The Application of Virtual Reality Technology to Digital Tourism Systems

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***Abstract* —Tourism is a new growth point of national economy, information technology leads social development, the combination of the two not only has important social significance, but also has a huge commercial potential. Virtual reality technology application to digital tourism systems is based on actual tourism landscape, aiming to use virtual reality technology to simulate and create surreal scenes and build a three-dimensional virtual tourism environment. Without leaving home, virtual tourists can be in 3-D virtual environment to enjoy the scenic beauty thousands of miles away, images are clear, detailed and vivid. In this paper, digital tourism systems are analyzed, and the overall design, from the perspective of virtual reality technology application and travel information, is discussed to provide some technical solutions, and to promote the development of traditional tourism.**

Keyword -- Virtual Reality; Digital Tourism System; 3D Modeling; Image Modeling

I. INTRODUCTION

Today's society, the pace of life, work efficiency, people's lives more and more nervous. Living conditions are getting better and better, but less and less time for themselves. On the one hand people want from work to relax the tension boring freed, of course, the best way is to travel [1]. On the other hand, social reality and so people do not have enough time to leave their environment to live and work where they want to go, otherwise you will pay the price unbearable. Thus, due to the characteristics of social development would lead to people's lives there is a conflict [2].

VR (Virtual Reality), referred to VR technology, which uses a three-dimensional computer-generated virtual world, simulate people's visual, auditory, tactile and other senses can feel things, scenes, allowing users as proximity to reality. The technology integration of computer graphics (CG) technology, computer simulation technology, artificial intelligence, sensor technology, display technology latest developments, network parallel processing technology, is generated by a high-technology computer aided simulation system [3-4]. In recent years, with the development of computer hardware and software technology, and there is growing recognition of the important role of virtual reality, virtual technology in all walks of life have been different levels of development. The dynamic programming of virtual reality technology to the field of tourism propaganda show, tourist attractions, online virtual tours, etc., can get good results.

II. ANALYSIS OF THE VIRTUAL REALITY CHARACTERISTICS

Traditional industrial product is no longer map the performance of technologies to meet the current needs of design, product design and virtual reality technology based on the expression of the most authentic products and to give a complete vision, an expression display realistic auditory and olfactory Expression of experience in product design, and more mature [2].

Virtual reality technology is the use of computer technology for complex data visualization, a new way to interact. It is simulated by computer software and hardware and sensor applications a 3D virtual world, to provide users with a visual sensory experience, hearing, smell, or even like. Users can "enter" the practice to a virtual environment, virtual reality technology to simulate the real experience of real effects on the body, function, allowing users as their general instructions, free viewing various angles of things to achieve different functions of the process [5-6].

Virtual reality technology three basic characteristics: immersion, interaction and imagination to fully reflect the characteristics of virtual reality technology [7]. Interactive course, if you want to immerse participants interact in virtual reality and Production Association, you must use a computer to create a realistic three-dimensional virtual model, then by a computer program control between "People" and "virtual", so that the participants on the basis of experience, a sense of reality, such as vision, hearing, smell, enable the participants to produce a corresponding association. Virtual reality features shown in Figure 1:

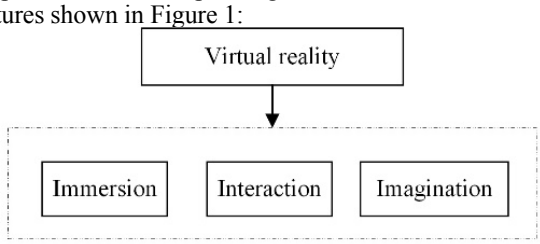

Figure 1. Characteristics of virtual reality.

Immersion. It refers to the user feel full exposure to the same virtual world, the virtual world is surrounded.

Immersive virtual system stems from the perception of the real world more, including our common visual perception, tactile perception, motion perception, taste perception, olfactory perception and the body feels like. Due to the limitations of current technology, virtual reality systems, the visual immersion, immersive aural, tactile immersion and application of research immersion smell relatively mature, but the taste perception of immersion and other technologies are under study, premature.

Interactivity. Users interact with the virtual world by means of virtual reality system special hardware devices (such as head-mounted displays, data gloves, etc.), a natural way to interact. In the system, the user can control various parameters of objects directly, such as: direction, speed, and the system can also be feedback to the user, such as: driving simulation system, the two vehicles collided, the user will feel the tremor, car jitter. Past the uneven road, the car bumps. This interaction generated in real time and the same perception in the real world, even the users themselves are aware of the existence of the computer.

Conceivability. It is a virtual environment is a human imagination, but this reflects the imagination of the designers thought appropriate, which can be used to achieve a moving target. So virtual reality technology is not just a media or an advanced user interface, it also can also solve engineering problems, medical issues, military issues, tourism issues, urban planning, etc. designed by the developer of the corresponding software, it is usually in the form of exaggerated reflection of the designer's ideas.

III. Related Virtual Reality Technology

Virtual reality technology is a set of computer technology, sensor and measurement technology, simulation technology, microelectronic technology, integrated high-tech one involves many disciplines. In the virtual environment, the virtual object is subject, by modeling a virtual representation. The key of the virtual object is the main condition 3D virtual scene modeling, and user experience of 3 d interaction flow. In general, the virtual objects in the scene modeling methods include: geometric modeling, image modeling [8-9].

Geometric modeling. Geometric modeling is the basis of virtual reality modeling technology. Virtual Environment geometric modeling is the object representation of geometric information, involving data structures representing geometric information related to the construction and manipulation of the data structure algorithms. Every object in the virtual environment contains both shape and appearance. Shape of the object by the structure of the object individual polygons, triangles and vertices and so on to determine the appearance of the object by the surface texture, color, light and other factors to determine [10]. Therefore, the model file is used to store the virtual environment geometric model should be able to provide the above information. At the same time, but also to meet the virtual modeling of three commonly used indicators (interactive display capabilities, interactive manipulation capability and ease of construction capacity) of the virtual object model requirements, a case is shown in Figure 2.

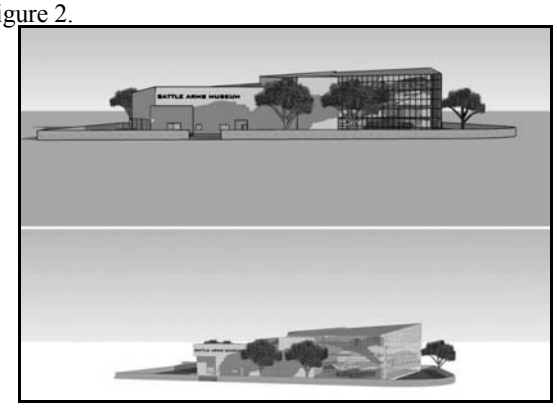

Figure 2. Case study for geometric modeling.

Geometric modeling can be further divided into hierarchical modeling approach and the owner of the modeling method.

(1) Level modeling approach: the use of a tree structure to represent the various components of the object, to describe the motion of inheritance more favorable. For example: the arm can be described by a hierarchical structure composed of the shoulder, arm, elbow, forearm, wrist, hand, fingers, etc., and each finger can be further subdivided into the thumb, index finger, middle finger, ring finger and little finger. In a hierarchical model, sports a high-level member is bound to change the spatial position of the lower-level components, such as: wrist rotation is bound to change hands, each finger position, rotation is bound to change the position of the arm elbow, wrist, hand, etc., and the rotation of the shoulder joint is bound to affect the position of the arm, wrist and arm like.

(2) The owner of the modeling method: make the same kind of objects have the same owner, it is a master class contains a detailed structure of the object. When you want to create an instance of an owner's, just copy the pointer to point to the owner. Each object instance is an independent node has its own independent orientation transformation matrix. Modeling with wooden chair, for example, four wooden chairs bench legs have the same structure, we can build a stool leg owner, every time you need stool legs instance, simply create a stool leg pointing pointer of the owner. Through independent orientation transformation matrix, you can get the orientation of each leg of the stool. The advantage of this is simple and efficient, easy to modify, and good consistency.

Image Modeling. Image-based virtual scene, also known as virtual reality space. Virtual reality space is discrete continuous video images captured by a camera or a video camera as a basis for data collection, generating a panoramic image after image processing and its spatial association to establish a virtual environment with spatial manipulation capabilities. A case is shown in Figure 3.

Image-based modeling and rendering techniques:

1) Method based on stereo vision. Stereoscopic view based synthesis methods mainly using stereo vision technology from the known reference image synthesized from the ideal image new viewpoint. The key issue is to find correspondence between each pair of known images, which is to solve the stereo matching problem.

2) Method based on the view interpolation and deformation. Require new viewpoint located on a straight line two with reference to FIG viewpoint of the decision, a new view by reference to FIG linear interpolation method for generating a view based on interpolation. Of course, if there are a lot of pieces with reference to FIG interpolation can also be obtained through a series of arbitrary viewpoint images.

3) Method based on the image side. What have a good stack of multiple image combination of the same scene into one large image processing is called a split. Image mosaic technique is used to generate, image stabilization panorama, and increase the image resolution, image compression and video extension and so on.

4) The method based on a hierarchical representation. It is a video series for the 3D scene into motion a separate, different levels described by the affine motion model, each layer produces a 2D image stream and a 2D transform stream, and eventually incorporated into the display screen.

5) The method based on the full visual function. It is based IBMR try to capture the full visual function completely arbitrary optical flow space within the region. This method reconstruct a continuous function from the all-seeing to some discrete samples, and then in the new viewpoint position resample this function to draw a new view.

Figure 3. Case study for image modeling.

Application process. In this paper, a new build process, structural optimization, structural optimization, site optimization of the entire modeling process, and separately, and scheduling system in the field, each time reducing the huge data processing, short treatment data, real-time scheduling system to improve the site ĥ?? By applying improved algorithms, improve scene entities (such as trees, buildings, etc.) the accuracy and speed of the display, so that the whole scene look more realistic, real-time and interactive, to achieve the desired effect. The system's development goals, the system shown in Figure 4.

3d model creation module is the foundation of the whole system, including geometric modeling and physical modeling. Model parameter optimization module, data model, optimized data access code. Parameter optimization model data module, extraction system given 3d file 3d data. Displays a list of control and generation module, the design of a scene based on user needs to display a list, based on the system size scene, composition and hierarchy, control the display range in the form of an integer index list displays a list of the index tree. Model library module, after the display list 3d model department according to the site's database, set the document. Model optimal combination: according to the actual needs of the actual structure of the model, as well as system optimization parameter extraction and model libraries and lists key information display, combinatorial optimization model. External reference model, introduced from outside the system changes in some form or the form of a relatively less volatile rules that require relatively modest level of detail of the model. Special effects technology modules for implementing special effects scenes. Interactive control module, the user information based on 3d entities to determine the position and angle. Real-time rendering module, optimize integration scenario model.

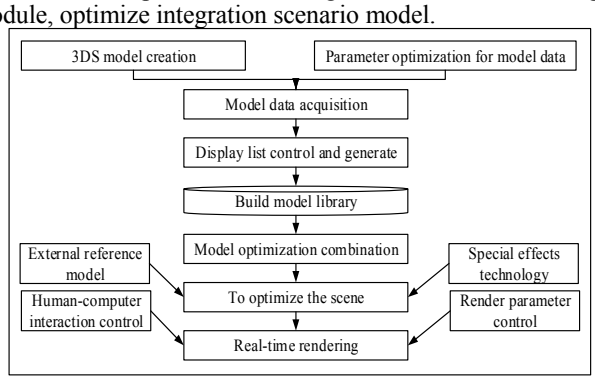

Figure 4. The application of 3D modeling technology in virtual reality.

IV. THE APPLICATION OF VIRTUAL REALITY IN DIGITAL TOURISM SYSTEM

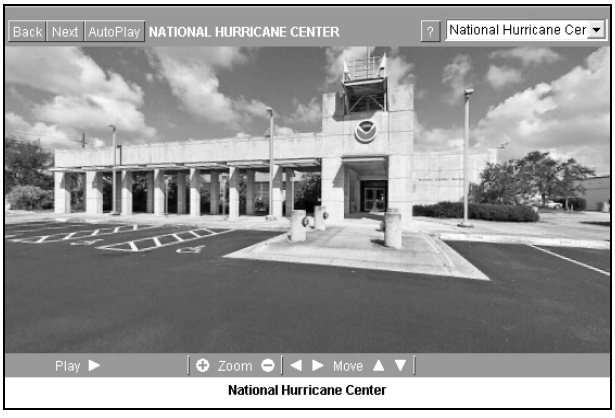

Figure 5. Application case based on virtual reality.

Tourist information technology is developing rapidly, but the construction of tourist information, there are still many to be the perfect place. The current tourist information products tend to provide only for travel subject, object and query functions publish their own property characteristic information, and rarely intuitive publish information on its spatial characteristics and the relationship between spatial information query and analysis, cannot let tourist destinations and intuitive user generated, image understanding. Especially for tourist attractions, travel services such as hotels, publicize hotel service environment most are still stuck in the use of static images and text stage, there is no continuous display of the virtual space, the lack of realism and interactivity. In fact, space acquisition, management, analysis and presentation of information is the tourist information essential component. Currently, virtual reality technology is becoming more mature. This technique can be intuitive and image display tourist destination environment, the landscape, so that people on an intuitive understanding of the formation of a tourist destination, to achieve good publicity, more attractive to tourists. Therefore, the virtual reality technology will become an important part of tourism information. The virtual reality technology and network technology can achieve online virtual tour. Virtual tour is to use virtual reality technology to simulate real-world scenarios, allowing users to obtain a continuous spatial information and be able to interact with the virtual environment. Virtual tour is based on object model library and database, through virtual reality technology to implement interactive tools, which includes building simulation, simulation scenery, and simulation services. An application case is shown in Figure 5.

The virtual reality technology and Java technology, and Web database technologies combined can achieve a virtual tour on the Internet. Virtual tour is divided into virtual scene to build tourism and travel virtual scene roaming in two parts, shown in Figure 6.

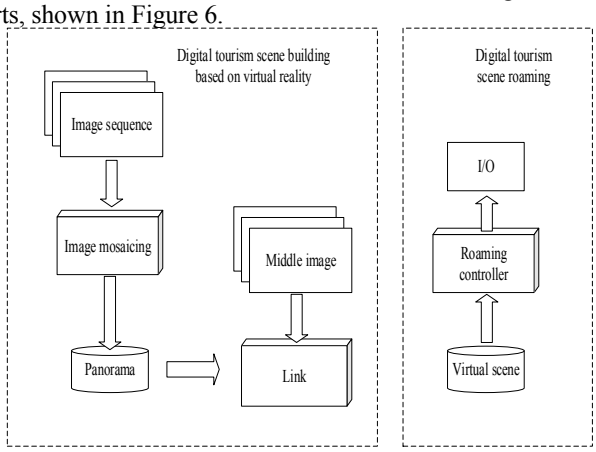

Figure 6. The digital tourism system model based on virtual reality.

Tourism enterprises will be collected according to the requirements of the original input image sequence to the system, using a stitching algorithm proposed earlier in this article were generated cylindrical panoramic image stitching process, re-establishing links in accordance with the positional relationship between the respective panorama viewpoint in space, and insert An intermediate image, thereby generating tourism virtual scene. Roaming controller uses Java Applet to realize that it can be scheduled based on the user's instruction to the virtual scene in panorama, and can be embedded in Web pages, so that users can make a virtual tour on the Internet.

V. CONCLUSION

Virtual reality technology in tourism is in its infancy, there are many shortcomings, but there is a huge potential for development. Virtual tours, although will not completely replace real tourism, need improvement of technology and more in-depth study to bring it closer to real tourism. Virtual tourism is a useful complement to traditional tourist but missing in terms of market direction. It is not only to meet some of the loss due to special reasons tourism market, but also through its own technological advantages, good promotion of traditional tourism and traditional tourism industry to provide better supporting role. With virtual reality technology maturing, research about into virtual tour drawbacks, such as concept definition not being uniform, the lack of systematic theoretical system, less innovation, virtual tour case study can combine theory and practice to deal with various issues until they are gradually resolved. Meanwhile, with the development of virtual reality technology and as tourism mature, we believe that a combination of both would be more reasonable and effective, to better meet the needs of tourists, and thus related research will need to mature.

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