Research on Urban Park Landscape Renewal Based on Smart Landscape Under Computer Digital Technology

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Abstract. With the continuous development of computer digital technology, my country is gradually transforming into a smart city. Urbanparks are important places for people to carry out public activities. The development of high-tech has brought challenges to urban parks and new opportunities. This paper proposes to build a smart park relying on digital technology, taking smart landscape as a new entry point, and by analyzing the application characteristics of smart landscape in urban parks, and then proposes realization technologies from four aspects: high technology, interactive place, ecological environment, and humanistic characteristics. Wisdom, place wisdom, humanistic wisdom and ecological wisdom, explore the urban park landscape renewal strategy guided by smart landscape. The construction of a smart park system that meets the spiritual needs of tourists and has diversified development provides a new way for the sustainable development of urban park landscapes in the future.

Keywords: Digital Technology · Smart Landscape · Smart Park · Landscape Update

1 Introduction

With the rapid development of digital technology, the urban development model haschanged, and digitalization, informatization and artificial intelligence technologies have been gradually embedded in various urban systems [1]. Human needs are constantly changing, which puts forward higher requirements for the design, management and service of urban parks. The future urban park is not only limited to landscape design, but will also provide a series of solutions around social, economic, environmental and other issues.

Based on the current development status of urban parks, this study starts with the concept of smart landscape of digital technology, explores to improve the level of design, service and management of smart parks, and expounds how to use high-tech digital technology to bring smart park landscape innovation. In order to meet the needs of enriching the recreational experience and enhancing interaction, while continuing the spirit of the site, highlighting the regional culture, in order to provide research ideas for the realization of the real "wisdom" in the landscape space of the urban smart park.

2 Digital Technology and Smart Park

2.1 Smart Landscape

Smart landscape refers to relying on the high integration of modern computer information technology and a certain range of landscape elements as the basis, and integrating high-tech into a smart scene that meets the needs of interactive experience, so as to build a more convenient and livable smart living place and landscape space [2]. Wang Ye, an expert from the Architectural Design and Research Institute of Tsinghua University, believes that the space environment in the new era will be mostly "comprehensive scenes", and the traditional functional space model should evolve or even be redefined. The "smart scene" is starting a new expression for the new space environment and place demand with the power of evolution.

2.2 Smart Park in Digital Technology

With the rapid advancement of urbanization, the development of modern cities hasgradually changedfrom incrementaltoquantitative. Smart city is anew model of current urban renewal. When the development of smart city is derived from urban parks, smart parks emerge as the times require. Smart park refers to the use of the Internet, Internet of Things, big data, cloud computing, artificial intelligence, virtual reality, GIS and other new-generation computer information technologies to digitally express the process of park services and management, and create an urban park that can interact with each other [3].

With the increasing maturity and popularization of digital technology, the "smart landscape" of urban parks has necessary technical guarantees (Fig. 1).
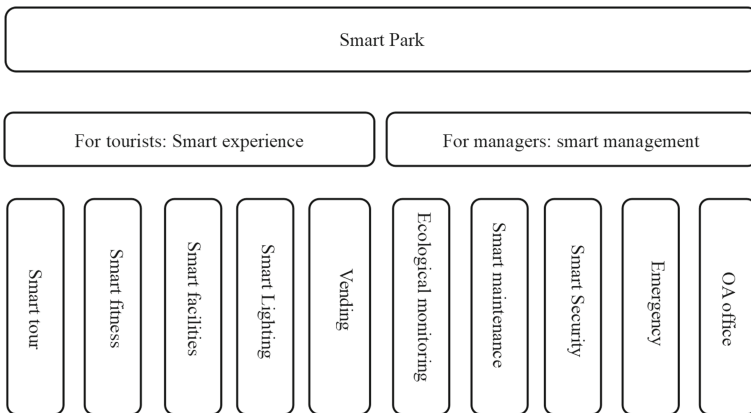

Fig. 1. Smart Park Service Management System.

3   Application Features

3.1   Experiential Landscape Space

With the intervention of smart landscape, the integration of new technologies has improved the experience of tourists in urban parks in many ways. For example, virtual technologies such as digital projection and augmented reality (AR) are used to create unreal scene experiences, break the physical limitations of people and space, and realize multi-dimensional and multi-domain perception experiences of people and landscapes [4].

The application of digital technology endows landscape facilities with more inter-activity. Landscape facilities are no longer lifeless objects, but enrich the functionality and playability of landscape facilities through the application of sensing technology. For example, in landscape pavement, the interaction between spray and collector floor, every time people step on a floor, they can drive a group of spray to start spraying, fully experience the fun of interaction; in public facilities, located in the Champs Elysees, Paris, France The "Smart Digital Station" on Sher Street, which provides people with rest, WIFI interface and touch screen with city service information and guides, this kind of urban public furniture is a pioneer in integrating technology into urban life.

3.2   Efficient Integrated Management

The application of smart monitoring technology has brought great convenience to the management of urban parks. First of all, the scientific maintenance of plants can be realized through technologies such as big data and automation, and the difficulties of plant maintenance due to lack of professional talents can be avoided. At the same time, in the later maintenance of plants and facilities, timely feedback can be obtained through monitoring technology. Secondly, through monitoring technology, it can provide tourists with real-time weather, crowd flow and other data, so that tourists can arrange activities more reasonably. Finally, the combination of monitoring technology and cloud technology has designed a related mobile APP, which can provide visitors with services such as site usage, site reservation, and parking payment information [5] (Fig. 2).
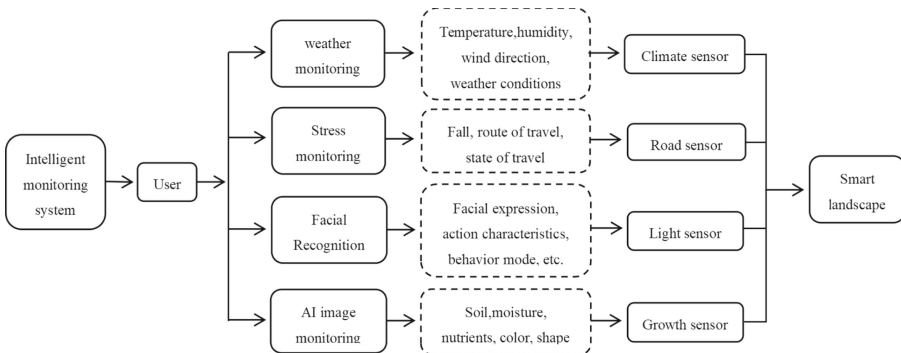

Fig. 2. The realization process of smart landscape in city park.

4 Design Principles

4.1 Informatization and Intelligence of Technology

At present, the city is built with high density, and the construction of urban park landscape needs more precision and refinement [6]. Comprehensively use the Internet, Internet of Things, virtual reality, cloud computing, artificial intelligence and other technologies to optimize the planning, design, construction, management and other aspects of urban parks, provide more humanized services to the public, and improve the social, ecological and health of park landscapes and other benefits. At the same time, the construction of smart parks is an opportunity for traditional parks to transform and upgrade in the period of technological innovation, which improves the level of informatization, intelligence and digitization of the entire garden industry. As sociologist Saskia Sassen once said, "What we need is to urbanize technology and make it work for users."

4.2 Functional Interaction Experience of the Place

Modern park landscapes often pay more attention to spatial form, functional layout and use and construction. It ignores people's experience and perception of the landscape. What people need is not only beautiful scenery, but also a landscape place with human touch. The future development direction of smart parks is bound to focus on the emotional interaction between people and the landscape. The experience interaction of the park landscape space is mainly reflected in the senses and emotions. It can be combined with the local regional culture to display historical culture and popular science education; it can also create a narrative place through the environment to guide visitors to interact with the landscape and generate emotional resonance.

At the same time, urban park landscape optimization can be combined with the application of smart systems, fully considering the experience needs of park users and the work needs of managers to carry out smart urban park renovations.

4.3 Eco-friendly Mutualism of the Environment

The smart park should be planned and designed on the basis of the concept of sustainable development and low carbon, integrate the preface theories of "ecology" and "wisdom", and use the Internet of Things technology, big data technology and ecological technology to carry out ecological construction to achieve ecological friendliness. Symbiosis with the environment. On the one hand, it is necessary to respect the original natural landscape and the survival mode of creatures, and reduce the impact of activities on the natural environment by integrating natural resources and landscape elements for innovative reuse. On the other hand, we use smart technology to inquire and sort out land needs, give full play to the advantages of smart ecology, solve environmental problems of the site in a flexible and intelligent way, reduce the waste of ecological resources, protect biodiversity, and realize the self of smart ecology. Regulation and sustainable development.

4.4   Continuation of Regional Context of Culture

Since then, the traditional Chinese landscape wisdom advocates "scenario blending", adding poetic understanding and processing to the landscape to express emotions. Explore the local context and stories, endow the site with its own regional attributes and cultural characteristics, and inject the soul of sustainable development into the smart park through the inheritance of the regional context.

The continuation of the spirit of the place and the regional context makes the urban public space more attractive and inspiring. In the landscape design of the smart park, we should be alert to the fragmentation and impact of the modern and digital landscape development mode on the original cultural connotation in the region. On the basis of the overall harmony, highlight the local characteristics, inherit the historical context, and effectively integrate the local flavor of life and the original ecological landscape.

5   Design Strategy

According to Maslow's Hierarchy of Needs Theory, the hierarchy of human needs is presented in the form of an increasing pyramid, and the same is true for the needs of the crowd for landscapes, which can be divided into physiological needs, behavioral needs and psychological needs, which are respectively reflected in basic security, interactive services and emotional resonance. When the low-level needs of tourists are satisfied, there will be higher-level needs. Therefore, the experience level of park landscape construction should also be displayed in an incremental way according to the needs of tourists, and combined with the method of smart landscape, it should be constructed by strategies such as smart technology, smart place, smart humanities, and smart ecology. Improve the emotional experience of tourists and bring more dimensions of landscape experience to tourists (Fig. 3).
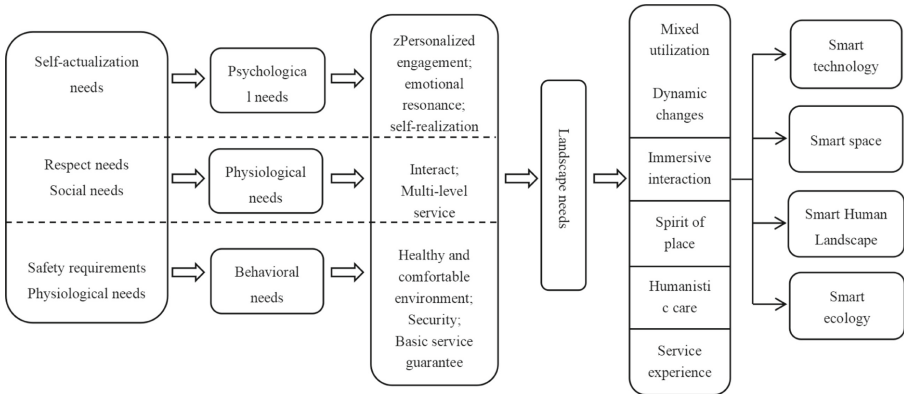

Fig. 3.   The impact of crowd demands and landscape demands on smart landscapes in urban parks.

5.1 Involving in High-Tech and Realizing Smart Technology

5.1.1 Landscape Experience

In the early stage of urban smart park planning, big data, satellite positioning, GIS, Imaps, Global Mapper and other technical means can be used to collect data on the site environment, locate users and analyze and evaluate their behavior habits. Using high-tech digital technology to complete the collection, processing, management, analysis and application of information is more convenient and intuitive, which is conducive to the targeted site planning and design for the different needs of different groups of people.

Through quantitative analysis and simulation of the environment, the laws of nature are translated into the city computer program language, and the natural forms are dynamically simulated, so as to achieve a natural landscape planning. Using GH, Rhino and other software to build a space model, intuitively feel the effect of completion, and scrutinize the effect of landscape layout and plant configuration, which can effectively improve the design adaptability.

5.1.2 Tourist Experience

Through the Internet of Things, "things and things", "people and people", and "people and things" are effectively connected to provide tourists with more humanized services and immersive interactive experience. High-tech digital technology endows the interactive landscape with more possibilities, and high-tech-driven smart facilities enhance the rich experience of visitors in the park landscape space.

For example, the navigation system in urban parks has problems such as low recognition, little content, and easy damage. Through interviews with 40 tourists and 10 managers in Nanjing Bergamot Lake Country Park, it is found that tourists are not very satisfied with the existing guide system. Among them, none of them are very satisfied, 13 are relatively satisfied, and 27 are not satisfied. People, dissatisfied 10 people. The survey data shows that people have a high degree of acceptance of mobile statistical monitoring equipment (Fig. 5). According to the figure, people's functional requirements for the park guide system are mainly concentrated in the distribution of scenic spots, explanation of scenic spots, facility distribution, and facility usage (Table 1).

Table 1. Functional requirements of tourists for the navigation system.

function	Proportion%
Attraction distribution	59.11
Attraction explanation	37.44
Facility distribution	31.53
Facility usage	25.62
park photo	18.72
Tourist evaluation	9.85

Table 2. The functional requirements of the administrator for the navigation system.

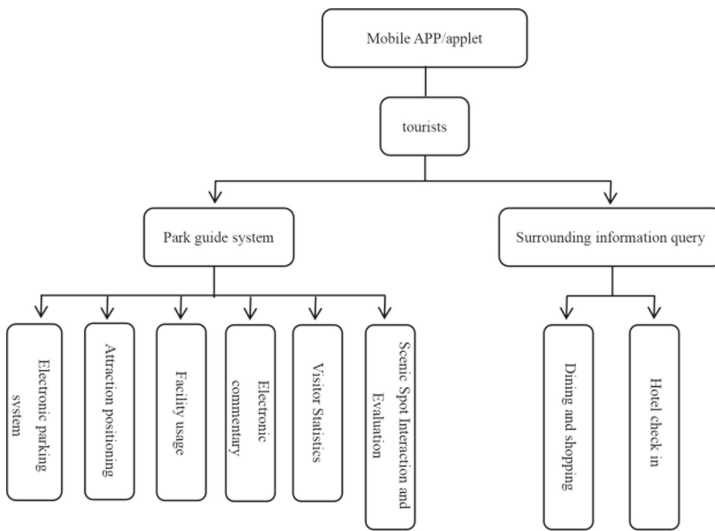| founction	Proportion%
Manage Attraction Locations	44.33
Edit attraction information	6.4
Damage Alerting and Maintenance of Facilities	55.67
Statistics on visitor numbers and behavioral preferences	45.81
See what visitors are saying about the park	28.57

Fig. 4. Design of functional modules of mobile terminal navigation system.

As can be seen from Table 2, the functional requirements of park administrators for the park guidance system are mainly concentrated in five aspects.

According to the above problems and needs, through the intervention of Internet of Things, cloud computing and other technologies, develop a mobile terminal smart guide system, try to understand all aspects of the park, and optimize the tour experience (Figs. 4 and 5).

5.1.3 Service Management

Intelligent operation management is mainly aimed at park managers. Different from the traditional management method that only relies on the subjective experience of managers, intelligent operation management uses big data, artificial intelligence, cloud
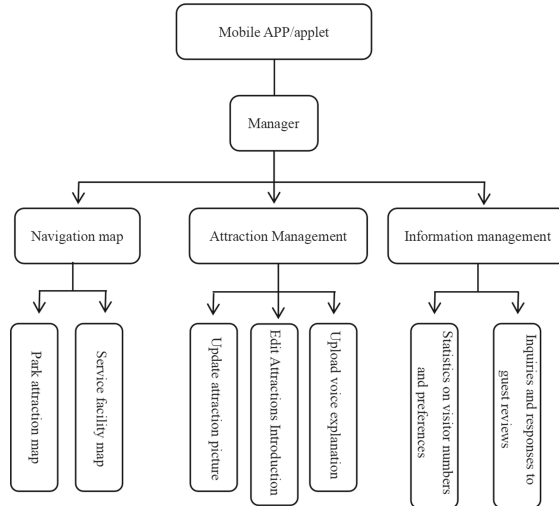
Fig. 5. The background module design of the mobile guide system administrator.

computing and other high-tech to dynamically mine and process various park data to provide Provide technical support for the management and decision-making of the park, including smart ecological monitoring, smart maintenance management, smart security and other aspects. For example, smart maintenance management includes irrigation, pest control, etc. It mainly uses information technology to detect indicators such as microclimate, soil water and fertilizer in the park in real time, and uses remote sensing and video technology to monitor the health of plants. In addition, image recognition and comprehensive analysis of big data are carried out through the intelligent platform, and the drip pipe system and sprinkler irrigation system are linked for water and fertilizer management and pest control.

5.2 Enriching Space Functions and Creating a Smart Place

5.2.1 Dynamically Mixed Event Spaces

The dynamic mixed utilization of space can enable the site to carry activities of different functions in different time periods, make the space function more complex, and use the space more efficiently to meet the different needs of different groups of people. At the same time, in view of the current unique post-epidemic era reflection, it is more necessary to face the actual needs of disaster relief and resettlement and the needs of public services, and it is also necessary to build a flexible space to deal with major events, achieve "combination of disaster relief", and improve urban space [7]. Adaptability in harsh conditions.

The dynamic space can change in response to changes in time, demand, and natural elements, and the dynamic landscape in the dynamic space can also change through the perception of the intelligent system or human regulation, which increases the richness and participation of the landscape space, giving The power of people to participate in

space and change the landscape builds the emotional intersection between people and space to form a deeper landscape experience.

5.2.2 Experience Space for Immersive Interaction

The immersive experience relies on technologies such as virtual reality, augmented reality, holographic projection, and intelligent interaction, and combines regional culture to create a narrative space. Through the substitution of scenes, visitors can interact with it and even participate in the creation. Through the spatial interlacing of perception, intuition, and behavioral awareness, it can comprehensively enhance the depth of tourists' experience, blur the edge of space, weaken time and space, and provide people with an immersive interactive experience that can resonate and shorten the social distance between people., to enhance people's thinking identity.

The current immersion is often concentrated in a specific indoor experience space, while the immersive experience of landscape space is reflected in the spatial sequence of transitions, rich and varied visual dimensions and landscape levels. Give narrative and theme to the organization and arrangement of landscape space, create suspense and changes in space experience, allow visitors to move forward in space with the advancement of the story, and use landscape as a carrier of space to transmit information. The language naturally reveals the connotation of the place, which further strengthens the emotional experience and spiritual experience of the place for tourists (Figs. 6, 7 and 8).
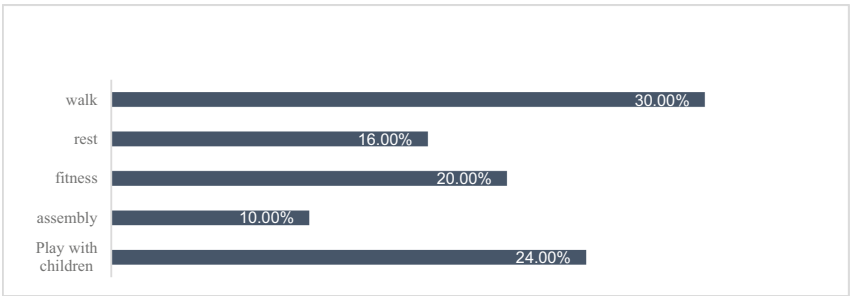

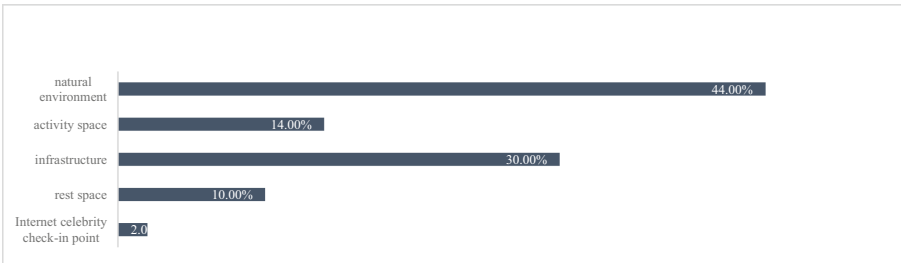**Fig. 6.** Visitors' needs for smart park landscape functions.

Fig. 7. The impact of landscape elements on the environment of smart parks.
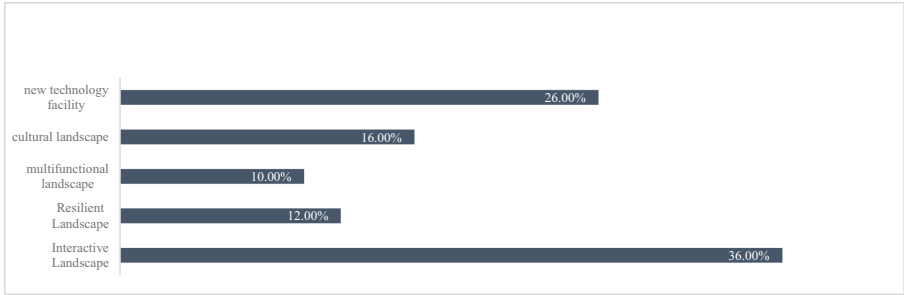
Fig. 8. Visitors' expectations for the landscape space of Smart Park.

5.3 Integrate Cultural Characteristics and Reconstruct Intelligent Humanities

5.3.1 Cultural Translation

Different regional environments produce different urban landscapes. While updating the landscape space, it is necessary to continue the original natural attributes and humanistic characteristics, and maintain the diverse behaviors and life atmosphere in the original site, so as to reflect the local cultural form and regional context. By fully excavating local cultural characteristics and translating and expressing in landscape language, landscape space and facilities can be innovated through visual perception, facility interaction, emotional artistic conception, etc., so as to realize the inheritance of regional context. For example, in the second ring road of Chengdu, two-thirds of the parks retain the culture of the old teahouse. Visitors can enjoy the lake view and drink tea under the trees or on the pavilions and corridors, and experience the slow life of Chengdu. It builds local residents' sense of belonging to the park and foreign tourists' perception of the city.

5.3.2 Humanistic Care

The application of the smart landscape system can provide more convenience for disadvantaged groups. For example, for the blind, the navigation sign system that can be broadcast in language is more convenient than the simple Braille navigation map. However, the smart landscape guided by high technology also has two sides. The intervention of high technology also restricts the use of some tourists to a certain extent. For example, the elderly are inconvenient to use smart facilities such as scanning codes on mobile phones and paying attention to public accounts. Therefore, the introduction of a smart system requires that it is convenient to use and can meet the needs of most people. For example, "scanning the face" can be used instead of "scanning the code", so as to resolve the sense of distance between the high-tech and the elderly, so that they can also participate in it. For people with different needs, differentiated strategies are adopted to achieve the participation of the whole people.

5.4 Improve Ecological Benefits and Realize Smart Ecology

The smart ecology in urban parks can start from the construction of a complete urban landscape ecological pattern, emphasizing the integrity of ecological elements in urban
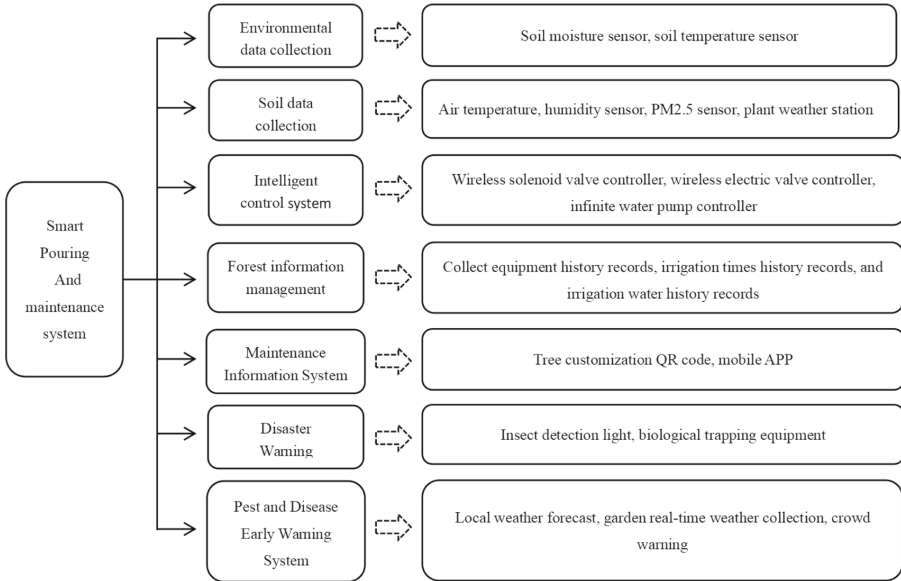
Fig. 9. Smart watering and maintenance system.

space, on the one hand, retaining special plaques, building a rich type of habitat, and integrating crushed plaques on the other hand, building a green ecological environmentEssenceFor example, a water storage equipment is buried underground in the underground of G-PARK Haidian Science and Technology Park. By using the water-seepage paving material, let the water go down naturally and then give back to the park to meet the irrigation and interactive water of the entire park.At the same time, considering the biological diversity in the park, the use of water and green space to shape biological habitats can be managed and protected in conjunction with infrared cameras.

Based on the analysis and feedback of intelligent monitoring systems such as intelligent control system and wireless network technology, the ecological environment can be directly and intelligently controlled, so as to achieve more precise management of green space in urban parks and improve the efficiency of park greening management (Fig. 9).

6   Conclusions

With the development of computer high-tech information technology and the renewal of smart cities, landscape innovation design methods have shown a new and diversified trend. This paper takes the green and diversified development method as the development goal of urban park landscape renewal through the intervention of smart landscape., using smart landscape as a means of development, through the combination of intelligent technology and urban park landscape, put forward new construction ideas in terms of technology, place, ecology and humanities, realize the renewal of urban park landscape, and further promote the development of smart city.

References

1. Qiao,Q.W., Hong,S., 2014. Innovating the construction and operation mode of smart city to realize sustainable development. WORLD TELECOM.
2. Liu, Y.R., 2021. Study on landscape design of liushaoyan wisdom Park in Deyang City.
3. Feng, X.L., 2016. On the construction and development of smart Park in the city. HEI-LONGJIANG SCIENCE AND TECHNOLOGY INFORMATION.
4. Yang, Y., Lin, S.H., 2018. Discussion on interactive experiential landscape design strategy. HEILONGJIANG AGRICULTURAL SCIENCES.
5. Huang, J.Q., 2021. Application of smart park system in urban park renovation.
6. Gao, B.L., Wang, Y.C., Zhang, L., 2020. From informatization to intelligence -- Practice and development trend of intelligent construction of urban parks. GARDENS.
7. Wei, F., 2018. Dynamic mixing in Landscape Design -- 2017 ASLA Student Award design award winning project. CHINESE GARDENS.