

## Research on Virtual Reality Roaming System Based on Artificial Intelligence Technology

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**Abstract:** in Recent Years, the Research and Application of Virtual Reality Technology Have Developed Rapidly. It is a New Technology Involving Computer Graphics, Artificial Intelligence, Multimedia Technology, Human-Computer Interface Technology and Many Other Fields, and Has Broad Application Prospects. in This Paper, Stereoscopic Image Technology and Virtual Roaming Technology Are Integrated and Realized in Mobile Terminals, Which Exactly Accords with the Above Characteristics of Mobile Virtual Reality Technology. under This Platform, a Function Module of Visual Editing Path and System Simulation to Enhance the Reality of the Scene Are Developed Focusing on the Custom Path Roaming Mode Commonly Used in Large Projection Surface Immersion Environment. When the Scene Model is Very Complex, the Real-Time and Accuracy of the Scene Display in the Virtual Roaming Process Become Irreconcilable Contradictions. At This Time, the Scene Model Management Becomes Very Necessary. the Technology Means of Product Design and Development Using Various Technology Types Such as Stereo Image Technology, Artificial Intelligence Technology and Virtual Reality Technology Can Also Be Called Mobile Virtual Reality Technology. At Present, Mobile Virtual Reality Technology Has Become a Cross Platform, Multi-Disciplinary, High Heat Technology Research Field.

### 1. Introduction

Virtual reality technology is a high-tech practical technology developed in the end of the 20th century and driven by applications involving many disciplines [1]. It uses computer and electronic technology to create realistic three-dimensional sensory environments such as sight, hearing, touch and so on, forming a virtual world. It integrates computer technology into real life to the greatest extent, so that computer technology is no longer only an auxiliary tool used for a certain job, and the power of computer technology is most humanized reflected in today's rapid development of science and technology. The application of three-dimensional image technology and virtual reality technology in various fields has been quite extensive, greatly enriching people's choice space in life, work, study and entertainment [2]. In the near future, people from all over the world may not have to go to the scene in person, but just have a good swim on the Internet. People can know the situation of cities and schools anytime and anywhere. The development of interactive virtual reality technology will be more closely linked with multimedia, network and database [3]. Immersion makes people feel that they really enter into the virtual space, and users will feel that they are fully integrated into the virtual reality. Interactivity is an important reason why the virtual reality system can attract users, so that users can really participate in the virtual reality and virtual objects for certain interaction [4]; virtual roaming technology is an important research of virtual reality technology One of the research directions is that a series of major changes in technology and methods caused by it are of great significance to the development of military, aerospace, architectural planning, business, scientific research and other fields.

## **2. Requirement Analysis of Mobile Virtual Roaming System Based on Artificial Intelligence Technology**

### **2.1 Functional Requirement Analysis**

The real world that people observe through their eyes is real and stereoscopic, and if the virtual roaming system wants to have a reliable sense of experience and immersion, it is also necessary to introduce stereoscopic image technology into the virtual roaming system to enable it to have stereoscopic display function. Virtual reality is an advanced computer user interface, which provides users with visual, auditory, tactile and other intuitive and natural means of real-time perception and interaction to maximize user convenience [5]. Use people's natural skills to inspect and operate objects in the virtual world and participate in events therein; At the same time, it provides visual and natural real-time perception such as sight, hearing and touch, and enables participants to “immerse” in the virtual environment. Therefore, the roaming system has three-dimensional display function, which can make the user's sense of reality be changed by the size, distance, rotation, scaling and other attributes of all objects in the scene, as if he were personally on the scene [6]. Therefore, as the eye of the observer, the position of the viewpoint, the direction and angle of the line of sight, and the next movement direction of the viewpoint have great influence on the roaming effect. This kind of experience is “immersion”, “invasion” or “telepresence”, that is, whole-heartedly entering, simply speaking, projection generated in the virtual world. The most ideal is to make it difficult for users to distinguish the true from the false, and even to make users feel more “true” than the true.

### **2.2 Non-Functional Requirement Analysis**

Based on its unique physiological characteristics, human beings have their own specific ways of perceiving and observing things. In the real world, people's eyes see the surrounding environment, things, people, etc. Virtual reality technology is developed on the basis of computer graphics, simulation technology, multimedia technology, sensor technology, artificial intelligence and other technologies, but it is not a simple combination of these related technologies [7]. According to the different objects applied by virtual reality, the function of virtual reality can be expressed in different forms, such as designing or conceiving a certain concept into visualization and operability to realize realistic field effects and achieve the purpose of cheap simulation training in any complex environment. However, as the performance of intelligent mobile devices has greatly improved, intelligent mobile terminals have gradually become a new platform for the integration of stereoscopic image technology and virtual reality technology. At the same time, mobile terminals have incomparable advantages, mobility and portability as electronic computers. In a virtual scene, there are usually multiple viewpoints. Even if the distance between viewpoints is very short, if you roam directly from one viewpoint to another, there will be obvious jumping feeling. Therefore, there must be a transition image for roaming between viewpoints [8]. Because virtual reality technology is currently used in some fields in a targeted way to solve some problems that are difficult to directly solve, it is not only necessary to understand the application requirements and knowledge of virtual reality technology, but also need rich imagination. Only in this way can the problem be solved creatively.

### **2.3 Requirement Analysis of Operation Environment**

You can choose Google Cardboard mobile virtual reality devices or other products developed based on the same principles. Just like the interaction between human and nature in reality, completely immersed in the virtual environment created by the computer refers to the characteristics of the virtual reality system different from the traditional three-dimensional animation. Users are no longer passively receiving the information given by the computer, but can use interactive input devices to manipulate virtual objects. Due to the fact that when the system is finally implemented, the program running terminal is put into the mobile virtual reality device and displayed in front of the user's eyes, the tablet device is not suitable for the operation of the system

due to its large size and weight. In order to ensure the smooth operation of the system, it is necessary to have a good gyroscope acceleration detection function for the operating equipment. As VR is a systematic technology, it does not only consider the problem from one aspect as a single technology, it needs all components as a whole to pursue the best overall performance of the system. Virtual reality system software is mainly to provide a development tool platform capable of developing virtual systems, to be able to receive information from various sensors, to be able to generate stereoscopic images, and to integrate various types of three-dimensional models and various CAD functions.

### 3. Design of Mobile Virtual Roaming System Based on Artificial Intelligence Technology

#### 3.1 System Design

Artificial Intelligence Technology Mobile Virtual Roaming System is a virtual roaming system designed and implemented based on geometric modeling technology. According to logical function division, the design of the system consists of two parts, the interface design of the roaming system and the scene design of the roaming system. On the one hand, it accepts the operation command from the user and applies it to the virtual environment; on the other hand, it feeds back the results generated after the operation to the user in various appropriate forms. For general three-dimensional roaming systems, customized path roaming is more common. Because, for ordinary users, only through the roaming of the customized path can the overall scene be effectively browsed better and more comprehensively. Interacting with the virtual environment created by the computer in a multi-dimensional way can enable participants to immerse themselves fully in the three-dimensional virtual environment created by the computer, create the feeling of being personally present, and integrate people with the environment. The interface design includes the design of welcome interface and interactive prompt interface. Scene design includes indoor scene design and outdoor scene design. The system design diagram is shown in Figure 1.

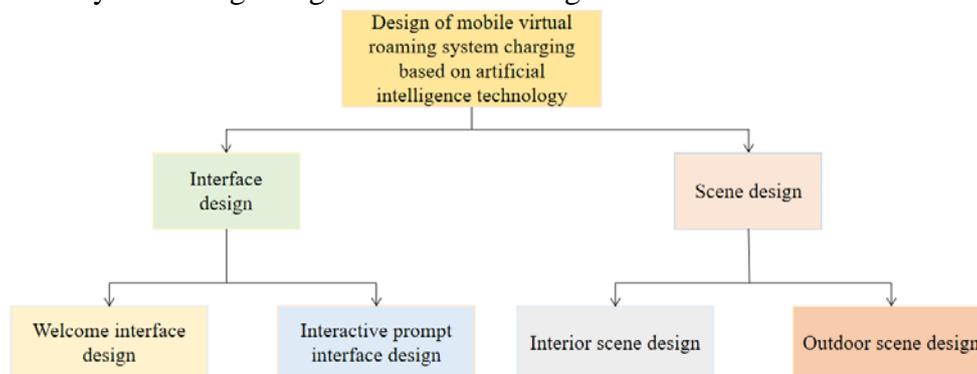


Fig.1 Schematic Diagram of System Design

The three-dimensional model is formed by connecting a series of three-dimensional coordinate points into many triangles, and the display of the three-dimensional model is also formed on the basis of the display of points and triangles. The following series of changes are required to display a three-dimensional coordinate point on the screen. Matrix multiplication is the most important method. In the interface design, the welcome interface will guide the user to enter the virtual roaming system correctly and prompt the user how to perform scene roaming and scene interaction. After the user is confirmed, he can enter the system for virtual experience. Use the keyboard to adjust the scene view. After the user has selected a good starting point, in order to make a clearer position selection, the scene view can be specifically adjusted by using the keyboard. Through the combination of virtual reality and qualitative and quantitative integrated environment, people are guided to deepen concepts and sprout new ideas to express their creativity. Other questions and requirements raised by observers must be explained with similar images or words, which is not intuitive and comprehensive in operation and has considerable limitations. However, the multimedia presentation program with virtual reality technology as its core does not require the

viewer to exert any imagination. The interactive prompt interface will prompt the user that the object can carry out relevant interactive operations when the user comes into contact with an interactive object in the scene. The schematic diagram of system interface design is shown in Figure 2.

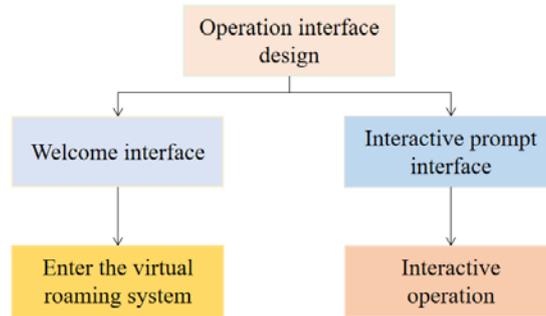


Fig.2 Schematic Diagram of Interface Design

### 3.2 The Choice of Design Platform

The design and development of each system need a technical platform with complete functions as a support, and the construction of artificial intelligence mobile virtual roaming system mainly involves two technical sections: the construction of roaming scene model and the realization of roaming system functions. This needs to be accomplished by the cooperation of a reliable 3D visualization production platform and a 3D interaction engine. In a virtual scene, the viewpoint is in a virtual scene, and the observation effect is similar to the projection effect of the projection light emitted by the viewpoint on the object in the virtual scene on an image board, which provides rich related classes, so that developers do not have to deal with complicated projection transformation and other issues too much. Although its efficiency is very high on the graphics hardware layer, it is rather complicated when dealing with complex problems. For example, every geometry must specify all its data one vertex after another. Unity3D can be used to easily create rich interactive contents such as 2D/3D games, real-time 3D animation, architectural visualization, virtual roaming, virtual display, etc. From the perspective of function realization, Unity3D integrates a variety of fully functional development modules to provide users with hierarchical development methods. The three-dimensional coordinate systems in the virtual scene are all right-handed systems. All scenes are in the world coordinate system, and the viewpoint and model can be regarded as a local coordinate system respectively. When roaming the scene, the observer thinks that he is advancing because the scene model is retreating. At the same time, the cross-platform deployment attribute of Unity3D is unmatched by other engines. Applications designed and developed through Unity3D can be released to Windows, Mac, Wii, Web, IOS, Android and other platforms, significantly improving the system's multi-platform support and integration capabilities.

### 3.3 The Interface Design of Mobile Virtual Roaming System Based on Artificial Intelligence Technolog

According to the principle of simplified interface design, the overall style of the operation interface of the mobile virtual roaming system based on artificial intelligence technology is mainly concise and clear. The welcome interface will automatically appear in front of the user after the roaming system is initialized to guide the user to enter the virtual roaming system correctly. In order to facilitate the development of three-dimensional graphics applications and to optimize graphics performance, the concept of scene graph was created. The scene database contains geometric figures to be represented and their state information. It is organized into hierarchical structures, called scene graphs. According to the acquired map information, a global plan is made, and the information of the surrounding local environment is continuously sensed during the traveling process, so that decisions are made autonomously, and the self-guided safe driving around obstacles to reach a specified target and perform predetermined actions and operations. In this roaming system, users are allowed to move to any position in any direction in the three-dimensional space,

and these behaviors are controlled by the mouse. When different mouse buttons are pressed, different types of movements will occur. In the welcome interface, the user will be prompted how to observe the environment in the roaming system, move through the handle and interact with each other. The prototype of the welcome interface is shown in Figure 3.

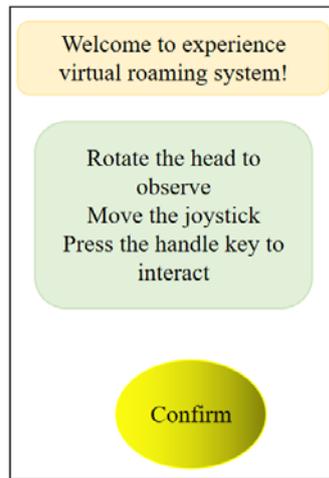


Fig.3 Welcome Interface Prototype Diagram

In the process of virtual roaming, you can zoom in or zoom out the model, and the parameters are the same. However, it is not commonly used to enlarge or reduce the model along one direction, and it does not meet the realistic requirements of virtual roaming. When we implement the system, the virtual human simulating such a roaming behavior is flying, can vertically ascend and descend, can move forward and backward, can look around, and can look up from top to bottom. The same virtual object will see different effects under different behaviors. The background of the central core part of the welcome interface is semi-transparent. Users can observe the back scene through the interface and guide the usage of the roaming system in the middle content box. In other words, the relationship between nodes in the scene graph has definite directionality, i.e. there is no ring in the scene graph from top to bottom and from left to right, otherwise it may cause infinite loop when traversing the scene graph. The viewpoint tracking method is to set the viewpoint outside the moving object and move along with the movement of the object, with the relative position of the viewpoint and the moving object unchanged. In the indoor roaming scene, the user's interactive goal is to find the key element to open the door and switch to the outdoor scene roaming. The interactive mode is that when staring at the interactive object, the visual center will automatically display a yellow light spot to prompt, and then press the handle key to interact.

#### 4. Conclusions

Artificial Intelligence Technology Mobile Virtual Roaming System follows the principles of advancement, practicability, immersion, portability and other principles to design and build a high-level and efficient virtual reality experience platform. In the development process, the author develops the common functional modules of virtual reality on the desktop system in parallel with the configuration of a large projection surface immersion environment based on two graphics workstations, which not only reduces the difficulty of development and debugging, but also takes into account the application of common desktop systems and has wider application value. Combining stereoscopic imaging technology with virtual roaming technology on Android mobile platform, relying on the Unity3D virtual reality engine and Google Cardboard for Unity3D SDK software development kit, and cooperating with relevant mobile virtual reality equipment, stereoscopic imaging and mobile portability of virtual roaming experience are realized. The function of the roaming system currently implemented is relatively simple. It only provides roaming of single user in three-dimensional space and query of model attributes, but it cannot satisfy multi-user and deeper interaction. How to exploit new functions and develop deeper applications on the

basis of 3D virtual roaming is also the next work to be done.

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