updates, guarantee measures should be formulated for the survival of specific migrant workers in cities.</td>
</tr>
<tr>
<td></td>
<td>Rental housing</td>
<td>Newcomers and stable-type migrant workers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Commodity housing</td>
<td>Growth- and stable-type migrant workers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Public housing</td>
<td>Newcomers and growth-type migrant workers</td>
<td></td>
</tr>
</tbody>
</table>
Daily necessity sales space has different scales and forms, including large-scale commercial complexes, shopping centers, and hypermarkets, middle-scale community shopping centers and supermarkets, as well as small-scale convenience and specialty stores. Catering space is composed of different consumption-wide organizations, including restaurants, snack bars, fast food restaurants, centralized food plazas and breakfast stands. Service space includes vegetable markets, daily service facilities (e.g., haircutting, laundry, sewing, and repairing), post offices, banks, and hotels. Among them, vegetable market is the most closely related with the daily life of surrounding residents. The market has different forms, such as integrated markets, convenience markets, and scattered booths. Entertainment space mainly covers music halls, theaters, karaoke, Internet cafes, game centers, coffee and tea stores, and gyms. In addition, business and service spaces can be divided into “organized” nurturing business space and “non-organized” spontaneous business space.

(2) Hierarchical structure of business and service spaces

<table>
<thead>
<tr>
<th>Scope of service</th>
<th>Name</th>
<th>Content</th>
<th>Size (m²)</th>
<th>Reference case (urban villages in China)</th>
<th>Wide and main characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>City-wide</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Large commodity market</td>
<td>Large commodity retailing and wholesale market</td>
<td>&gt; 10,000</td>
<td>Wholesale fruit market in Hujiamiao, Xi'an City</td>
<td>Service radius is larger than 1 km. Service objects cover different user groups. It is the type of nurturing business space.</td>
</tr>
<tr>
<td></td>
<td>Large supermarket</td>
<td>Large chain supermarkets</td>
<td>&gt; 6,000</td>
<td>Lotus SuperCenter in Hujiamiao, Xi'an City</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Office space</td>
<td>Office space in the regional business circle</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Community-wide</td>
<td>Vegetable market and bazaar</td>
<td>Includes agricultural and sideline products and food</td>
<td>3.5 - 7</td>
<td>Vegetable market in Liede Village in Guangzhou City</td>
<td>The district is mainly occupied by nurturing business space.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(urban village community)</td>
<td>Different types of catering and non-staple food booths</td>
<td>Restaurants, fast food restaurants, snack bars, food plazas and breakfast stands</td>
<td>—</td>
<td>—</td>
<td>business space, accompanied with spontaneous business forms. Service objects cover surrounding urban residents, and service radius is controlled within 500 m. The business spaces are closely related to the daily life of residents.</td>
</tr>
<tr>
<td></td>
<td>Community supermarket (supermarket)</td>
<td>Middle-scale supermarkets</td>
<td>&lt; 6,000</td>
<td>Tianjin New Village supermarket in Shenzhen City</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Department stores and specialty stores (department stores)</td>
<td>Middle-sized commodity stores or business streets</td>
<td>6,000</td>
<td>Chuanglian in Chengxi Village, Xi'an City</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Community service</td>
<td>Drugstores, hair salons, laundry stores, repair stores, banks, post offices, hotels, education, medical, and caring centers for the old and young</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Entertainment space</td>
<td>Gyms, internet cafes, and coffee and tea stores</td>
<td>—</td>
<td>Manchong International Business space in Xi'an City</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Community special service space</td>
<td>Special functional space in the district</td>
<td>—</td>
<td>Tea Market in Huayi residential area in Xi'an City</td>
<td></td>
</tr>
<tr>
<td>Residential-wide</td>
<td>Different service stations</td>
<td>Haircutting, laundry, repair, and drugstores</td>
<td>—</td>
<td>Shops along the streets in the Jiali residential area, Xi'an City</td>
<td>Self-sufficient business and service spaces</td>
</tr>
<tr>
<td>(renovated urban village district)</td>
<td>Convenience stores (canteens)</td>
<td>Convenience stores</td>
<td>100</td>
<td>Manchong International Business space in Xi'an City</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Breakfast stands</td>
<td>Snack and fast food stores, mainly supplying breakfast</td>
<td>—</td>
<td>Bazaar in Jiali Community, Xi'an City</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Entertainment</td>
<td>Rooms for collective activities in the village</td>
<td>—</td>
<td>Liede Village Committee of Guangzhou City</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. Names in brackets are the retailing industries according to Classification of Retail Formats (GB/T18106-2004).
2. Usable area of nurturing business space is set according to the national standard GB/T18106-2004. Definitions of large commodity market size refer to the definition of Opinions of Chongqing People's Government on Healthy Development of Large Commodity Transaction Market (2015). Sizes of other spontaneous business, catering, and community service spaces, office buildings, entertainment spaces, special services, and village centers are determined according to specific situations and functions in the urban village community.
Different forms of the same type of business and service spaces may have different service objects and scopes. Thus, the functional orientation of renovated urban village districts and the combination of suitable business and service spaces are required. Considering the service scope of city-wide and residential-wide nurturing business and service facilities, current laws and regulations divide city commercial network into urban, regional, and community commercial centers, business streets, and various wholesale markets (Ministry of Commerce of the People’s Republic of China 2004). Demonstrative business space in the old community, which was released by the Ministry of Commerce in 2005, included catering stores, vegetable markets, grocery stores, beauty salons, repair stores, laundry stores, photo studios, renewable resource-recycling stations, family service stations, bookstores, and video stores (Ministry of Commerce of the People’s Republic of China 2005). However, no explicit regulation existed on the service scope of spontaneous and informal business spaces, such as vegetable markets and booths. In this study, business and service spaces in the renovation district were divided into city-wide, community-wide, and residential-wide districts (Table 4) according to existing codes and standards. All wide spaces were divided according to business type and space size.

4.3. Traditional culture and activity space

Nineteen out of the ninety finished urban villages in Xi’an City can assure outdoor entertainment of villagers after the renovation. Only few urban villages, such as Xihejia Village and Changyanbao Village, were equipped with special activity spaces, which were idled for a long period. The remaining renovated urban villages had limited place and space for village activities, accompanied with poor manifestations of culture and traditional characteristics. Therefore, insufficient and inappropriate traditional culture and activity space for villagers is one of the major barriers of their citizenization during the renovation. Such citizenization should be enlisted into the renovation goal of urban villages. Guaranteeing spatial factors for citizenization in residential space construction should also be given attention. Traditional culture and activity space mainly cover four functions. (1) Daily meeting and entertainment activity. Meeting place is mainly used during traditional entertainment activities, weddings, and funerals. (2) Traditional festival place. Traditional festivals include the national holidays and traditional festivals of the village. The former often has thick atmosphere of festivals, humanity and living activities due to influences of traditional folk customs. These festivals are conducive to good interactions with surrounding urban residents. (3) Exhibition and inheritance of folk culture. The demands of the functional space and emotional belonging of villagers can be met by reusing old buildings in the village (Skaiste and Virginija 2017). (4) Other composite functions: combined functions with an autonomous organization of villagers. In addition, the collective economic management departments of the village are beneficial for village management and organization. Combined functions with community business, service, education, and old caring become components of community service functions. Combined service objects reach the sphere of surrounding urban residents and migrant workers. The combination provides a valuable public activity place for the urban village community. Moreover, these combined service objects are conducive to the communication and integration of different user groups and facilitate “citizenization” of villagers.

4.4. Space composition and functional orientation

On the basis of the given analysis, residential, business, service, and entertainment space were integrated into a residential-wide district, thereby forming a renovation district with different functional orientations. Fig. 3 shows that typical urban villages in completed urban areas formed a close relationship with surrounding residential areas before the renovation. The village was also equipped with functional attributes of community center. Therefore, community-centered and -subcentered renovations of urban villages are the main functional orientations of construction space in renovated urban village districts. In addition, with limited land areas for resettlement housing in the renovation of urban villages, functional spaces can be distributed in surrounding urban residential areas. The space demands of different user groups in urban villages can be satisfied by multiple channels through the renewal and complementation of the functions of new and old residential spaces.

5. Conclusions and prospects

The space demands of different urban groups in typical urban villages in Xi’an City, China are analyzed to summarize building spaces in renovated urban village districts under the inclusive philosophy. The analyzed space demands are adapted to building spaces, such as residential, service, business, and cultural spaces. Given the different service scopes and objects of different construction spaces, three functional orientations are proposed for the renovation of urban villages. The following conclusions can be drawn.

(1) Community-centered renovation residential districts: functional orientation meets community-wide residential and business service demands in surrounding urban residential areas. The space mainly contains renewal and public benefit residential spaces and community-wide business and service facilities. Given limited land areas in the renovation of urban villages, public benefit residential housing can be planned in old residential areas in surrounding areas.

(2) Community-subcentered renovation residential districts: functional orientation and other residential areas assume the community-wide residential and business service demands. The space mainly includes public benefit residential space and community-wide business service facilities. Given the limited land areas in the renovation of residential urban villages, commodity housing and nurturing business space can be planned in surrounding residential areas.

(3) Community-subordinated renovation residential districts: functional orientation only meets residential and business service space demands for internal residents. Both spaces cover public benefit and basic residential spaces and residential-wide business service facilities. With limited land areas in the renovation of urban villages, public benefit housing and business service facilities can be planned in surrounding residential areas.

The three proposed renovation schemes for residential districts have explicit functional orientations and clear service objects to residential space, as well as clear business service space forms. Moreover, certain space distribution measures are considered, laying founda-
tions to further study the overall layout, construction space combination, and accessibility of residential areas. However, different user groups have different space demands due to different cultural customs and space behaviors, thereby influencing the design mode in renovated urban villages. Hence, future studies should further analyze the different space demands of user groups in urban villages in different cities and regions. Furthermore, the applicability of the residential design mode should be investigated.

**Acknowledgments:**
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1. Introduction

With the rapid development of urbanization in China, urban local flooding is happening more and more frequently. Multiple causes have given rise to urban local flooding, where the most important is the increasing frequency of extremely heavy rainfall and numerous drawbacks in the traditional urban construction. Traditional urban construction model has resulted in gradual expansion of non-pervious area at the surface layer and shrinkage of green land, which directly leads to loss of urban rainfall absorbing function and increase of surface runoff and then local flooding. According to a special investigation project by Ministry of Housing and Urban-Rural Development over flood drainage capacities of 351 cities in 2010, during 2008-2010, 62% of these cities experienced local flooding to different degrees, where 137 cities experienced local flooding for over three times; among cities once experiencing local flooding, maximum ponding duration of 57 cities exceeded 12h. Therefore, local flooding has become a serious problem endangering personal property safety.

In the rapid urbanization progress, China is experiencing severe shortage of water resources, and even excessive development of water resources in recent years, which gives rise to cutoff of multiple rivers and large-area loss of lake wetland (Joksimovic and Alam 2014). Statistics shows that over 400 cities in China are suffering from shortage of water resources, where water supply is severely insufficient in over 100 cities. Even though rainfall resources are abundant in China, especially annual rainfall in southern provinces such as Hunan reaches 1,150mm-2,100mm, rainfall utilization ratio in China is still at a considerably low level. Backwardness of rainfall management and control capacity will result in waste of water resources to some degree.

City local flooding, deficiency of urban water resources and aggravation of water environmental quality have formed water crisis of Chinese cities. Within the global scope, similar problems are generally encountered in urban construction process of developed countries, and most of them have formulated related policies and strategies related to stormwater management. In 2012, China formally proposed the management concept of stormwater “sponge city” suitable for national conditions. This concept aims at regulating rainfall, making the city reserve water resources like “sponge” to gradually recover ecological function of natural water detention. As a long-term process, sponge city construction needs participation of all sections of society, and university campus with large land use scale should play more positive roles. According to the statistics, newly added building area in Chinese universities exceeds 400 million, and newly added green area is about 100 million. Resource utilization in Chinese universities should be transformed from traditional extensive type into refined and scientific use mode, and sponge campus construction is...
imperative. This will become an important link in the sponge city construction and will bring an opportunity to turn the increasingly severe water crisis. Sponge campus will gradually become the mainstream of campus planning and design in the future and sponge campus construction will become the demonstration window of sponge city construction (Liu et al. 2015).

2. State of the art

Some developed countries in the world have already reached a high level in the aspect of stormwater management. In the 1970s, America proposed the concept of Best Management Practices (BMPs), which was initially used to control non-point-source pollution. Through its development for a certain while, rainfall detention capacity in the catchment area was enhanced through comprehensive measures like reducing area of the non-pervious region, increasing permeation and runoff detention and developing landscapes with low impact (Moore et al. 2016). Afterwards, on this basis, new stormwater pattern namely Low Impact Development (LID) was gradually formed with the emphasis laid on maintaining the original hydrological features to the greatest extent in the city construction (Frederick et al. 2011; Chang et al. 2018). Water Sensitive Urban Design (WSUD) in Australia was a kind of comprehensive management mode and method developed for urban water environmental problems and a spatial integration method using technology (water sensitivity) and design (aesthetics and function) from the angle of urban design. The core viewpoint of water sensitive urban design system is reasonable distribution of water resources with urban water cycle taken as a whole and realization of mutual relation and mutual influence between water system and water environment from the overall urban spatial layer so as to solve many water problems occurring in cities (FASAL 2017). Sustainable Urban Drainage Systems (SUDS) in UK is a new drainage system and management technology energetically promoted by the government. This system aims at studying operation laws of groundwater and surface water to reach sustainable cyclic management and control. SUDS highlights coordinated development between man and nature and closely combines water quantity, water quality and water landscape in comprehensive city designs so that water resource system in the whole region can be optimized (Fletcher et al. 2015). In addition, some of other countries have carried out related researches and practices and obtained prominent achievements. Japan Ministry of Construction has promoted rainfall detention and permeation plan since the 1980s and supplanted and conserved ground water and resurgent spring water and recovered base flows of rivers by retaining and detaining rainfall so as to reach effects of reducing flood peak and flood disasters (Che et al. 2005). Ontario State of Canada issued Guidelines on Rainfall Management Planning and Design in March, 2003, which highlighted the comprehensive treatment concept and lowered confluence level by enhancing internal detention in the catchment area and finally conducted pipeline control through transmission control. In 2004 version and follow-up updated version, water balance objective and inflow loss control were introduced to enhance rainfall detention effect (Bradford and Gharabaghi 2004). According to new stormwater management concepts and practices in the abovementioned developed countries, it’s not difficult to find that the dialectical relationship between “detention” and “drainage” of stormwater has been recognized and understood internationally in a brand-new way, the traditional management method which totally separates “detention” from “drainage” has been gradually abandoned, but instead, macroscopic overall management is conducted from a global scope, and doing stormwater detention as far as possible under the condition of flood prevention has gradually become a new trend.

China has a late starting in sponge city construction in China. In 2013, general secretary Xi Jinping put forward the concept of “constructing sponge cities featuring natural detention, natural permeation and natural purification”. In October, 2014, Ministry of Housing and Urban-rural Development formally issued Technical Guide of Sponge City Buildings—Establishment of Low-influence-Development Rainfall System, and this was the first time when the “low-influence development” concept was included in an official document in China. In 2015, China built 16 first batches of pilot sponge cities, which were input into construction firstly; in April, 2016, 14 cities were listed in the second batch of pilot sponge cities. With advent of the trend “sponge city” construction, “sponge campus” planning and construction has emerged in the proper time. Among existing studies, those are published as journal articles include: taking Tsinghua University sponge campus, Shengyin Garden transformation project, Xuetao Road stormwater management and landscape design and renovation project as examples, Liu Hailong et al.(2014; 2016) integrated stormwater management measures with landscape environment through the application of a series of sponge campus-related measures; Wu (2018) and Qu et al. (2018) added the sponge city concept in planning and design of Jiangsu University and Guilin University of Technology; Du et al.(2014) investigated the campus rainfall utilization landscape scheme of Henan Agricultural University and put forward a rainfall collection and utilization landscape scheme.

Although domestic concepts like rainfall management and rainfall utilization in China have entered the visual field of scholars and managers, new construction and renovation projects are still very complicated and arduous under complicated regional rainfall conditions. In fact, China obviously lags behind developed countries in sustainable development fields like rainfall utilization not only in aspects of technological methods, code standards, laws and policies but also in the aspect of concrete application. Faced with contemporarily complicated natural, geographic and social environmental conditions and prominently conflicts, scientifically referring to conceptual methods in developed countries like LID, WSUD and SUDS to study, popularize and apply them according to national conditions is still an enormous challenge faced by sponge city and sponge campus construction in China (Managi 2016).

Therefore, sponge campus construction of Hunan City University in hilly area taken as an example, this study proposed the sponge campus planning scheme based on the sponge city concept by analyzing deficiencies of campus construction in the aspect of water resource utilization with objectives of water safety, water environment and water resource utilization, and analyzed and evaluated it through Storm Water Management Model (SWMM) simulation.
method, expecting to provide a certain guidance and help for sponge campus construction of other universities.

The remainder of this paper is organized as follows: Section 3 consists on the profile of the study area and the research methods used in this paper; Section 4 presents the ArcGis spatial analysis method and SWMM simulation method, constructing sponge campus construction indexes, content system and optimal design strategies; Section 5 draws research conclusions of this paper.

3. Methodology

3.1. Profile of the study area

The study area in this paper is Hunan City University, an ordinary university located in millennial old city Yiyang in Hunan Province, China. Existing campus area, building area and greening rate of the university are 94.33, 550,200 and 38.6% respectively. Mountain and water and building depend on each other in the campus plan. Qingshan Lake, Cuiping Mountain and Yuhu Mountain are located in the core area of the campus, and it belongs to a typical campus with hilly terrain. Yiyang where the university is located belongs to subtropical humid monsoon climate with climatic features of moderate climate, concentrated rainfall, dry summer and autumn and long hot summer. Abundant rainfall in the area provides conditions for utilization of campus water resources. With about 1.5 Qingshan Lake in the campus, it has provided foundation for sponge campus construction. The university has carried out some work in the aspect of water resource utilization and achieved some effects, but this is far away from sponge campus requirements, mainly manifested by the following aspects:

3.1.1. Water quality of Qingshan Lake in the campus is gradually deteriorated.

Due to sewer leakage, municipal wastewaters from student dormitories permeate into Qingshan Lake, which results in N and P increase in the lake water. Watermifoil and water hyacinth grow wildly in the lake; water quality is transformed from Type III to Type IV and V; offensive odor comes from some water areas with eutrophication phenomenon.

3.1.2. With large catchment area, traditional municipal drainage pattern is adopted in the campus, and local flooding can be easily formed in some sections under a rainstorm.

Now catchment area in the campus is 94.33. The campus is divided into three drainage areas to collect rainfall which will be discharged into Yincheng Avenue municipal pipe network by Dongdamen main pipeline. Meanwhile, the campus pipe network also undertakes about 53.3 drainage area from the mountain in Zishan Lake at west side of the campus, and total catchment area reaches 147.6. As traditional municipal drainage pattern is used in the campus, the constructed drainage system is of low standard. Non-pervious pavements like in-campus road, plaza and stadium account for a large proportion. Surface runoff is large under a rainstorm, which results in overflow of some pipelines in the campus. Local flooding can be easily formed in some sections like Xingcheng Plaza, stadium and canteen, which brings about much inconvenience to students and teachers. Meanwhile, rainfall is rapidly converged into main drainage sewer located on Yincheng Avenue in the rainstorm period, which usually gives rise to local flooding of Yincheng Avenue and affects transportation of trunk road.

3.1.3. Campus construction has not considered comprehensive utilization of rainfall.

Even though campus construction area reaches 550,200 at present and number of students reaches 17,821, roof greening and rainfall collection and utilization facilities are not considered in any building, so it’s far from “green building” standard. Some rainfall is consciously gathered into Qingshan Lake as landscape water in the campus construction, but after being stored in Qingshan Lake, rainfall is drained away with overflow. Purified rainfall is not comprehensively utilized to conduct campus landscape watering and road and plaza cleaning.

3.2. Research methods

3.2.1. ArcGis spatial analysis method

ArcGis was used to do a spatial analysis of elevation, slope, hydrology, land use and soil type in the university, and the area which was the most suitable for campus sponge facility construction was obtained.

3.2.2. Comparative analysis method

Through the analysis and comparison of features and advantages of related theories proposed by developed countries, construction indexes and design content system of sponge campus planning were established and optimal design strategies of sponge campus were put forward.

3.2.3. Computer simulation analysis method

Sponge campus taken as the object, SWMM was used to select proper low-influence development measures. Low-influence-development rainfall system model of the sponge campus was designed, scenario simulation of low-influence development was carried out, runoff change process curve and pipe flow change at rain pipe output in the study area were analyzed, and effects of low-influence development measures on stormwater management of the university were evaluated.

4. Results and discussion

4.1. Construct campus sponge facilities according to local conditions based on ArcGis spatial analysis method

A comprehensively analysis of current elevation, slope, hydrology, land use and soil type in the university was carried out using ArcGis software. The campus terrain is high in the west and low in the east, water on the ground surface is mainly drained from west to east by crossing the campus, and 1.5 Qingshan Lake stores some surface water in the campus. Field research combined, the campus area with easy ponding can be rapidly judged. The full understanding of the current water drainage and detention conditions in the campus has provided a sufficient basis for proper construction of campus sponge facilities according to local conditions.

4.2. Sponge campus construction indexes, content system and optimal design strategies

4.2.1. Sponge campus construction indexes

In order to realize multiple objectives of Hunan City University namely campus water safety, improvement of campus water environment and saving of campus water resources, a definite index system was formulat-
ed so as to solve problems existing in campus construction (Table 1).

4.2.2. Content system of sponge campus construction

(1). Establishment of the water safety guarantee system
Based on the detailed campus status survey, local flooding causes are reasonably distinguished. Adhering to principles of paying equal attention to source prevention and control and original project renovation, mutual complementation of traditional scheme and new concept and regarding engineering measures and management measures as equally important, permeable pavement, rainfall detention tank, detention pond and green roof are arranged at the source to control runoffs, grass planting gutter, rainfall wetland and biological retention belt are used in the midway to purify water quality and campus “sponge” function is maintained through water detention of Qingshan Lake and humid pond at the east entrance. Peak runoff is regulated to relieve the threat posed to municipal drainage pipe network on Yincheng Avenue, reduce flood risk to the greatest extent, reduce disaster loss and guarantee campus safety.

(2). Establishment of comprehensive water environmental governance system
For diffuse pollution existing in the campus water environment, on the one hand, optimizing drainage and sewage separation system, and prevent domestic wastewater from leaking into Qingshan Lake; on the other hand, reducing rainfall runoff pollution from the source through LID such as rainfall wetland, biological retention, grass swale and detention pond. Starting from recovering landscape water functions of Qingshan Lake, Qingshan Lake is transformed into a humid pond with self-purification ability, and comprehensive water environmental governance system combining source control and ecological purification of Qingshan Lake is established to maintain hydrological and ecological environment of Qingshan Lake.

(3). Establishment of water resource utilization system
Comprehensive rainfall utilization system will be constructed, and rainfall detention tanks are set in south and north sides of each student dormitory; building roofs of teaching buildings and secondary schools are greened, and underground rainfall detention tanks are set between buildings; underground rainfall detention tanks are set in stadium and plaza for sedimentation, filtration and sterilization of collected rainwater; Qingshan Lake and green land at the east entrance are transformed into humid ponds to purify stored water. Rainfall is stored, purified and recycled through these measures for campus landscape watering and stadium cleaning to improve rainfall utilization efficiency and effectively save water resources.

4.2.3. Optimal design strategies of sponge campus
Current campus water drainage in Hunan City University is divided into three areas: north drainage area, south I drainage area and south II drainage area. Different schemes of rainfall collection, purification, storage and utilization were set according to topographical and drainage features of each area.

(1). North drainage area
The rainfall collecting and disposing flow chart of north drainage area as shown in Figure. 1.

(2). South I drainage area
The rainfall collecting and disposing flow chart of south I drainage area as shown in Figure. 2.

(3). South II drainage area
The rainfall collecting and disposing flow chart of South II drainage area as shown in Figure.3.

4.3. Evaluation of LID facility effect based on SWMM simulation analysis
Current campus status and rainfall runoff conditions after LID renovation were analyzed and compared through the SWMM simulation method so as to evaluate effect of LID facilities on campus stormwater management.

<table>
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<tr>
<th>Table 1. Sponge Campus Index</th>
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<td><strong>Index field</strong></td>
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4.3.1. Simulation analysis of the current rainfall pipe network
According to current pipe network systems such as rainfall pipe diameter, pipe material, rainfall well and pipe network layout form SWMM was used to simulate rainfall quantity. The site was divided into 61 subcatchment areas according to land usage and terrain conditions. Through the model simulation of original data: 24 nodes were overloaded within 2-year recurrence interval with ponding phenomenon, and 51 pipe ducts among 61 ones were overloaded; 38 nodes or impounding reservoirs were overloaded within 30-year recurrence interval. According to the SWMM simulation report, it could be known that total rainfall depth under 2-year recurrence interval reached 65.253mm and the effluent volume of the end discharge output was $L$; total rainfall depth under 30-year recurrence interval reached 114.833mm and effluent volume at the end discharge outlet was $L$.

4.3.2 Simulation analysis of the rainfall pipe network system after planning of LID sponge campus facilities
According to analysis results of current rainfall runoffs and control rate of total runoff quantity taken as the objective, LID facilities were reasonably arranged according to land usage in Hunan City University and sponge city concept, and campus sponge renovation was carried out. Campus catchment areas were re-adjusted (40 catchment areas) according to optimal design strategies of the sponge campus. Through the rainfall simulation with 2-year recurrence interval, total rainfall depth reached 65.253mm and effluent quantity at the end discharge outlet was $L$, which was obviously reduced relative to that (L) before renovation. Through rainfall simulation with 30-year recurrence interval, total rainfall depth reached 114.833mm and effluent quantity at the end discharge outlet was $L$, which was obviously reduced relative to that (L) before renovation. Pipe-free segment and rainfall well were overloaded finally, indicating that LID facilities exerted significant effects and sponge campus construction effect was satisfying.

5. Conclusions
In order to study construction paths and methods for sponge campuses of institutions of higher learning in hilly areas, Hunan City University taken as an example and starting from ArcGIS spatial analysis method, this paper used computer simulation technology on SWMM to analyze deficiencies of campus construction in the aspect of water resource utilization. Sponge campus planning and construction indexes, content system and optimal design strategies were proposed by taking water safety, water environment and water resource utilization as the objectives. Conclusions were drawn as follows:

Design flow of sponge campus planning in hilly areas was teased out. The difference between sponge campus planning and traditional campus planning lied in rainfall treatment, so from the angle of rainfall management, this study proposed new reflection upon sponge campus planning and design in hilly areas. Campus planning and construction of Hunan City University taken as an example, the analysis was conducted from aspects of hydrological conditions and landform features of the campus according to rainfall runoff features, sponge campus planning and construction indexes and content system were established, and optimal design strategies of the sponge campus were proposed.

(2) Model simulation method was used to verify that through reasonable layout of LID facilities in the sponge campus, it could effectively improve control of surface runoffs so as to realize comprehensive utilization of rainfall resources in the campus. The main idea was to take full consideration of the determined spatial layout of the sponge campus and ponding distribution in the campus and then decide layout areas of LID facilities according to campus land use composition, ponding problem generated after construction, site conditions and reserved site space, followed by hydrological simulation and evaluation through the SWMM so as to select the optimal planning and construction scheme.
The design flow of sponge campus planning in hilly areas was defined in this study so as to lay a certain research foundation for sponge campus planning and construction of universities and exert demonstration and driving effects on solving of city local flooding problem and rainfall resource utilization. This study is based on overall campus planning results and data of Hunan City University. The planning deviates somehow from actual construction conditions, and some planned lands are not developed yet, which will have a certain influence on calculation of runoff, impounding volume, etc. Therefore, attention should be paid to complete and accurate campus data collection in the future study, which will contribute to proposing accurate and effective planning and renovation suggestions for the sponge campus.

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THE RESEARCH ON THE CONSTRUCTION OF URBAN VISUAL PLANNING SYSTEM BASED ON THE DEVELOPMENT OF CULTURAL TOURISM INDUSTRY

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Abstract
The cultural tourism industry, which has subtly met the needs and solved the major problem of the current age, is a new growth point for the current city economic growth. Therefore, its position in the industrial structure system will be increasingly improved. The development of the cultural tourism industry also provides an important opportunity for the renewal and re-engineering of urban space. For the current urban space construction crisis needs the integration of historical and cultural elements urgently while the development of the cultural tourism industry itself happened to need the city to provide the necessary carrying space and incubation carrier urgently as well. Thus this research discusses the construction of urban visual planning system and the specific implementation path from the perspective of the development of cultural tourism industry.

Keywords: Cultural Tourism Industry, Urban Construction, Visual Planning.

Highlights:
* The construction of urban visual planning system.
* The implementation path of urban visual planning.

1. Introduction
As the evolution of economic globalization, many cities are keen to build modern high-rise buildings to enhance the city’s comprehensive grade accompanying with the gradually fade of their own city history and culture. As one highly possible result, in the near future, the city’s historical and cultural elements are difficult to be discovered by people and eventually will be forgotten by them under those icy reinforced concrete buildings in the city. When we visit a city, the tall buildings should not be the first thing that catches our eyes but the city’s rich cultural heritage and cultural atmosphere. At the moment, just as the period of vigorous development of China’s cultural tourism industry, the cultural tourism industry should form a benign interaction mechanism with urban space re-engineering, that is to say, the cultural and creative industries are playing an very important role in the inheritance and innovation of the urban cultural traditions, the improvement and extension of the urban industrial structure, and the strengthening and promotion of the urban cultural temperament. Therefore, how to highlight the local historical and cultural characteristics by adding the local cultural elements into urban planning and design and how to promote the development of local urban cultural tourism by effectively planning the urban visual system and enhancing the urban visual effects, has become an necessary problem that needs to be considered. Based on this, this paper starts from the current situation and historical background of urban space reconstruction in contemporary China, then fully explores the construction and implementation ways of the urban visual system.

2. The Background and Problems of China’s Urban Space
2.1. The Background of the China’s Urban space
Compared with the developed countries, the urbanization process in China has created an amazing growth rate, which has reached 58.52% by the end of 2017. If we review the urbanization from the perspective of urban construction, we can say the urbanization is equal to the renewal and reconstruction of urban space. The conventional process of the urbanization, we often overlook the inheritance and innovation of culture but focus on expanding the city space as quickly as possible, which caused the so called chaos (meaning every city has the same appearance). As a consequence, all those urban constructions has no regional peculiarities, all those urban architectures have no cultural connotation, and all the extraordinary traditional elements are gradually abandoned, eventually lead to the collapse of the city’s entire cultural cognition system. The modern process of the urbanization can not only stay in the expansion level of the horizontal dimension, but also expend to the sublimation of the vertical dimension. The “marriage” between the city and the culture in the 21st century is one inevitable result of historical progress because the direction of urban development must start with the “functional city” then to the “cultural city” (Jixiong 2007). The reconstruction of urban space began with the horizontal “extended expansion” development pattern that is from the industrialization era, then transform to the vertical “connotation growth” development pattern that is from the post-industrial era. As shown in figure 1.
To explore the urban architectural culture elements, it is necessary to put the extraction and transformation of urban architectural elements in an important position. By using a specific carrier, sticking with the original, expanding the choice of channels then spreading the culture, which will all help us shape one unique image of the city from multiple angles in the future and fully display the local historical and cultural heritage to everyone. Urban architecture is one representation of the historical development of the city as well as a reflection of the cultural changes in the city. The changing of architectural styles of the city not only record the occurrence of historical events and the development of urban history but also describe the character and image of the city. The systematic review and research planning of urban architectural styles can help to study the urban development context, shape the city image well, publicize and enhance the city influence, and carry forward the local traditional culture.

2.2. The Current Situation of Urban Space in China
The construction of a city embodies the city’s cultural taste and civilization as well as the city builder’s cultural accomplishment and cultural quality. The People-oriented spirit aims to seek a more optimized lifestyle by meeting both the basic needs and the spiritual needs. Urban architectural design is a dynamic and practical social aesthetic existence, which is composed of the contemporary society and the non-social mass aesthetic integration, caused by social aesthetic motives and non-social aesthetic motives, and achieved by social aesthetic ability and non-social aesthetic ability. It has the highest degree of symbolism, naturalness and enrichment, so it is the best way that can reflect the profound national cultural heritage. With today’s rapid development of society, urban buildings are changing fleetly, the high-rise buildings are everywhere and the intelligent construction is emerging, yet the visual differences among different cities are vanishing. When human beings strive to build more and more beautiful buildings, the localized visual culture is perishing.

1) Cultural Remodeling: Cultural Crisis in Today’s Urban Construction
The modern cities are all facing the so-called “special crisis”. Scholar BAOXING Q attributed the primary cause of this crisis to the following two aspects: one is the every city has the same appearance caused by the mutual cloning of modern architecture; the other is the long history of the culture suspends here caused by the incorrect urban renewal (Boxing 2004). Mr. JIXIANG S, Dean of the National Museum, summarized the problems existing in the current urban cultural construction into eight aspects, which are urban landscape convergence, urban construction imbalance, urban image vulgarity, urban environmental deterioration, urban spiritual decline, urban management disorder, city Culture sinks and city memories disappear.

Based on the above, urban space reconstruction should follow the “urban diversity theory” and “small and meticulous planning” which is proposed by Jane Jacobs in his book The Death and Life of American Big Cities, instead of blindly dismantling. Only in this way can we continue the cultural history of a city. However, the real uniqueness of a city is rarely derived from those tall modern public buildings but the residential buildings scattered here and there. Sadly, these traditional residential buildings which are full of regional characteristics are being replaced by the popular real estate economy and the traditional neighborhood relationship is facing a crisis of disintegration. Therefore, it is worth noting that Chinese contemporary cities are not only facing the problem of lacking protection of old cultural heritage, but also facing the problem of insufficient creation of new urban cultural site.

2) Industry Update: Industry Crisis in Today’s Urban Construction
In the post-industrial era, the trend of decentralization in large cities became more and more obvious. It gradually transferred many functions originally belonging to urban centers and inner cities to the cities of satellite city structures. More and more cities are facing many practical problems such as the decline of traditional industries and the hollowing out of urban industries, which means the industrial structure of urban inner cities needs to be adjusted and the urban renewal is imminent. At the same time, along with the continuous development and growth of the cultural creative industries in the new era, the city’s cultural renaissance and industrial renewal have gained new opportunities for developing. With this, traditional industrial cities urgently need to explore new industrial development models to achieve a new round of urban space reconstruction.

3) Space Reengineering: The Control and Reduction Crisis of Today’s Urban Construction
BAOXING Q once pointed out that between 1800 and 2000, from historical cities to modern cities, the most fundamental change in the architectural style was that the isolated buildings replaced the courtyard buildings (Xiaoyi 2016). This change has prompted the “barbaric growth” of urban space in the vertical sense, which means more and more urban buildings designers are blindly pursuing high volume ratios in mass and do not hesitate to destroy the scale and contour of the original city (Jixiang 2010). The original continuous, piece-and-smooth, homogeneous urban texture was rigidly divided into individual islands that is caused by modern rapid traffic (Jian 2010), in another word, the urban spatial landscape order was completely chaotic. The traditional urban cultural space is forced to be compressed, and at the same time, the flexible construction of the modern urban cultural space is often neglected, which made the corridor between the individual spaces of the city is being obscured, made the urban space divide into isolated individual closed spaces and made no effective “conversation” or “communication” happen between each various space.

With all the research above we are able to know that the fundamental cause of all urban crisis is that most modern cities often only have a high-scale
spatial foundation, but have no strong cultural foundation. In the rapidly evolving urbanization process, large-scale isolated buildings can easily enhance the oppression of urban space. While the urban cultural space can make the rigid urban space become more flexible and add more vitality to every city. This can restrain the violent expansion trend of the city in the spatial dimension and lead the urban to develop towards the connotative development direction, which can avoid the urban malformation effectively. The visual image of a city is the most direct and external visual expression conveyed to the whole society, it is a concentration of the natural features, historical and cultural genes, and humanistic spirit of local region. It is embodied in the space, shape, narrative, color, texture of the building, decoration and many other aspects (Qianjun 2016). Therefore, it is significantly important to establish the urban visual planning system.

3. Urban Visual Planning System Based on the Development of Cultural Tourism and Construction

3.1. The Connotation of Urban Visual Planning System

In the past urban planning work, there already includes the work contents of urban visual planning, such as the height limit control in urban planning, color planning and outdoor advertising management in urban control regulations, and the style coordination area and visual gallery in urban cultural relics protection planning, the culture and graphic design of the road and urban tourism planning, etc. But the visual planning in these planning work is not systematic and incomplete, therefore, it is necessary to construct a visual planning system. In today’s society, both the pace of people’s life and the pace of society are getting more and more rushing. In a fast-paced society, it is difficult to win a deeper understanding of cultural connotations and most people rely on the visual representation of urban landscapes to realize the city culture. Therefore, the supplier of the cultural information should provide more efficient and convenient information delivery methods for visitors because the visual communication of cultural information is the key factor affecting how can the recipients receive effective information in time. This requires the governments and the planners to pay attention to the visual image of the city, to build the urban visual planning system on the basis of the existing urban planning work, to display the historical and cultural elements in the most public way to everybody, to lighten the public and the tourist’s cognitive burden and let them understand the city culture and visual image gain a wider public awareness. These all require that urban visual planning must start with the local culture then try to find a visual image element that can reflect the historical context of the city and conform to the contemporary visual aesthetics in the context of the development of the cultural tourism industry, which can not only inherit the urban context, but also facilitate the spreading speed of the city culture.

3.2. Construction of Urban Visual Planning System

To study the visual image, we need to start from the four-dimensional elements, which are graphics, color, material and visual space. We can also use them to define the visual image of anything. Therefore, the urban visual planning system has to construct from logo, color, texture and visual corridor. See figure 2 for details.

1) City Logo Planning

Most cities have their emblems, but with the changes in the aesthetics little by little and the disconnection between urban planning work and urban cultural construction, most citizen know nothing about their city’s emblem. Therefore, the first step of urban visual planning should move up the urban culture and top-level design by cultural excavation and graphic design in order to change the emblem of the city into an easy-to-propagate graphic eventually confirmed in the form of urban CI and urban color also combined with the development of cultural tourism to spread the design of the cultural and travel logo (Xuefei and Lixin 2018; Xiaotao 2014; Ren 2016). In the interest of deepening the concept of culture-oriented travel, we should design the mascot. This series of logos or graphic design fully consider about the application of logo and urban color, especially about the important things such as city squares and city portals for achieving the spread of urban culture during the period of spatial planning in urban planning (Xiaotao 2014; Xueyan 2015).  

2) Urban color planning

Color is the most important factor in vision, however, there still are color chaos and unclear problems existing in many cities. Most the world’s great cities like Prague, Santorini all have their unique color system. The city logo planning completed the mining of urban culture and business travel business cards first. On the basis of urban logo planning, try to let the urban color match with the urban culture by using urban color planning. Then combining with the urban plans to plan the color of the main functional areas in the city (Xiao-wen and Hu-jing 2018; Liang-jin 2017). Under the color guidance of urban identity planning, complete the color planning of the city administration area, business area, commercial area and residential area (Chang-yong and En-gang 2019; Jie et al. 2018; Tian-zhen and Jia-hai 2018). Also under the color guidance of the cultural tourism logo, complete the color planning for cultural relics protection zones, landscape coordination zones, and tourism development zones.  

3) Spatial Texture Planning

The planning of urban spatial texture is based on the urban color planning to do a further visual planning of urban spatial materials. Barcelona in Spain is a very regional city and the famous architecture Scodi has designed many unique buildings for the city through his whole life. The unique architectural form and material texture left a deep imprint to everybody and even become a world famous cultural heritage. Planning the texture material of the urban space can help to form a recognizable urban space. For example, most of the building are using blue and white glass curtain walls, using the exterior color aluminum panels in the CBD, aiming to establish a image of the urban business area. While the auxiliary central area and residential area should spray on the outer wall. Urban color planning and urban texture planning are the key and difficult steps in urban visual planning system.
Under the guidance of “multi-regulation in one”, the urban visual planning system must be carried out under the existing urban planning system and set one city logo planning part, one city vision corridor part, one urban color planning part and one urban texture planning part. The city logo planning can be widely recognized by the public through planning texts, design documents, government establishment procedures, etc. Urban color planning, urban texture planning, and urban visual corridor planning are all implemented through urban zoning planning and urban control regulations. In the end, it will be recognized from the government to the public.

4. Implementation Path in the Development of Cultural Tourism
In the process of rehabilitative protection of urban cultural heritage, most urban planners often overlook one key step, which is the construction of cultural ecosystems around the cultural heritage. Specifically, it refers to the creation of “invisible” external space outside the ancient architectural body. For example, retaining some typical life styles in urban space, such as the maintenance of traditional neighborhood relationship, which carries the significance of the traditional urban culture. As the statement in the book Machu Picchu Charter (1977) saying “The personality and characteristics of a city depend on the size, structure and social characteristics of the city, so it is necessary not only to protect and preserve the historical sites and monuments of the city, but also to inherit the general cultural tradition.”

4.3. The Bottom-up Extension Path
The traditional planning used the government and the administrative department to decentralize planning tasks and the planning indicators as well as to achieve the planning objectives through planning management, which completed a large degree of unity and coherence of the objectives, but still is lacking public awareness of urban culture for the precipitation and inheritance. The design of urban visual planning system starts from urban culture, and it directly affects the public’s visual sense of the city, which largely makes up the lack of urban culture in traditional planning. The bottom-up path in this article includes both urban citizens and the experience of the public. Especially about the public experience of the cultural travel, during the era of urban transformation and development, the cultural industry and tourism industry will occupy the main position of urban economic growth. And during the self-media era, the good experience and visual cognition of the cultural tourism will be great motion to spread of urban culture and urban visual image. Through these specific implementation paths, which can publicize the urban culture effectively and impress every visitor and citizen deeply. Eventually the history and culture of the city can be continued and passed on effectively.

5. Conclusion
The city is a symbol of human civilization, an ideal tool and environment for realizing the social organization and human life. It can not only provide the material conditions and conveniences for people, but also can meet the needs of people’s diverse life and development with its unique cultural, social and economic background. The city is not only a place for people to live, but also a background and carrier for a variety of cultural activities. As an organic part of cultural
tourism, the city reflects the rich cultural characteristics, the background of a specific era, the region and the nation, which makes the construction of urban visual planning system have significant meaning. The establishment of the urban visual planning system can fix the problem of the inaccurate understanding of the urban culture and urban style. Combined with the development of the cultural tourism industry, it will help to achieve goal of spreading the urban culture and embellishing the urban visual image.

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STUDY ON ENVIRONMENTAL REGENERATION AROUND QINGLONG TEMPLE IN XI’AN CITY

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Abstract
The paper is aimed to avoid the situation that historical relics are encroached, isolated and fragmented because of cities in the rapid urban process. Taking the environment around the Qinglong Temple in Xi’an city as an example and based on the characteristics of urban patterns in the history, this paper explores the spatial connection relationship between historical relics and surrounding villages as well as the connection between metro traffic and commercial bodies. At the end of the paper, the improvement strategy is put forward, namely the design concepts of “stepwise style” and “landscape style”, which can be achieved by the demand of ecological restoration and the relationship between urban axis. To be noted, the research shows, by restructuring new connection space, the city can promote the urban memory to be restored, the urban appearance to be reshaped, and the urban patterns in the history to be respected and displayed.

Keywords: Qinglong Temple, Historical Pattern, Spatial Regeneration, Historical Relics.

Highlights:
The Qinglong Temple of development.
Connection space renewal.
A basis for environmental regeneration designs.

1. Introduction
First built in the Sui Dynasty, the Qinglong Temple is situated on the Leyou Plateau, one of the six hills of Chang’an and the commanding height of the city. To be specific, the six hills of Chang’an refer to six loess ridges running across the capital base, south of Weishui River and north of Zhongnansha. When planning the Daxing City, the emperor Yu Wenkai regarded the six high hills as the six hexagrams of Qian in The Book of Changes, and arranged them in the order of “Chu Jiu, Jiu Er, Jiu San, Jiu Si, Jiu Wu and Shang Jiu” from the north to the south. According to the meaning of Qian hexagram, public buildings with different functions were built on the six hills: the imperial palace was placed on the Jiu Er highlands, the imperial city and government organs on the Jiu San highlands, and more temples and Taoist temples on the Jiu Wu highlands because Jiu Wu means honor. In conclusion, important public buildings (palaces, imperial cities, government organs and temples, etc.) were all located on highlands, which were separated from the general residential areas placed on the lower terrain. In this way, the combination of urban buildings and urban geographical conditions allowed the overall layout of the city to be clear, three-dimensional and spectacular. And these six high hills were the geographical basis of the overall planning and layout of the Daxing City (Chang’an City) and the skeleton of the city. As an important temple, the Qinglong Temple was planned on the Jiu Wu Leyou Plateau, which was the commanding height of Chang’an in Tang Dynasty and the best scenic spot for climbing and sightseeing as it allowed tourists to have a panoramic view of the whole city. In addition, it has been a tradition for locals to enjoy Zhongnanshan and watch sunset. Tourists can see Xingqing Park and the Weishui River in the north, the Dayan Pagoda in the south, the Furong Garden in Qujiang below and Qinling Mountains far ahead.

The Qinglong Temple was once a famous temple in Chang’an in Sui and Tang Dynasties, and the Leyou Plateau where Qinglong Temple was located was a tourist attraction as early as Qin and Han Dynasties. In Sui and Tang Dynasties, it was integrated with Qujiang Pool and Ci’en Temple, which became the most attractive tourist attraction in Chang’an. Moreover, it was high, always facing south and overlooking the city plains. Several poems have vividly depicted the way that the plateau overlooked Chang’an in Tang Dynasty, such as Bai Juyi’s “The fog in the northeast is so dense while the clouds flow into the palace”, and “the world of mortals floods among green trees when I look down at the 12 streets”.

The excavation of the Qinglong Temple site started in 1973. In 1980, the first conservation plan was planned to commemorate the exchange promotion by Kukai, which focused on the reproduction of the original Buddhist pattern of the Qinglong Temple. In 1982, the construction of the Kukai Monument was completed. At this time, the gardens between the Kukai Monument, and the east and the west yards around the pagoda were not yet built. In other words, there was only Kukai Monument, on which you could see the Dayan Pagoda on the Leyou Plateau. In 1984,
the main body of the restoration project of the Huiguo-Kukai Memorial Hall was completed, and the gardens between the Huiguo-Kukai Memorial Hall and the Kukai Memorial Hall were completed one after another. After the completion of these two projects, the upper ruins of No. 4 had been excavated and maintained their original appearance. Since the north side of No. 4 ruins was only 6 meters away from the Huiguo-Kukai Memorial Hall, for the conservation of the ruins, only greening treatment was adopted instead of hardening treatment.

In 2008, the Xi’an Municipal Government launched the second conservation plan, aiming at improving the image of the Qinglong Temple site and focusing on the scenic spots and surrounding environment of the Qinglong Temple. To be specific, the general idea of the plan was to highlight the Buddhist culture and the characteristics of Tang Dynasty of the Qinglong Temple, protect the historical features of the region and improve its regional environmental quality, further realizing the benign cycle of the ecological environment and the sustainable utilization of resources in the area. The unified plan solved all the matters by implementing the procedures step by step; it referred to the culture and history in Tang Dynasty to shape the landscape and characteristics of scenic spots; and it improved public service facilities such as recreational green space, evacuation sites, parking lots, urban sanitation and barrier-free facilities by relieving the traffic and reforming roads, thus improving the overall environmental quality of the area, and maintaining the sustainable development of scenic spots.

From the excavation of the Qinglong Temple site in 1973 to the completion of the first phase of the Leyou Plateau Heritage Park in 2012, the Qinglong Temple on the Leyou Plateau has become a historical and cultural scenic spot that integrates ruins, temples, parks, museums and tea houses. Its main areas are as follows: The Qinglong Temple Site Reserve in Sui and Tang Dynasties in the northwest, the Qinglong Temple Area and the Qinglong Temple Site Conservation Center in the south, the Huiguo Hall Business Hotel in the southeast, the Historical and Cultural Experience Area of the Leyou Plateau in the north, the Qinglong Temple Museum of Guyuan Building in the center, etc. The base is adjacent to the Qinglong Temple Heritage Park with Tang culture as its main architectural style, the design of which emphasizes the cultural characteristics of amusement park and highlights the features of site protection.

Both plans try to maintain the temple pattern of the Qinglong Temple, namely the pagoda in the front and the palace in the back, and succeed to restore the grand view when the temple was crowded with visitors and numerous pilgrims came to worship the Buddha in the prosperous Tang Dynasty. In addition, the plans attempt to enable people to feel the grand atmosphere from the Tang Dynasty here. However, the actual situation of the Qinglong Temple nowadays is worrisome. Although there are many Buddhists worshiping Buddha here, the original pattern and significance of the original Leyou Plateau in Chang’an City have been in danger due to the high-degree development and the lack of shaping of historical environment. Therefore, it is urgent to truly realize the once brilliant historical reproduction, which requires us to focus more on the heritage areas with special historical significance. This study focuses on how to treat the historical heritage more correctly, how to make the spiritual and material urban heritage permanent, and how to adapt to the surrounding environment and the rapid urban development.

2. Investigation on the Present Situation of the Surrounding Environment of the Qinglong Temple in Xi’an City

2.1. Platform Erosion and Vegetation Destruction
The platform where the Qinglong Temple is located is rare in Xi’an. The erosion and excavation of the platform lead to the disappearance of the landscape. Consequently, the Qinglong Temple on the “Gangsi Temple” before can not be completely restored. The loess exposed or the retaining wall built destroys the original vegetation system.

2.2. Contradictory Relations with the Adjacent Village in the City
The Qinglong Temple site is surrounded by villages, namely the Tielumiao Village (including Tieyi Village and TieEr Village) and the Wangjia Village. In the process of urban development, all farmland in the vil-
The temple and the leyou plateau in the spatial pattern of citizens to realize the importance of the Qinglong manding height of the city, which is insufficient for the temple sees the past of the leyou plateau as the convergence of the steep ridge below the cliff of the Qinglong ken viewing frame. only the 15-meter height difference in the dayan pagoda, they can be disturbed by the high-rise buildings in the distance and have an incomplete and broken viewing frame. Only the 15-meter height difference of the steep edge below the cliff of the Qinglong Temple sees the past of the Leyou Plateau as the commanding height of the city, which is insufficient for the citizens to realize the importance of the Qinglong Temple and the Leyou Plateau in the spatial pattern of Chang'an City in Tang Dynasty.

2.3. Contradictions between the Qinglong Temple, and Urban Transportation and Commercial Development

The Qinglong Temple Station is located in the southeast section of the second ring of Xi'an as well as in the intersection of Xi'an Metro Line 3 and Line 5. The station is named for the nearby Qinglong Temple Historical and Cultural Scenic Spot. The core business circle of Xi'an City is in the south mostly, the secondary business circle is within 3 kilometers of the southeast of the Bell Tower, and the marginal business circle, such as the Sanqiao business circle, is located in a relatively remote position, while the Qinglong Temple is in the overlapping coverage of Lifeng International Business Circle and Qujiang business circle in Xi'an. Because of its location, the temple is surrounded by catering, supermarkets, followed by hostels, barbershops, etc. However, there is no comprehensive commercial mall around to provide people with one-stop shopping and entertainment experience. Also, because of its remote location, a large number of car wash and repair industries and residential areas are mixed together, occupying the streets, hindering commercial development, and leading to the overcrowded living environment. It is one of the urgent problems to stimulate the life of the area by providing more job opportunities for villagers, or attracting other people to be more active in this area or even settle down.

3. Design of Environmental Regeneration around the Qinglong Temple in Xi'an City

3.1. Space Connection between the Qinglong Temple Site and Surrounding Villages in the City

There is a transitional area between the Qinglong Temple site and the surrounding villages in the city, which is situated in the 12 major taphrogenic belts of Xi'an City with a width of 30 meters, and remains idle. As the illegally-built villages in the city are quite close to the cliff of the Qinglong Temple and have occupied part of the taphrogenic belts while the cliff is reinforced by bricks and hardening, the platform has been eroded and the vegetation system has been destroyed. From the Qinglong Temple, the commanding height of Chang'an in Tang Dynasty, people can oversee the whole city. In addition, according to many ancient poems and lyrics passed down from generation to generation, the visual relationship between the Qinglong Temple and the Dayan Pagoda can be told. When planning and designing the Kukai Monument, the academicians Zhang Jinqiu considered the visual relationship between the reception hall and the Dayan Pagoda. However, due to the crowded buildings, the visual relationship between the Qinglong Temple and the Dayan Pagoda has almost completely disappeared. Through field investigation, it is found that only near the inaccessible edge of the cliff in the Qinglong Temple can tourists see the Dayan Pagoda while they cannot do so in other locations due to the disturbance of the forest. Therefore, the cliff in the transitional area between the Qinglong Temple and the villages in the city should be designed as an accessible landscape area for visitors. On the one hand, such design can ensure the visual relationship between the Qinglong Temple and the Dayan Pagoda. On the other hand, it reuses the transitional and idle area. Furthermore, the platform landform of the cliff can be restored through reasonable landscape design. In this paper, the concept of “stepwise style” design is adopted and the following three landscape strategies for spatial connection design are used: (1) The design of slope landscape belt is used on the cliff to integrate the Qinglong Temple site with the transitional area of the villages in the city. The plants are planted on the slope surface to form a protective corridor and arranged based on the step shape. Seven levels are set up to reflect the Buddhist “a pagoda of seven stories” culture. (2) Stone is used to reinforce the cliff surface and form a gray space together with the slope surface. People can rest, meditate or carry out activities related to temples here. (3) The “dustpan-like” platform is set up in the landscape belt as such platform can effectively exert certain pressure on the terrain, thus consolidating the terrain and reinforcing the original terrain. Moreover, each dustpan-like platform can reinforce the terrain from three sides.

3.2. Space Connection Design of the Qinglong Temple Site and Surrounding Rail Transit

Because of the urban renewal of the villages around the Qinglong Temple, the efficient and effective renewal orientation is necessary. The support of urban rail transit will make the region a public center for future urban construction, so it is necessary to design the connection between the Qinglong Temple site and the surrounding rail transit space, especially in highlighting the urban cultural heritage and integrating urban efficiency, which are of great values. According to the land regionalization map of the main urban area of Xi'an City Overall Plan (2008-2020), the Tang City Wall Ruins Park on the east side is planned to stay at the cross of the Xiying road and the Yanxiang Road, and connect with a small area of green space at the Qinglong Temple Heritage Park on the Leyou Plateau in the north. It is concluded that the Overall Plan suggests that the large area of planned green space of the Qinglong Temple be used as the beginning and the end of the green belt of the Tang City Wall, which means there should be a certain bond and connection between the Qinglong Temple and the Tang City Wall. After superimposed analysis of the ancient and modern road network in this area, it is found that Yanxiang Gate of Chang'an City in Tang
Dynasty fell at the cross of the Yanxiang Road and the Xiying Road. And according to the land regionalization map of the main urban area of Xi’an City Overall Plan (2008-2020), the Tang City Wall Ruins Park temporarily remains where it is. Such decision may be based on the idea of regarding the Yanxing Gate as the terminal point, which is also proven. The Fangjian Road that the Yanxing Gate faces passes through the south side of the Qinglong Temple Park and connects the south gate of the Qinglong Temple Park with the Yanxing Gate. Therefore, the axis relationship between the Fangjian Road and the Yanxin Gate should be high-

Figure 2. The Design of Connection Space

Figure 3. The Connection and Axis
lighted by controlling the sight corridor to allow visitors to spot such relationship, or planning the pedestrian road to make the relationship visible (Figure 3). According to the present situation and base limitation, this paper adopts the strategy of “landscape-style” architecture to connect the Qinglong Temple with traffic hub and commercial space. Different from the traditional vertical buildings isolated in landscape environment, landscape-style architecture integrates the landscape into the roof by “folding”, “embedding” and “inheriting”, which makes the contemporary composite space with comprehensive

Figure 4. The “Landscape-style” Design

Figure 5. The “Landscape Architecture” Design.
functions and huge scale show the flowing, melting and smooth organic form. In addition, its spatial form continuously spreads horizontally, and enables the architecture to be merged with the urban surface through the softening of the boundary. This organic spatial form reconstructs the urban surface and integrates the newly constructed space into the urban environment. At the same time, the two opposite concepts of the top and bottom of the space are obscured and blurred, which brings visual continuity to urban design. The new connection space is no longer isolated on the surface as a contradictory heterogeneous element, but is integrated into an organic unity as a huge and continuous form with the environment. This kind of strategy can make the new connection space less superior and integrate it with the surrounding environment in an open and continuous form. The smooth transition from the Qinglong Temple Heritage Park to the Metro and commercial buildings helps form a harmonious urban public space. In terms of the city image, this strategy controls the height of architecture, showing humility, in order to highlight the Leyou Plateau. In this way, no sense of abruptness visually is shown while the architecture is well integrated with the environment, which is applicable to the situation that Zhongnanshan can be overlooked from the Qinglong Temple. Therefore, it is an effective way to achieve high volume ratio of traffic and commerce without destroying the texture of the surrounding urban relics.

One of the air interfaces, used in the plazas with roof gardens, can be combined with the landscape space as a way to extend and spread space. Another type of air interface, overhead space, can guide people into the second and third floors, showing the “multi-first layer” pattern, which can increase the efficiency of the urban complex in the rail transit development period. Compared with the indoor atrium and the indoor crossing space, it can also ensure the accessible views, especially the significance of the historical pattern.

4. Conclusion
Urban historical relics bear the cultural heritage of urban development. With the constant changes of urban pattern, historical relics have been challenged unprecedentedly. Based on the basic analysis of the current situation and the types of urban areas around the Qinglong Temple, and according to the characteristics of villages in surrounding cities, rail transit and the development period of commercial bodies, this paper puts forward the precondition of the connection design between such urban relics and the surrounding environment space—the specific method of qualitative analysis and quantitative control of urban relations. To be specific, this paper sorts out the urban connection and axis relationship in the area, explores the specific methods to control the planning scope, development intensity and building height, and illustrates the specific design scheme.

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SENSITIVITY MICROSCALE OF URBAN HEAT ISLAND REDUCTION BY GREEN SPACE.

Shizhen Wang, Huanchun Huang, Cui Hao, Lei Cao, Ting Liu

Abstract
Green space is one of the main measures to alleviate urban heat islands (UHI). The transformation mechanism of daytime and nighttime scale sensitivity of vegetation coverage to reduce the UHI effect in a daily cycle has been unclear. As a result, we propose a scale sensitivity measurement algorithm to study the spatial and temporal response relationship between UHI and green coverage. Based on the scale theory of landscape ecology and the method of geostatistical analysis, we adopted ArcGIS, MATLAB, SPSS, and other data processing software as well as a large amount of measured and high-resolution satellite imagery data of Beijing and Tianjin to quantitatively study their spatial scale sensitivity and daily variation features of urban green spaces to reduce summer UHI. The results show that first, the green coverage rate and the UHI intensity experience positive and negative correlations during the daytime, and negative correlations at night. When the correlation coefficient is significant, there is a linear relationship between the UHI intensity and the core green rate. Second, the reduction of the UHI by green spaces displays spatial and temporal change scale sensitivity characteristics. The radius scale of daytime sensitivity is 15m, and the radius scale of nighttime sensitivity is 60m. The study’s conclusion enriches the theoretical parameters of landscape ecological scales and patterns, and provides spatial and temporal scales for systematic planning of green space to reduce UHI.

Keywords: Core Green Rate, Spatiotemporal Scale, Sensitivity, Urban Heat Island.

Highlights:
* There is a linear relationship between the urban heat island intensity and the core green rate.
* There are spatial and temporal change scale sensitivity characteristics of green spaces reducing UHI.
* The study’s conclusion provides spatial and temporal scales for planning of green space to reduce UHI.

1. Introduction
The urban heat island (UHI) effect refers to the phenomenon that air temperature or surface temperature of urban built-up areas is higher than that of rural areas. In cities today, the intensity and impact areas of UHI have been increasing rapidly, which has seriously jeopardized public health and air quality.(Shi 2018) Although a large number of articles in the literature have suggested various measures to alleviate UHI, most of these measures have not been implemented except for green space construction, which is a practical measure to reduce UHI.(Walter 2017) Related studies have shown that urban green space structures affect the cooling efficiency; however, the sensitive spatiotemporal scale of effectively reducing UHI during the daily cycle in summer remains unclear.

2. Related research progress and definition
UHI is a spatial phenomenon of hierarchical structure. Green space is one of the primary tools to alleviate UHI. Abundant research on the reduction of UHI through “greening” has been conducted in China and other countries (Santamouris 2014). Urban green space can absorb 80–90% of solar radiation, which is reflected to the sky through branches, leaves, and leaf crowns of macrophanerophytes, avoiding the direct radiation of the ground by the sun. Urban green space can reduce the ambient temperature by horizontal ecological processes such as wind and atmospheric turbulence (Gunawardena 2017). There is nevertheless little concern about the efficiency of cooling, in particular the scale and mechanism of efficient cooling. At present, only Huanchun Huang, Yingxia Yun and few other scholars have studied the scale sensitivity problem of the floor area ratio(Huang 2017), and there is a lack of systematic and in-depth research on the spatiotemporal scale sensitivity of the reduction of UHI with green spaces.

Since the 1970s, the use of satellite images in research on UHI has been widely accepted in China and other countries, and many research findings have been obtained (Bernard 2017). After 2000, green space and UHI entered the quantitative research stage, which successively focused on three aspects: first, the quantitative description of green space and UHI, and the irregular research conclusions that fail to guide the planning and design; second, research on patterns, mainly concentrating on the UHI and the Normalized Difference Vegetation Index (NDVI), vegetation coverage, vegetation types, etc.(Yu 2006); third, only a few studies have centered on the spatial char-
acteristics of green spaces (Dos 2017). Current research needs to be developed further in the following directions: improvement of the basic data acquisition and analysis methods; clarification of the scale effect of the mitigation of UHI with green spaces; and deepening of the model and enhancement of empirical test support. Therefore, based on Remote Sensing, Geographical information System, high-precision map data, and high-precision test instrument results, this paper quantitatively analyzes the spatiotemporal scale sensitivity and interaction mechanism of the reduction of summer UHI with green spaces in Tianjin and Beijing, two typical cities. The layout of this paper is as follows: Section 3 discusses a conceptual algorithm for the core green rate, and builds an algorithm for scale sensitivity; Section 4 analyzes the space–time scale sensitivity of green coverage and UHI intensity, and clarifies the gradual change characteristics between green spaces and UHI in summer; and Section 5 presents the study’s conclusions.

3. Methodology

3.1. Study areas

The UHI effect displays different characteristics at different latitudes and in different countries. In this paper, the study areas are the downtown area of Tianjin and the urban area of Beijing. Beijing and Tianjin are two typical cities of China’s building climate zone II and vegetation zone III, while the building climate zone and vegetation climate zone are approximately coincident. Therefore, the study of the UHI of Tianjin is representative of the eastern part of Northeast China, the North China region, the southeastern part of the Loess Plateau, and the Guanzhong area. The effects of interlayer plants are not obvious in the community, which is mainly composed of oak, beech, maple, ash, linden, and birch, with relatively wide leaves. With rapid urbanization, the severity of the UHI problem is intensifying. Therefore, the study areas explored in this paper are determined as an area that covers most of the urban region in Tianjin, with a total area of 316; and an area that covers most of the central urban region of Beijing, with a total area of 1166.

3.2. Study data

In this paper, the data collection and processing standards have been significantly improved, eliminating the shortcomings of previous studies, such as low data accuracy, few monitoring points, and insufficient spatial layout samples. Although the intensity of the UHI at night is higher than during the day, the summer daytime is the most harmful period in terms of the degree of damage by UHI. Consequently, the test time was selected as daytime from July 7 to August 7, 2013, and from July 1 to August 30, 2015.

The meteorological conditions for testing and analyzing data need to meet the following requirements: first, the UHI observation avoids the effect of rainfall because the impact of a large amount of precipitation on the UHI is extremely significant, making the observation results not representative; second, while the representative clear and cloudy weather is selected to conduct observation, the intensity of UHI on sunny days is greater than on cloudy days; third, the average wind speed during the observation time should be controlled at a speed close to 2.6m/s. The number of sites was arranged to ensure that enough samples would be taken. The test point data were obtained from 24 urban regions, and 60 urban areas were finally determined (Figure 1).

3.3. Research methods and theories

3.3.1. Scale sensitivity measurement method

Scales are the intrinsic features or patterns of things in nature, which are expressed by human beings or other organisms. The problem of scale sensitivity is in fact the embodiment of the laws of geography. The generation of UHI that is influenced by ground objects within a certain spatial scope in the surrounding area will no longer be linked to relevant regional variables farther than a certain distance. This distance is the most sensitive scale of the UHI. This paper focuses on the spatial scale sensitivity of greenery coverage to UHI, i.e., how the spatial scale of green space can best exert its influence on the central point of the UHI. The measure of scale sensitivity index uses the absolute value of the correlation coefficient between the influencing factor and the UHI intensity. The study adopted the calculation proposed by Huanchun Huang and Jiangang Xu. (Huang 2017)
3.3.2. The concept of and calculation method for the core green rate

The percentage of greenery coverage is the percentage of the vertical projected area of plants in the total land area within a certain urban land-use scope. It is the environmental control of the overall design of the plot—in fact, it homogenizes the space of the entire plot, ignoring the difference among the points in the space. Therefore, this study proposes the concept of core greenery coverage rate (hereinafter referred to as core green rate).

The calculation method of the core green rate uses the calculation idea of kernel density function. Based on the raster data format, the sliding circle for the area space unit is used to perform point-by-point calculation of the space motion search, and the average value (or point density) in the window as the core green rate value of the center point. A spatial variation map of the core green rate with continuous spatial variation can be obtained. Its calculation formula can be expressed as:

\[ R(x) = \frac{1}{A} \sum_{i=1}^{n} K_h(x - x_i) \]

where
- \( K(x) \) —represents the kernel density function,
- \( w \) —represents the weighted value of space \( i \),
- \( h \) —represents the threshold range of spatial action,
- \( n \) —represents the number of points in the threshold range,
- \( d \) —represents the dimension of the data,
- \( A \) —represents the area of the filtering window.

4. Analysis and results

4.1. The scale sensitivity of the reduction of UHI with the core green rate

According to the scale sensitivity calculation formula, the search circle with different radii was set separately, and the spatial and temporal scale sensitivity of the reduction of summer UHI with the core green rate was calculated and evaluated. The sensitivity index \( S \) at different spatial scales was used to draw the scale sensitivity curve of the reduction of summer UHI with the core green rate (see Figure 2).

It can be seen from Figure 2(1) that the sensitivity of the 15m radius is the strongest on the microscopic scale during the daytime, and the sensitivity of UHI of the core green rate is gradually reduced after the radius is greater than—or less than—15m. Therefore, it can be concluded that the core green rate can best reflect the influence on UHI intensity when the spatial search radius scale is 15m, i.e., the green space laid out in a circle with a radius of 15m exerts the greatest reducing effect on the intensity of UHI at the center point \( O \) during the daytime.

It has been estimated that there is only one sensitive scale at night. It can be seen from Figure 2(2) that the sensitivity of the 60m radius is the strongest, and the radius of the UHI is gradually reduced after the radius is greater than or less than 60m. Therefore, it can be concluded that the core green rate can best reflect the influence of greenery coverage on UHI intensity when the spatial search radius scale is 60m.

4.2. The core green rate and daily pattern of UHI in summer

Correlation needs to be used to accurately describe and characterize the relationship between the core green rate and the day-to-day variation of UHI in summer. We calculated the correlation coefficients between the core green rate and UHI intensity of 60 stations in the Tianjin and Beijing urban areas, and drew the correlation curves of daytime and nighttime (Figure 3).

It can be seen from Figure 3(1) that the core green rate and the UHI intensity in the daytime go through two stages, which are converted from a positive correlation to a negative correlation, and there are mainly negative correlations in the afternoon. Locally there is a positive correlation between 8:30 and 13:00; the degree of positive correlation changes from high to low; the correlation is the highest at 8:30; and the correlation coefficient (8:30) exceeds the test with a confidence level of 0.04. 13:00–17:00 shows negative correlation; the change is symmetrical around 15:00;
As seen in Figure 3(2), the core green rate and the UHI intensity are always negatively correlated from 20:00 to 06:00 the next day. From the results of the correlation test, the correlation coefficient exceeds the test with a confidence level of 0.01. This shows that the UHI intensity at night decreases as the greenery coverage increases.

4.3. The regression analysis of the reduction of UHI with the core green rate

Through the comprehensive comparison and analysis of parameters such as and RMSE, it was found that the linear equation has the best fitting effect. The fitting equations for each time period are:

It can be seen from the fitted curves (Table 1) that UHI intensity in the daily variation period is linear with the core green rate. The UHI intensity decreased as the core green rate increased, and the average core green rate increased by 10%. The UHI intensity decreased by 0.18°C from 14:00 to 16:00, and the UHI intensity at night decreased by 0.24°C. From 20:00 to 6:00 the following day, the negative correlation was stable. The more that green space was arranged in the 60m scale, the lower the temperature, and the regression equation of the temperature of UHI had higher credibility.

5. Conclusion

Based on the kernel density and moving window search method, this paper uses a large amount of measured and high-resolution satellite imagery data to study the regularity of the green spaces to reduce the sensitivity of the micro-temporal scale of the summer UHI, and draws the following conclusions:

First, regarding the greenery coverage rate and UHI intensity, the UHI intensity during the daytime experienced two stages of positive and negative correlation; there was negative correlation at night; and the correlation showed periodic characteristics with time. The correlation coefficient had a significant period, and UHI intensity had a linear relationship with the core green rate.

Second, the cooling of green spaces had the scale sensitivity characteristics of spatiotemporal changes, and the sensitivity of spatial scale had time limitations. The sensitive scales of daytime and nighttime changed obviously, the microscopic sensitive radius of the core green rate during daytime was 15m, and the night sensitive scale radius was 60m.

With the improvement of data precision and the advent of the era of big data, the urban UHI effect has many new research directions, and many of the original studies can continue to sharpen the accuracy.

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