Aesthetic Analysis and Research of Industrial Heritage Landscape Design based on Computer Vision -- Taking Beijing Shougang Site Park as an example

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Abstract—Visual perception is the most direct and main source for human to obtain external information, and it is also the direct way to form personal subjective impression of the external objective world. The information of visual perception is subjectively processed by human brain, and different people may have very different ideas about the same landscape. This paper innovatively uses computer intelligent visual simulation to establish a visual perception data model based on Beijing Capital Iron and Steel Works, and finally uses a combination of qualitative and quantitative research to solve the reasons why different types of industrial heritage landscape elements bring people different aesthetic feelings. It is hoped that this paper will bring some help to the future practitioners of computer intelligent landscape design and research.

Keywords-Intelligent computer; Visual perception; Data model; Industrial heritage; Design aesthetic

1 INTRODUCTION

Eye visual perception is the most direct way for the public to have psychological feelings about the external material environment and landscape aesthetic environment, and it is also an important data source and result support for the study of urban landscape aesthetics.

With the development and implementation of new urbanization, the secondary industry in the city is constantly transforming to the tertiary industry. Correspondingly, a large number of factories in the city are abandoned and abandoned. In the traditional image of people, these abandoned factories are often accompanied by negative perception images such as pollution, garbage and dirt. However, from the perspective of visual aesthetic perception, abandoned industrial heritage has many visual aesthetic advantages that historical buildings and contemporary landscape cannot be compared.

Therefore, this paper takes the visual perception research as the starting point, takes the aesthetic value of industrial architectural heritage as the research content to analyze and study, and takes the Capital Steel Works site Park of Beijing as the research object to analyze and study.[1]

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2 METHODS

The main entry point of this study is that when the public visit the landscape of industrial heritage, their vision will instinctively carry out emotional processing and perception of the landscape image that catches their eye. Visual perception is the process in which the brain processes and perceives visual information. However, brain perception of "beauty" or "unbeauty" in this landscape is the difference in brain perception intensity of industrial site landscape information. Therefore, this study aims to construct the research method and technical route scheme for the analysis and research of environmental aesthetics of industrial heritage landscape based on visual perception from three aspects of acquisition, processing and analysis of visual perception image data.[2]

2.1 Acquisition of visual perception information

The acquisition of visual perception information of industrial building sites can be based on two aspects. On the one hand, the site of industrial building sites can be directly inspected and observed, so that the image information of industrial building sites can be directly acquired. The advantage is that the image is clear and the information is reliable, but the disadvantage is that it is difficult to obtain the limited amount of information.

On the other hand, information can be obtained from the site images of industrial building sites through indirect channels such as the Internet, books and photos. The advantage is that it can acquire a large amount of information and obtain a large amount of architectural site image information in a short time. The disadvantage is that it is difficult to conduct in-depth processing and research on the information.

2.2 Processing of visual perception information

The processing of image information of industrial building sites can be divided into the following points. The first is qualitative visual information processing method, which surveys and processes image visual perception information of the public by issuing questionnaires or conducting field surveys. That is, subjects were asked to make subjective statements about their inner feelings after seeing the image. The feeling can be beautiful, big, bad, nostalgic, and this method is mainly to capture the public's immediate impression of a landscape.

The second is the visual information data processing method of the theorem. Researchers can select representative landscape images of key industrial sites and divide the images into relatively homogeneous ones. Meanwhile, site plan and actual scene map are juxtaposed in order to perceive the spatial location of data. For example, the 1,000-meter path where the perception point is located is divided into 25 sections in A unit of 40 meters, which can be represented by Arabic numbers "1-40". The perception object is divided into several spatial sections according to the landscape real picture, which can be represented by letters "A-G". (figure 1) [3]

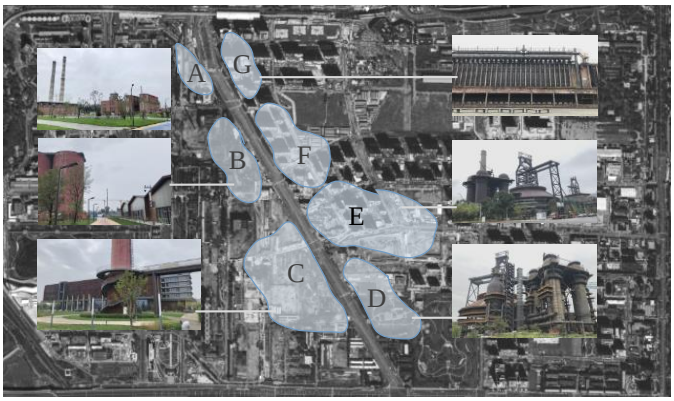

Fig.1.Homogenizing visual data information processing

2.3 Aesthetic analysis of visual perception information

After the acquisition and preliminary processing of visual perception data information, it is necessary to analyze and study the data based on the perceptual and quantitative perception of the public. Based on public feedback and objective status quo of architectural heritage, comparative analysis and research should be carried out, mainly from the aesthetic elements of architectural heritage itself, psychological feelings to the public, the particularity of material color and other aspects of specific research.

At the same time, in the "personalized" aesthetic research of the architectural heritage landscape, we should also sum up the "common" elements in the aesthetics of the industrial architectural heritage landscape, so that our research is not only a one-sided study, but also can sum up the aesthetic law of the common heritage of China's domestic industrial architectural landscape.

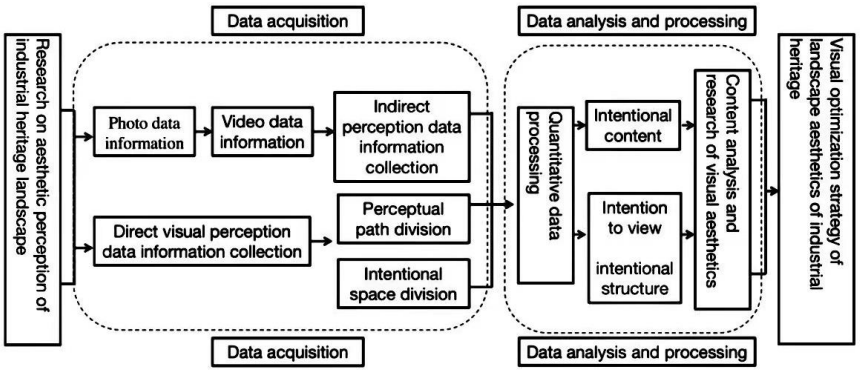

Fig.2. Technology roadmap for research

3 RESULTS

3.1 The visual perception influence of industrial architectural relic landscape at different distances

Through the preliminary investigation and research, we found that the visual perception of the industrial architecture landscape is different at different distances. In the case of different viewing distances, the visual and psychological feelings of the same industrial building site landscape may be very different. Therefore, we will discuss the different visual feelings of people from the distance factor and the landscape of industrial architecture ruins. [4]

1) Study on medium and long distance perception of industrial building sites

Medium and long distance generally refers to the distance between 100 meters and 300 meters from an industrial site landscape. Within this range, the public can have a clear and macro impression of the external outline and skyline of the industrial site buildings and industrial site buildings, but the distance is not so far that the concrete appearance of the site buildings is not clear.

Within this scope, the public will have a strong desire for exploration and thirst for knowledge of historical buildings and historical and humanistic traces due to the feeling of industrial "behemoth" reflected in the vision. Therefore, at this distance, the public's perception of industrial historical buildings is vague, and the aesthetic significance and value of industrial buildings are not profound enough. At this time, the feeling in the public heart is often that the inner imagination is far more than the building entity. Therefore, this distance is also the best distance to construct the skyline, exterior outline and overall sense of industrial site landscape.

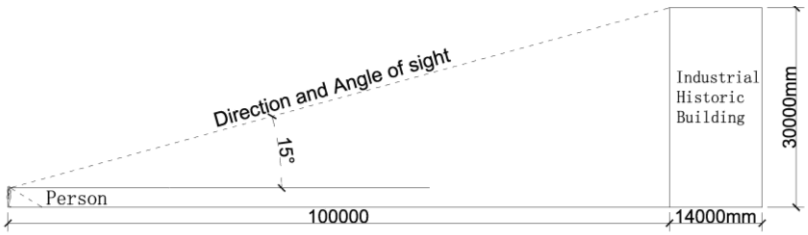

Fig.3.Quantitative impact analysis of visual perception (Cosco distance)

2) A study on close perception of industrial building sites

The close viewing distance generally refers to the distance between 100 meters and 50 meters. Within this distance, the public can have a more specific and intuitive feeling of the specific shape, structure, material and color of the industrial historical buildings. At the same time, this distance can not only make a specific observation of the appearance of the buildings. At the same time, the industrial historical buildings and their surrounding architectural environment can be observed as a whole. The general public's observation at this distance is not only to observe industrial historical buildings, but also to make an overall aesthetic evaluation of the buildings and surrounding environment based on the combination of the buildings and surrounding landscape environment.

At this distance, apart from buildings, there are also many elements such as parks, trees, sculptures and pavement around buildings that can affect people's visual feelings. At the same time, due to the closer distance, the public's sense of industrial giant for industrial buildings will be enhanced, and the public's mood of meditation, nostalgia and meditation will be deepened. The aesthetic design from this perspective should focus on the aesthetic environment of the surrounding environment of the building and the planning and design of private meditation and meditation space. [5]

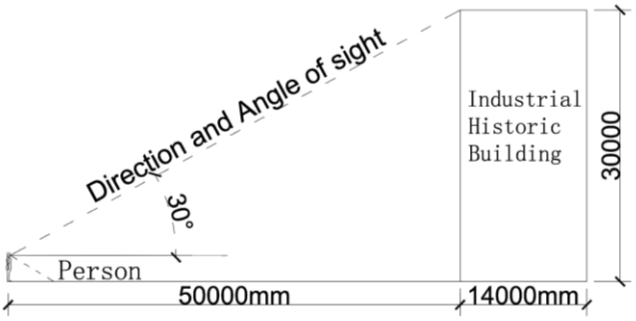

Fig.4. Quantitative impact analysis of visual perception (Closet distance)

3) Study on the contact sexiness of industrial architecture landscape

The research of contact visual perception of industrial architectural landscape usually refers to the visual perception within 50 meters. Within this distance, the public can observe and think more carefully about the structure, material and color of industrial historical buildings and their surrounding architectural environment. In addition to observation, the public can touch and smell the industrial historical buildings with their hands and noses, so as to feel the concrete appearance of the industrial historical buildings more intuitively and concretely.

At the same time, due to the short distance, in this distance, people are likely to have the inner sense of insecurity due to the negative feelings of old building materials, relatively pungent rust and chemical smell, and thus have a psychological desire to escape and stay away. Therefore, within the contact distance, we should not only pay attention to the optimization and processing of visual perception, but also take into account the optimization processing of tactile, taste and other aspects of interactive perception. [6]

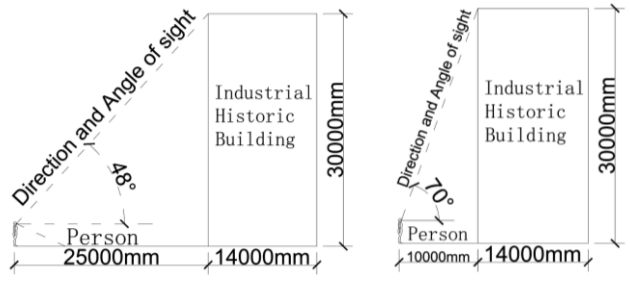

Fig.5.Quantitative impact analysis of visual perception (Contact distance)

3.2 Analysis and research on visual aesthetics of industrial architectural relic landscape

Compared with pre-industrial society, the span of post-industrial society is not very large, but the changes and influences are great. This influence is not only in productivity development, but also in ecological environment, human activities and other aspects. Agriculture was tens of thousands of years older than industrial production, and it also changed the shape of the earth, but people say "industry is dead", not "agriculture is dead".

What I want to say is that the impact of industry on the earth is not as big as people think, and we should think from the positive impact of economic development. We should excavate the intrinsic value of industrial site landscape from the aesthetic point of view, re-excavate the value of abandoned site, and make it glow with new value. [7]

1)An aesthetic analysis of the giant sense of industrial historical buildings

Deep in the human heart is always the pursuit and desire for great things, perhaps a desire to conquer. From ancient times, the design of the Tower of Babel was recorded in genesis chapter 11 of the Bible. People longed to build a high tower that could reach to heaven. The sagrada Familia Cathedral, designed by the 19th-century architect Antoni Gaudi, is still unfinished. All of these embody human's pursuit of massive architecture.

Industrial historical buildings can well interpret and satisfy the public's inner pursuit of huge things. Staying in front of large buildings will give people a sense of fulfillment and satisfaction. However, the shapes and colors of the daily residential buildings and skyscrapers are too regular and gorgeous, which deviate from the wild beauty that the public pursues in their hearts. For example, the huge blast furnace in Beijing Shougang Ruins Park (Figure 5) perfectly satisfies the public's inner pursuit of aesthetics beyond order.

Fig.6. Blast Furnace No. 1 of Capital Iron and Steel Plant (Taken by author in Beijing)

2) Analysis of nostalgic aesthetic feeling of industrial historical buildings

An industrial building park is also a youthful memory, especially for state-owned Chinese companies like Shougang, where workers at the capital's steel mills have devoted their lives to the factory. So many factories are not only factories, but also the memory of a generation. Another unique aesthetic feeling of industrial historical buildings is the beauty of nostalgia. [8]

Compared with modern metal materials and glass curtain walls, this kind of beauty is more restrained, inclusive and implicit. Although there are no stunning shapes and colors, the hidden stories always make people want to explore and explore the industrial historical buildings.

3) Analysis on the unique aesthetic feeling of industrial historical buildings

Due to its production function, the shape of industrial historical buildings is quite different from common residential buildings and commercial buildings.

Residential buildings, commercial buildings in reinforced concrete outside the facade is always a variety of exquisite decoration, but industrial buildings are often rough steel exposed outside, giving people a more shocking visual impact. In addition, due to the production attributes of factories, industrial buildings often have unique texture in modeling. Gradual change, approximation and repetition are very common in industrial buildings, forming a unique aesthetic feeling in modeling of industrial buildings. [9]

4 CONCLUSIONS

First of all, through research and analysis, it can be concluded that the overall visual effect of industrial historical buildings in the distance from the Central Plains is better, which can give people a sense of industrial visual beauty and arouse people's desire to explore, but it is difficult for the public to have a detailed observation in this distance.

Secondly, in close proximity and contact distance, the public's rejection of industrial historical buildings increases, mainly reflected in the sense of insecurity caused by industrial historical buildings. Therefore, the industrial historical buildings should do a good job in the investigation of potential safety hazards, and at the same time do a good job in the repair and transformation of the building structure details, while maintaining good visual aesthetic requirements, and guarantee the basic safety bottom line.

Finally, the most important feeling industrial historical buildings bring to the public is the aesthetic feeling of industrial giant, nostalgic aesthetic feeling and modeling aesthetic feeling, which is not only caused by the characteristics of the building itself, but also the historical and cultural background behind industrial buildings. [10]

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