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Interactive Environment Design in Smart City

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Abstract. The interactive environment design of smart city is not just an interactive progress or interactive mode design, rather than generate an environment such as the "organic" life entity as human beings through interactive design, forming a smart environment with perception, memory, thinking, and reaction.

1. Introduction

The concept of wisdom earth promotes the rapid advance of smart urban construction, taking China for example, during the thirteenth Five-Year plan period, the Ministry of Housing and Urban-Rural Development of the People's Republic of China said it would invest more than 500 billion yuan of the smart cities' construction. Nowadays, the construction of smart city is centered on the use of information technology achievements in rapid development such as cloud computing, Internet of things, remote sensing technology and big data, energetically developing and operating the high and new technology in order to improve the organs and meridians of smart city continuously. But in order to make the smart city more plentiful, the urban environment is just like the muscle of smart city which cannot be ignored, and the activity of its muscle will affect the vitality of the smart city. To enhance the vitality of smart cities' environment is not just rely on the advanced science and technology, also needs the involvement of interaction design, thus, interactive environment design become the new horizon of smart city construction, we should extend the vision of smart city construction from the development and application of urban technology to the interactive environment design, and building a smart interactive environment with more intelligent, more convenient, and more attention to the human living experience.

The word "interaction" has appeared in the early 1980s, and its connotation was defined as the man-machine interaction, which means to realize the interaction and communication between human and machine and gain the operation and experience of comfort and convenience; as time goes on, the connotation of interaction extend to the product field, aiming at integrating the simply display, recognition, operation to the use process of daily product, making people effectively interact with product when using it, enhancing the experience and convenience of products use. Along with the advancement of the construction of wisdom earth and smart city, interactive environment will become a core element in the wisdom earth and smart city, the connotation of the word "interaction" will usher a higher level of exploration and redefined. In the context of wisdom earth and smart city, interaction has been extended from the interaction between human and machine, human and object to the interaction between human and environment, at this time, the interaction between human and machine, people and object are becoming the subsystem of interactive environment, the interactive environment



design become the ultimate goal of interaction design, which means to realize the interaction between human, object, environment at the same time; in the interaction environment of smart city, the interaction changes from the past one-to-one interaction between human and object to all kinds of required free interaction and free interactive switch such as people and people, people and object, people and environment, object and environment, single for multi-object, many people for multi-object, many people for single object and so on; the interactive environment enables the information in different environments' circumstances to be transmitted or used efficiently and rapidly in the interaction of real time, long distance, and boundless, finally promoting the wisdom of the city.

The leader of the global research of city modeling, Dr Michael Batty in the London university, had demonstrated that: "Because (the past researchers) regarded the city as a closed system from top to bottom, and ignored a wider range of the external environment effect." Although information network, the Internet of things, cloud computing, big data, 3 s technology and other high and new technology are developing constantly, the technical problems to build smart city construction are solved, but the result that only applied technology to the smart city construction is mechanical and cold, the city construction is not just a closed architecture, what the today's people really lack is more open, remote, humanize, intelligent interactive environment. In this social overall environment which enveloped by the increasingly mature Internet of things, there are many potential and remote relations between people, object, and environment, people gain more convenient and comfortable life under the overall environment through the space system directly formed by Internet and Internet of things, therefore, in addition to the high and new technology condition needs by the smart environment construction, the importance of interaction environment design is crucial. And the interactive environment design of smart city will be discussed in two aspects.

2. The interaction environment design strategy of smart city

2.1. Functional integration and linked interaction design of interactive environment.

In urban life, different environments are defined by different functional values they carried. In the construction of smart city, we should avoid the single function design of environment and think more about the environment of a main function, or multi-main function to integrate more possible auxiliary function, alleviate the contradiction between supply and demand of environment resource, make more and greater function value with the limited environment resource during the environmental function design. On the basis of environmental functional integration design, integrating capabilities to the environment and forming the linkage and switch between the function, meeting the changed demand of environment user freely and intelligently through the interaction design, when a function of the integrated environment is destroyed or not working properly, the other functions will work as usual. The environment function linked with interactive design is not only to meet the interconnection between the integrate function in the environment, but also to meet functional interconnection between the environment and the environment.

2.2. The capillary network of the interactive environment and the bond and connect design of the smart cities' main meridian.

In order to realize the linkage interaction of integrated function in the interactive environment, we must make full use of the rational structural design of the capillary network in interactive environment proceeded by the modern communication network technology achievements, and carry out the bond and connect design with the main meridian of smart city, finally realize the interconnectivity.

2.3. Interaction port and interface design of interactive environment.

The interaction port of interactive environment is just like the sensory organ of smart city, it transmits to the urban central system to generate intelligent responses through the neural networks of information high and new technologies when accept the interactive stimulus. The demand for human beings' survival activities in urban environments is changing, and the need for environment varies

from person to person, the smart city maximize the need for people to interact with the environment, thus, the design of interaction port is particularly important, interactive port's design such as location distribution, quantity, morphological shapes, alignment with environment, matching with city culture and economy, shaping of urban personality cannot ignore, meanwhile, the effective design of interaction port will meet the demand of interactive release and collect of information in early time, interactive operation during the demand process, post-demand interactions' summarize and sharing. Interface design of Interaction port will enhance the interaction experience and interaction efficiency effectively through the optimize design of interface personality, visual icon, and operation mode.

3. The interaction environment design goal of smart city

3.1. Environmental protective interaction design

With the industrialization of the city, the rapid growth of population, the expanding size, etc., the urban environment problem is increasingly prominent, environmental hazard and its control become a global event, one of the key goals of the smart city's interaction environment design is to solve environmental problems and eliminate environmental hazards. Interactive environment design aim for environmental protection, to realize the real-time, uninterrupted, all-dimensional interaction between environmental management and environment through the reasonable organization of information communication technology and the high and new science technology achievements, thus monitoring the environmental problem, checking the environmental hazard, or adjusting the environmental protect policy.

3.2. Environment self-regulation, repair interaction design.

The interaction design of urban environment is different from the product interaction design, the goal of product interaction design is to satisfy the functional interaction between the people and objects, and the interaction is intelligent, but the significant goal of environment interaction design in smart city is on the basis of satisfying the interaction between people and environment, and finally realizing the intelligent self-regulation and self-healing of environment, thus, the design of interactive environment is more advanced than the level of product interaction design, and the interaction is more intelligent. Environmental self-regulation, repair interaction design carried out in two aspects: ecological environment and artificial environment, start to preset it's interaction demand from the many function for people survive in urban environment (e.g., about the daily life of people, work, material and spiritual, etc) as well as the existing problems and hidden hazards (such as air quality, traffic safety, water pollution, noise nuisance, environmental risk, environmental ecology, etc.), combining with all kinds of new high-tech technology, designing and creating a large intelligent perception and intelligent regulation system similar to the virtual reality network architecture of the Internet of things, in all kinds of interactions between people, objects and the environment, the environmental wisdom self-regulation satisfying various functions for people living in the urban environment, the wisdom self-regulation of environment realizing the sustainable development of itself, at the same time, the wise perception system gaining data information to generate environmental body functions from each kinds of interaction between people, objects, the environment, intelligently sensing its own development problems and the hidden danger, wisely regulate service function and interactive mode, and gradually breeding environment own repair function. This may seem like a fantasy, but it must be the goal of human design efforts.

3.3. The interaction design with leisure existence.

The smart city is not only make the city more high-tech, more intelligent, we don't need a cold mechanical urban environment, in addition to improve urban people's sensation and interactive experience, it's more important for citizens to leisurely live in the interaction of people and environment, and enhance people's happiness. Interaction environment design taking people demand satisfaction and optimize interaction mode between people, objects, the environment as one of the

target, acutely dialyzing people interaction demand with the object and the environment in present and future in develop perspective , and designing an optimized interactive environment space for people, changing the present status of indoor and outdoor environmental space design that only focus on the green, the single function, the lack of interaction. In holography era, people research, develop and integrate the powerful intelligent technology to realize their own "leisure living", and the "leisure living" design of urban interactive environment will create more opportunities for the constant development between people, city, and environment.

3.4. Low cost, high quality, high efficiency, sustainable interaction design.

Wisdom interactive environment design, should be emphasized on realizing low cost, high quality, high efficiency, sustainable interaction design and solving multi-aspect, all-visual interaction requirements and environmental concerns, putting people in the environment to make it able to feel the environment directly and get convenience with the blending of environment, which means directly changing the function of the environment and it's service condition according to person's own demand, also facilitating the management of environment and development environment in the interaction with people and the environment.

4. Conclusion

Smart city's interaction environment design is not just a design of interactive progress or interactive mode, rather than generate an environment such as the "organic" life entity as human beings through interactive design and form an intelligent environment with perception, memory, thinking, and reaction. The design of intelligent environment has a long way to go!

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