Application of VR Agriculture Interaction Animation in Integrated Services of Smart City

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Abstract: Smart city is the trend and direction of developing the cities in our country. Based on Virtual Reality Technology, VR agricultural interaction animation takes the advantages to centralize the information, visualize the surfaces and simplify operation. With an introduction of the opportunity and methods to combine smart cities with VRA agricultural interaction animation, the paper presents the application range, current research status as well as future development of VR agricultural interaction animation’s application in providing integrated services in smart cities.

Key words: VR; agricultural interaction animation; 3D space; smart city; integrated services

Introduction

With advanced information technology, smart cities manage to achieve intelligent management and run control to create better conditions for urban dwellers to live and carry out production activities, promoting harmonious and sustainable development of the cities. It is the trend and direction of developing cities in future. VR agricultural interactive animation, based on virtual reality technology, uses three-dimension software to establish models of agriculture in reality or design scheme to reconstruct the real status of scenarios in computer and implement the mutual operation between users and the scenarios with technological support of interaction engine, taking the advantages of intuitive surface, simple operation, information centralized and etc. Organic combination of these two will definitely bring whole new service experience to the development and establishment of smart cities in China, providing good chances to comprehensively improve the conditions of related industries.

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1. Emerging background and current development status of smart city

In 2009, IBM started to promote the idea of smart earth, proposed the theme to “lighten the smart earth, build the smart China”, put forward the strategy to “make breakthrough in building smart cities in China”, causing widespread attention and concern. On August 7th, 2009, when Premier Wen Jiabao visited Wuxi and proposed to “accelerate to set up Chinese Experience China Center”, Internet of Things was listed as one of the five emerging strategic industries written into the government work report, pushing the development of smart cities in China. In November same year, Premier Wen Jiabao conducted a presentation “Use technology to lead Chinese sustainable development”, attaching great importance to instruction to make breakthrough in sensor networks and key technology of Internet of things to deploy technology R&D for post IP era at an early date, making the information network the key assistance to promote industry updating and speeding up progress towards the information society of mankind.

Up to now, domestic typical works studying on smart cities include: Smart City, Smart City opens the Future Life: Scientific Planning, The Road of Smart City: Scientific Governance and City Characteristics and so on, exploring the development of education, people’s livelihood, transportation and etc. based on smart cities. Living in smart cities, urban dwellers will get to fully enjoy individualized services on public service platforms provided by smart transportation, smart grid, smart medical, smart education, smart city management, smart emergency and other application system, living a life that is safer and more comfortable.

2. Insertion points to apply VR agricultural interaction animation in the establishment of smart cities

When it comes to the characteristics of smart cities, opinions in Smart City in China by IBM has been widely recognized in country, as far as which is concern, smart cities are featured by all-round instrumentation, fully integration, promotion of innovation, and collaborative operation. In other words, a smart city is an organic product of digital city, Internet of Things, cloud computing and other advanced technology.

If a digital city can be compared to a servant that takes alert thinking, then super computing center and cloud computing center are the equals of his cerebrum and cerebellum to store, analyze, process and integrate massive data and information. 3G, 4G, WIFI, WLAN and other communication networks are the equal of his nerve endings, Internet is his meridian; Internet of things, sensor networks and sensors are equals of his other sensory organs. All these parts will take the digital city, the body of the smart city, as the carrier, to complete all data integration, information flowing and functional operation. Without this “body”, like a heap of loose sand in complete disorder, all information and data won’t be integrated efficiently to make contribution to mankind, not to mention to form any thoughts and wisdom.

Digital city is a seamless information model covering the whole city. It can be said that the city we live in is a copy in the digital city. Collecting all chaotic information in city and organizing these information orderly in
accordance with geographic coordinates, can not only present correlations of all kinds of information about the nature, humanity, society and so on but also help people to retrieval and use this information. With the creation of the conditions for the development of smart traffic, grid management, location based services, urban public safety emergency response, etc., it has been a significant way to achieve harmonious development of city in information age.

Today, the concept of digital city has become much different from that of ten years ago. It is now an all-round urban information service system rather than a Geo-system application. The popularity of Internet has brought numerous opportunity to information services, speeding up the concept changing, thus, the digital city is gradually enlarged to be an all-round information service for the whole city. Its development has also become one task of the government.

This major premise provides good opportunity and development space to apply VR agricultural interaction animation technology to the establishment of smart city.

Currently, the development of Virtual Reality has already entered into mature period, greatly pushing the information digitization. Using three-dimension software to establish model of architecture scene to present overall model of the scene on the computer and realize mutual interaction between users and virtual scene with the support of related technology like the engine technology can finally achieve the advantages of centralized information, visualized surface, simplified operation and so on.

With the addition of VR technology, architectural vague cartoon in tradition has developed into VR architectural interaction animation in modern time. With different VR equipment, such as VR glasses, handles and so on, visitors can observe the architectural scenes in different distances from all-round perspectives with different fineness, in a way of dynamic interaction, in specific virtual three-dimension environment. Besides, the visitors can also choose their own roaming mode, like walking, driving and etc, and even control their visiting route freely. With the support of the engine, multi-programme and multi-environment real time switches during visitors’ roaming can also be implemented, bringing all visitors realistic audio-visual senses impact and creating an immersive experience.

Precise, highly efficient and intelligent operation of city is the goal of smart city, the implementation of which involves the interactions among different individuals, enterprises, organizations and governments as well as the interaction between the real world and digital world. All these interactions will be the opportunities to improve the efficiency and productivity. Given the features of VR agricultural interaction animation, this technology will have its platform to develop and perform well in urban dwelling service system and security service system built by smart city.

The following is the analysis of its application in different field of architecture services in smart city. Some existing typical cases have also been presented.
3. Specific applications of VR architectural interaction animation technology in smart city and analysis of relative cases

Applications that current smart city can carry out can be summarized into four service systems: 1. urban economy continuously running service; 2. urban dwelling services; 3. urban security services; 4. environment supervising services, in which, urban economy continuously running service and environment supervising services mainly develop related service system from the perspective of integrated application, whereas urban dwelling service and urban security services mainly start with service points of multiple specific projects, most of which can adopt VR architecture interaction animation technology to build the model and provide better service by allowing visitors’ to participate in. Therefore, intelligent traffic and smart personal application in urban dwelling service system will be two best breakthrough points to apply VR architecture interaction animation technology to the development of smart city.

3.1. Application of VR architecture interaction animation technology in intelligent traffic

With sensors among urban transportation infrastructures, intelligent traffic collects all information about vehicle flowrate, road conditions, weather, temperature, traffic and traffic accidents of the whole city in real time, to ensure information exchange between people and vehicles, roads as well as environments, and calculate dynamically the optimal traffic controlling schemes and the best vehicle route through cloud computing center to further improve the efficiency, mobility, security, accessibility and economical efficiency of transportation system. This will change the drivers’ driving routing selection mode in which the major basis are their own experiences and their subjective judgement on road conditions, achieving the most efficiency of utilization of road resources thus to ease road paralysis caused by unnecessary traffic jams.

In this system, VR architecture interaction animation technology can be applied to urban road conditions and neighboring environments query-system. With establishment of model and application of scene interaction, achieve realistic experience and implement real-time multi-environment switches, to materialize massive data to present intuitively the road condition and neighboring environments, to help them choose the travel mode and route more accurately, thus to effectively alleviate traffic burden at peak times, reduce the driving time and decrease accidents rates, the consumption of energy as well as pollution consumption.

3.2. Application of VR architecture interaction animation technology in intelligent personal application

After the construction of infrastructures in smart city is perfected, people, no matter they are indoor or outdoor, use mobile computers or other intelligence equipments, can get all services they want through Internet of things, cooperate with other team members and share their information with their families at any time. Every urban dweller will be able to enjoy all convenient services whenever and wherever they like. 
This is main application range of VR architecture interaction animation. With its advantages, the developers can develop all kind of service platforms, software, App and etc. taking VR architecture interaction animation as their subjective expression form. Currently, the applications of VR architecture interaction animation technology mainly covers several application types as following:

**1. Virtual interactive scenes roaming experience**

Virtual interactive scenes roaming experience is the core value of VR architecture interactive animation technology. In this field, many development directions can be found, for example, construction of virtual campus, development of interactive scenery roaming animation, interactive display of building materials products, interactive platform to display indoor design and so on. At present, the construction of virtual campus, development of interactive scenery roaming animation and so on has been developed well and applied widely.

The development of virtual campus, started at relatively early time, can be regarded as a more mature project. Many colleges and universities are conducting the research on this project and some concrete results have been achieved. In an successful case done by Shanghai Ocean University, smart campus design by students and teachers in this university have two main functions: first, it allows people in campus to easily stimulate the campus environment on the computer to get themselves familiar with the topography as well as the buildings in campus. Second, it can be used as a tool to do public promotion and advertisements, allowing visitors or people wanting to learn about the school to feel the campus environment in a more direct and realistic way.

As for interactive scenery roaming animation, representative cases have been show as following:

- **Connecting-island bridge Panorama Walk-through System by Zhoushan city.** With technology of computer network and three-dimension virtual reality, the project develops Connecting-island bridge Panorama Walk-through System, fully enhancing the publicity of Zhoushan and promoting the development of economy in Zhoushan. In this project, related software are used to establish Zhoushan Connecting-island bridge Panorama Walk-through System, which then will be displayed to the public through network, thus to further enhancing the city charm. Meanwhile, display technology of Connecting-island bridge Panorama Walk-through System can also be widely applied to produce Panorama Walk-through System of other scenic spots in Zhoushan, accelerating the development and utilization of tourism resources, improving the service quality thus to promote the overall development of the whole cultural development.

- **An examples of landscape animation, Jiufeng National Forest Park landscape animation by Animation Laboratory, School of Information, Beijing Forestry University.** Based on fundamental concepts and theories of computer animation and architecture animation, the project follows basic flows of design and production of architecture animation design and uses VR architecture interaction animation technology to present the scenery in Jiufeng
National Forest Park in form of three-dimension interaction animation, realistically.

Interactive displaying of building materials products and interactive platform to display indoor design are the newest research orientation. All parties have invested a considerable amount of research sources into these two field, believing there will be some representatives application coming out to make contribution to the society.

2. Restore cultural scenes of archaeological sites

Traditional way to restore the scene of archaeological site is to draw stratigraphic section, demanding a high level of data collection and judgement, as well as excavator’s techniques and experiences, thus, some important scene can not be restored due to limitation of the method. VR architecture interaction animation technology, through 3D-modeling, can have the site scenes rebuilt, making up for the shortcomings of data collection to some certain extent.

During restoring Daming Palace Cultural Site, experts rationally sketches out the cultural scene, uses 3D technology to build the model of the scene, then conduct interaction development with VR technology, managing to create the scene of the ancients’ houses, lives and sacrifices, contributing a lot to Archaeological research and historical reduction.

3. Establishment of traffic navigation system

With constantly increasing private cars and booming of self-driving travelling and trip platforms, demand for traffic navigation is also rising unceasingly. Traditional navigation mainly uses two-dimension maps to display the traffic information, leading much inconvenience in both vision intuitive quality and interaction acceptance. Accidents of route error or detour can be seen everywhere due to people’s failing to understand the navigation identification. VR architecture interaction animation technology can restore the scene by building three-dimensional model, providing the users with information about the road conditions and neighboring environments in a more intuitive and realistic way, allow people to have a more clear idea of their position so that they can choose their route more quickly and more accurately, effectively reducing the problems of route error and detour caused by map misidentification and decreasing the driving time, consumption of energy and automobile pollution. But due to the problems that 3D-modeling requires a vast amount of data and animation scene displaying consumes quite a memory, currently, the real integration of VR architecture interaction animation into navigation system still requires further experimental research.

4. Production of Recreational Game

Game Entertainments has always been the home area of VR technology, in which VR architecture interaction animation has put in a mature performance. Various recreational games, labyrinth Game with astonishing effect have become a part of people’s daily entertainment life.

Conclusion

Seen from the analysis above, with continuously development of service system of smart city and increasing demand of urban dwellers’, needs for related auxiliary tools also keeps rising. Therefore, the prospect of
development of VR architecture interaction animation technology in intelligent traffic and smart personal application is very broad. Applications achieved should be kept improving in accordance with the demand of users. In those potential field without any real achievements, the markets deserve our exploration. With our efforts, VR architecture interaction animation technology will bring better service experience to service system in smart city.

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