Landscape Planning and Design of Henan Oilfield Park Based on Space Syntax Theory

Abstract

With the rapid growth and maturity of various industrial zones in the tide of industrialization, more and more attention has been paid to the ecological sustainable development of human settlements in industrial zones. In this paper, a typical oil industry town in the end of energy development, Henan oilfield, is selected to carry out comprehensive planning and transformation of the Central Park green space, namely the surrounding traffic, by using the space syntax theory, to create an integrated central open park. Based on the space syntax theory, the spatial modeling and data operation of the whole park and local park were carried out. It was found that the leisure land in the central area was scattered, and there were problems and hidden dangers in the traffic conditions around the area. The final planning area in this paper, taking into account the existing resources and local environment, merges the scattered plots and retains the main road design of the Renmin Park area in the original site, re-design the rest of the site. The establishment of children's activity area, antique scenic area, waterfront leisure area, integrated sports area, viewing and exhibition area, Green Square area, etc. , to create a set of leisure, landscape, catering, entertainment in one of the Center Park in industrial town.

Key words: Henan Oilfield Park; Space syntax theory; Industrial area planning; Spatial structure

Sample

3 General Analysis of parks and green space in Henan oilfield

3.1 Holistic region analysis based on space syntax theory

3.1.1 Road system analysis

(1) Road connectivity value

By running the UCL Depthmap software, we can get the road connection relation (figure 3-1) . The overall connection value of the space in G area is high, and the road axis in the main living area presents warm colors such as red, orange and yellow. It shows that the different space units in the living area are closely connected, have good permeability, the overall planning is more reasonable, the area with the best connectivity is also the center of the G area, which is convenient for the needs of residents.
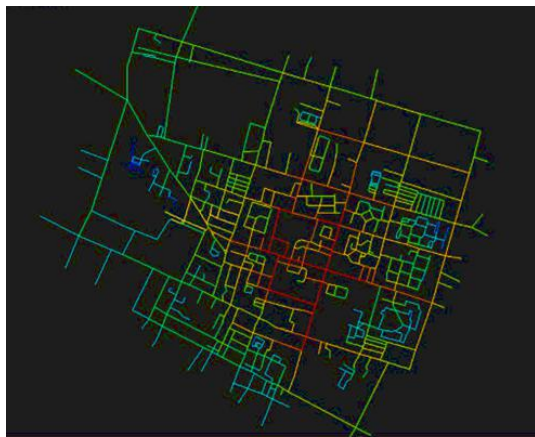

Figure3-1 Connectivity analysis diagram of G Area

Figure3-2 Integration analysis diagram of G Area

(2) Local integration

According to different walking distance set local integration radius, because the overall size of the area is small, the radius is set to 500 m, 1000 m. As can be seen from figure (3-1) , when the radius is 500m, most of the colors are yellow, indicating that it is more suitable for short-distance pedestrian travel, there is a local spatial structure center. When the radius is increased to 1000m, the color of the road axis is divided into cold and warm colors obviously, which shows that the best radius of the road local integration degree is between 500m and 1000m, and is close to 500m. In the road system, walking and non-motor vehicle can be suitable for the road in the G area.

Except for two main roads, all roads in the G area are non-centerline roads. However, in the actual consideration afterwards, as the chemical plants and mining areas are far away from the G areas, most of the workers need to take the office bus or private car to go to work, the children in the G area to go to school more use walking, bicycles, electric vehicles way of travel. This situation leads to congestion and chaos on many roads during peak hours, and small safety accidents often occur.

3.1.2 Analysis of land use layout

The former of the G area is the community of workers and staff, so the layout of the G area is different from the normal city. The construction and development of the G area is mainly man-made intervention, which is different from the living space formed by long-term human gathering.

(1) Residential land

The residential land in the G area is mainly surrounded by block-type residential areas in the G area periphery. Southwest of the community for the last century, mainly for the convenience of commuting, now many residents of the community have moved out. In the later stage, considering the development of oil field, the expansion of G area, and the influence of environmental problems on workers and residents, all the G areas in the later stage are mainly built in the northeast of the G area.

(2) Industrial land

The industrial land of Henan oilfield is extensive, but none of them is built in the G area. The most recent industrial land is located in the south, southeast and east of the G area, which is about 2-3km away.

(3) Land for public facilities

The office building of Henan Oil Field Headquarters (Henan Oil Exploration Bureau) is built in the center of the G area, next to the park and green space. All the kindergartens in the G area are built in the communities, while the schools are built in the middle of the district, which is intended to facilitate the children of workers to go to school, while playing a certain safety guarantee.

(4) Urban green

The residential communities are all equipped with the community central square. The central green space of the G area consists of a park (Renmin Park) and a plaza green space (Wuyi Green Land). In the initial stage of green space planning, it was also envisaged to be an ecological transition zone for industrial zones. However, since the area where the green space is located is also an important area for workers to go to work, the present traffic problems are becoming more and more serious with the popularity of private cars.

Choice measures the potential of an element to attract traffic across. As can be seen from the results (figure 3-3), the highest choice element is a street that faces south immediately adjacent to the middle road between Renmin Park and Wuyi Green Land. Field investigation also found that this road every day traffic jam, a large number of people, motor vehicles, non-motor vehicles and pedestrians mixed, the road is narrow, for the non-central line two-way, and more east-west fork. Through the survey of the activities of the commuters, mainly for work and school commuting, daily activities of the surrounding residents, other residents to visit the park and green passage. After trying to cut motor vehicle roads in parks and green spaces, the road choice has been greatly reduced.

(5) Commercial land

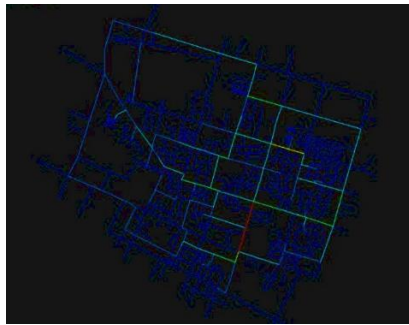The commercial site is adjacent to the Central Park and plaza area and is also surrounded by residential areas.
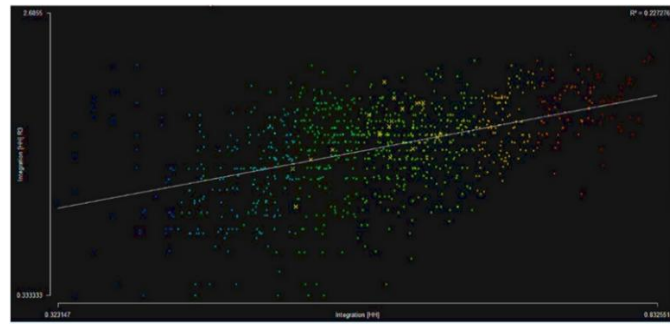
Figure3-3 Choice analysis diagram of G Area   Figure3-4 Synergy analysis diagram of G Area

3.1.3 Other analysis

(1) Synergy

Defining the coordinates generates a scatter plot, with a value of r squared (0.227276 < 0.5) , see the plot that considers the horizontal axis to be independent of the vertical axis, poor synergy, low RN values (low global integration) , and high R3 values (high local integration) . This situation is similar to the case of some urban villages, and the place is closed, the outside world has little influence on its development. This conclusion is in line with the oil field as the development source of industrial area.

(2) Questionnaire

By examining and distributing questionnaires at the intersection of the most selective street in the G area and at the interface of the planned land use, it is known that most workers have mentioned that the road is seriously blocked when commuting to and from work, at the same time, due to the strict management of the Exploration Bureau, Hospital and police station on the road connected to the north side of the road, parking is strictly prohibited, so many temporary parking choose to park on this road, this has led to increasingly narrow and congested roads that are not big enough in their own right. There is also a middle school (Henan No. 7 middle school)100m to the east of the road. Most students choose to go to and from school by bike, which causes the roads to become congested, there are also motor vehicles and non-motor vehicles to cross the face of safety issues.

(3) Revelation

By using the space syntax to analyze the road of the G area from many dimensions, we can know that the road layout and the space division of the G area are more reasonable, and the analysis results also accord with the actual investigation situation, on the whole, it can meet the needs of the residents. The whole road connection value and global integration degree of the G area are higher. It is suitable for short walking and convenient for daily communication. The G area is a grid-like road system, and the road in the center of the grid has the highest global integration, that is, the park and the green area. Mainly for the road network density larger small plots, building space is relatively complete. The park area studied in this paper has some problems as the space center of the G area. Because there are too many scattered roads in the plot, and there are many branch roads connecting the same main road, which leads to the increase of the choice of the surrounding roads and easy to cause traffic problems. Therefore, in the planning and design of the park, it is suggested to widen the main road or reduce the branch road in the central area to relieve the traffic pressure.

3.2 Road analysis in parks based on space syntax theory

3.2.1 Park road layout analysis

The main roads in the park (first-class roads and second-class roads) are selected for CAD drawing of the present situation of the park, and the spatial model is established by using Depthmap software. As can be seen from figure 3-5, the integration of the roads along the lake is high, the area has strong accessibility, and has the largest user population in the whole area of the park, such as walking along the lake area residents, scenic water tourists and so on. For privacy reasons, closer interactions are more likely to take place in less-integrated spaces, where crowds can be avoided. Therefore, the Renmin Park's internal space division and road set up more reasonable, to meet the residents in this sightseeing and leisure functions. The main roads in the park have a clear division of the park area and a regular layout. In the subsequent reconstruction, it should be mainly for renewal through the refinement of the branch roads and the local construction of the landscape facilities in the park, to enhance the scientific and functional use of the park. As shown in figure 3-6, the highest choice roads in the park and the higher choice roads are the first-class roads in the park, and the selectivity is a measure of the potential of the cross-traffic attracted by an element. Therefore, the park's main road planning and design are more reasonable.
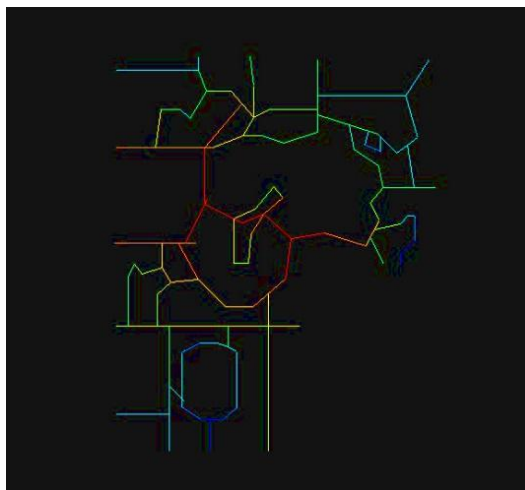

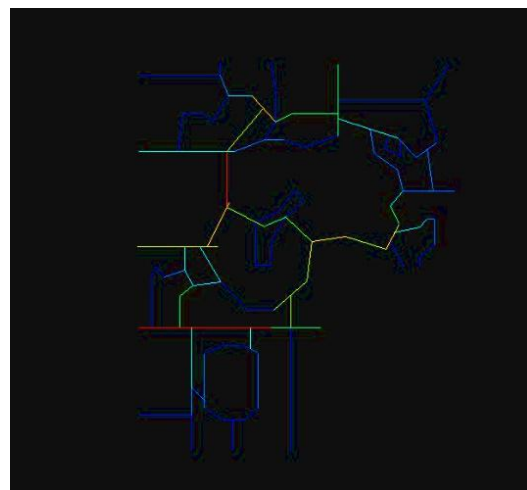Figure3-5 Integration analysis diagram of Renmin Park   Figure3-6 Choice analysis diagram of Renmin Park

3.2.2 Other analysis

(1) Synergy

A scatter plot is generated by defining coordinates, with values of r squared (0.500202 > 0.5) . See figure 3-7. The horizontal axis is correlated with the vertical axis, and the synergy is good. RN and R3 values are in the normal range. It shows that the planning and design of the main road of the park itself is reasonable enough. However, in the specific field visit, there will be functional zoning perception is not obvious, different areas of the larger differences in the flow of people. This may be due to the scattered distribution of landscape nodes in the park and the lack of landscape architecture or infrastructure within the park.

(2) Questionnaire

Most people are satisfied with the use of the park through the questionnaire survey and interview among the users of different age groups in the park. The interviewees are mainly

middle-aged and old people and children. The age range of current users is mainly preschool children and retired old people. This may be because the oil field itself is also facing the problem of aging, young people are busy with school work, lack of time to use the park; It may also be that the lack of age-specific features in the park's current facilities makes it less attractive to teenagers. Therefore, in planning, we should pay attention to the arrangement and design of the special features of different age groups in functional zoning.
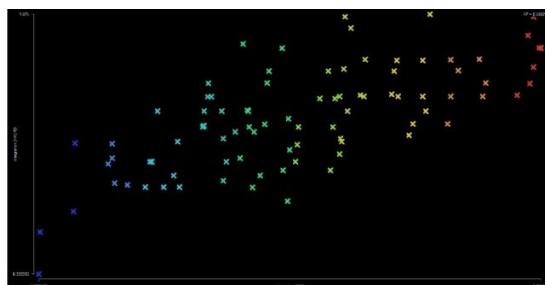

Figure3-7 Synergy analysis diagram of Renmin Park

4 Optimization of spatial layout in Henan oilfield Park

The main purpose of this design is to build an integrated and comprehensive open green space park through the comprehensive transformation of the park green space in the center of the G area, and to relieve the traffic pressure in the center of the G area at the same time, to improve the quality and satisfaction of residents' leisure and entertainment, and to provide reference for the construction of Central Park in industrial towns. Secondly, the design of the park focuses on the practice of ecological construction and the display of petroleum culture. It combines the structure of the open western-style green squares with the new chinese-style landscape, and the park shows the beauty of integration from east to west, to meet the aesthetic needs of different groups.

4.1 Optimization of spatial layout in whole park

4.1.1 Optimization principles

(1) Economic Principles of travel

The organizational structure of urban space determines the path and scope of People's travel, and the activities of people will further affect the layout of urban space and the pattern of land use. The global integration of roads reflects the convenience of moving from one point to any point in space, so the high integration of roads leads to greater mobility of people and more business opportunities. The matching of land use layout and road integration degree is: commercial land should be arranged in convenient place and the area with high population activity intensity, corresponding to the land near the road with the highest integration degree; Land for public services and public facilities has relatively low requirements for traffic conditions and people's living intensity, and therefore has a higher degree of integration relative to land near roads; industrial land is usually located on the outskirts of cities, however, there is a certain demand for traffic conditions, so with the land near the road corresponding to the low degree of integration.

(2) Natural commuting principles

The pattern of urban user movement is influenced by the spatial structure of street network, rather than specific land use. Therefore, the overall area of the park in the planning, can be re-role in its surrounding spatial structure. The re-planning of the street network should reduce the over-selection of road sections in the original site.

4.1.2 Model validation analysis

According to a series of space syntax analysis above, the overall planning and land use layout of the G area is in line with scientific ideas. However, because the central area has many functions, and the construction planning has gone through many stages, its road planning and land use division have some redundancy and unreasonable. In the central area, the green square is divided into Renmin Park, Wuyi Green Land, a community green square and three small scattered gardens. Their use of people and functions are similar, but the road is very fragmented, not conducive to the overall viewing of the tour, but also to the main road outside the central area caused a lot of traffic pressure. Therefore, the planning concept of this paper is to merge multiple scattered plots, traffic diversion, the construction of vertical structure of the passageway area. The main buildings and reasonable trunk roads within the site will be retained and further updated on the original basis.

According to the above two principles, the optimization principle needs to focus on the analysis of the overall regional integration and selectivity. When the spatial model of the planned site is introduced into the software, the selectivity is significantly reduced. The analysis diagram of the integration degree is shown in figure 4-1. The areas with the highest visible saturation are all near the central road through the park, it shows that the greater mobility of people here, the planning and design of the viaduct is very reasonable, can be divided here, alleviate traffic pressure, to ensure pedestrian safety.
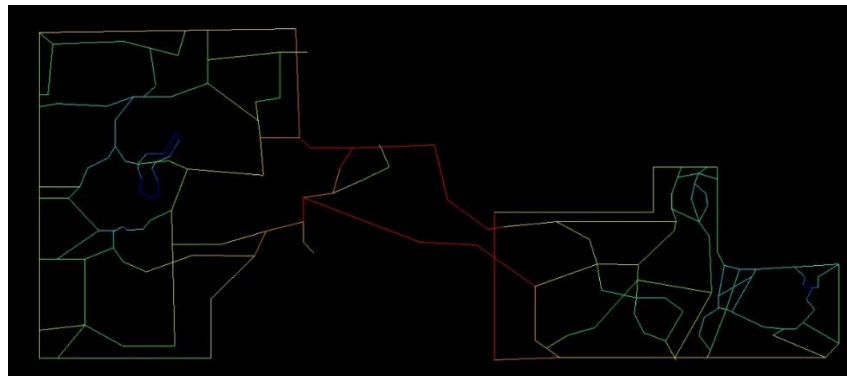

Figure4-1 Integration Analysis Chart of overall regional Henan Oilfield Park

4.2 Optimization of spatial layout in local areas of the park

4.2.1 Optimization principles

(1) The principle of high attraction

In planning and design, some major landscape nodes and viewing areas should be able to have a stronger crowd attraction. According to the theory of space syntax, the higher the degree of integration of the space, the higher the accessibility, the stronger the centrality, the easier to gather people. Therefore, landscape nodes and major viewing areas should be concentrated in accessible roadside or attractive spaces. In the same way, the building,

private space and quiet recreational area which are not related to the viewing and leisure of visitors should be arranged in the low accessibility area.

(2) The principle of whole and part cooperation

Although in real life, the degree of synergy in many cities is not very good, but urban development is also good, which includes a lot of external policy culture. In the general cognition, the scientific nature of the spatial structure can bring about the good development of the region, and the regional spatial structure with high degree of cooperation is better, therefore, as a small region artificial subjective planning design, there is still a need to focus on synergy. The high degree of coordination indicates that the global and local integration degree is very high, and relatively matching, integration degree is used to measure the accessibility, the accessibility is high or favorable.

(3) Matching principle of traversal strength

In landscape design, it is often said that the first class and second class roads and the different widths of the garden roads represent the situation that these roads attract the flow of people, we use selectivity to describe. The roads with high selection have strong traffic attraction. These roads should be used as the first class and second class roads in the park or the open square area, while the ornamental side roads and scenic paths in the park, the smaller the diameter of the road and the narrower the road surface, the lower the selectivity. If this principle can not be met, then in the actual situation, there will be local congestion.

(4) The principle of repeated validation

In the test of regional space, it is very difficult to make our planning area in line with the proposed principles at one time, so repeated verification adjustment is very important. For each result different from the hypothesis, we need to find out the problem through various auxiliary spatial data analysis, and we can't simply cut and add the road. The algorithm model of space syntax theory is a kind of auxiliary means, which is more important for the analysis and research of the result.

4.2.2 Model validation analysis

Since the two sites are connected by viaducts in the planning of the park, and the functions of the two sites are quite different in design, the main function of the site on the east side is the green space, while the site on the west side is the park, the connecting area of the two sites does not have a strong landscape function, but more traffic function, so the two sites should be modeled separately in the study of the spatial rationality of the road and the land use. The maps below show the final road and spatial structure of the site as a result of repeated validation and adjustment.

(1) according to the space syntax theory, the high accessibility regions are more attractive. As shown in figure 4-2, the highly integrated areas are located in the waterfront and Piazza areas, and the main landscape nodes are located in these spaces, while the architectural

accessibility of the main sites is not high, so there is no major contact conflict between the building users and the park visitors. Figure 4-3 shows the east side of the park in the same way, the high-attraction areas are squares and major landscape areas, and semi-private areas are less accessible, and therefore fully in line with the high-attraction principle of planning and design.
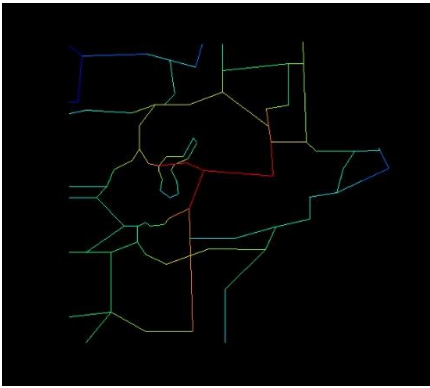

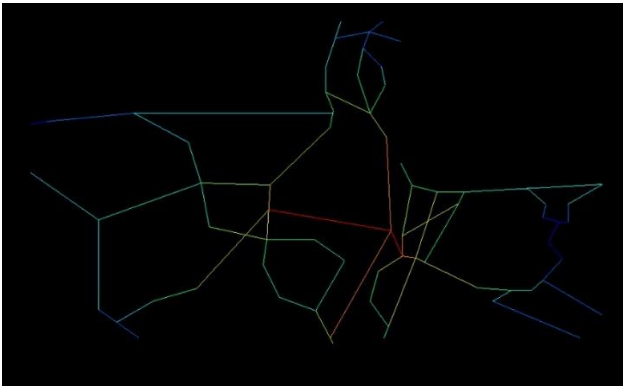Figure4-2 Integration Analysis Diagram (West)   Figure4-3 Integration Analysis Diagram (East)

(2) when the value of R squared rises above 0.7, it is considered that there is a significant correlation between the horizontal axis and the vertical axis. According to the figure below, the r-square value of the two areas in the park is higher than 0.7(the r-square value of the area on the west side of the park is 0.707587, much higher than the pre-planning 0.500202, and the r-square value of the area on the east side of the park is 0.851168) , therefore, the park after the planning of a higher degree of coordination, reflecting the planning of the park has a good spatial structure, in line with the overall and local principles of coordination.
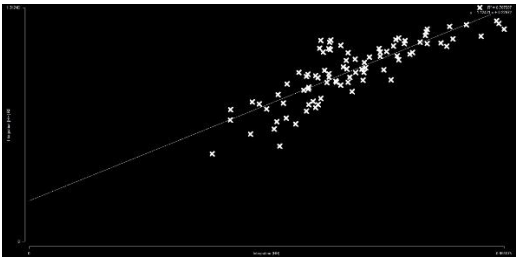

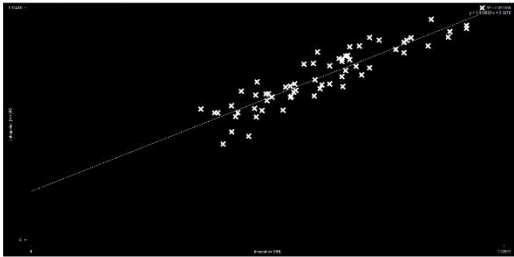Figure4-4 Synergy Analysis Chart (West)   Figure4-5 Synergy Analysis Chart (East)

(3) The choice reflects the possibility of the space being traversed. The higher choice, the more likely the space is to be traversed by people. From the figure below, we can see that the roads with high choice on the west side of the park are the first-class roads in the square and waterfront area, and the roads with high selection on the east side are the first-class and second-class roads in the planning, it is in accordance with the principle of crossing strength matching.
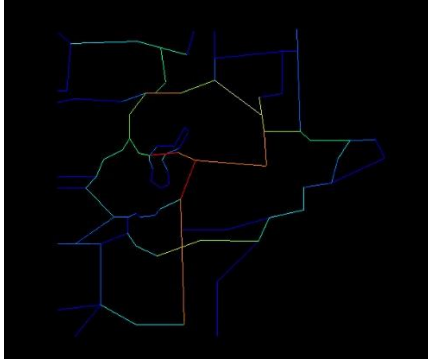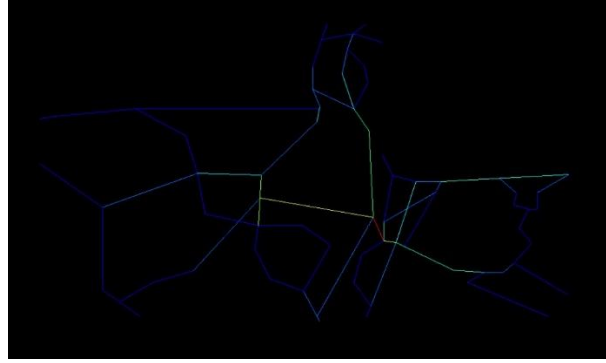
Figure4-6 Choice Analysis Diagram (West)

Figure4-7 Choice Analysis Diagram (East)