Implementation of attractions roaming system based on Unity 3D

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Abstract. Combining virtual reality technology with the tourism industry to design a virtual roaming system for scenic spots, it can provide users with a new way of traveling that can enjoy the scenery without leaving home. This article designed the attraction roaming system, first using 3ds Max to simulate the building model for Unity 3D call; secondly in Unity 3D, build roaming scenes, including editing terrain, adding sound effects. Role interaction is very important in a roaming system. In this system, by writing a C# script, the character can move forward, backward, left, and right to achieve autonomous roaming. In order to be more realistic when roaming, the collision function is also added; finally, based on the cross-platform of Unity 3D, the system is released for the PC side. The attraction roaming system designed in this paper enables users to enjoy scenic spots in the virtual world.

1. Introduction

Virtual Reality technology is referred to as VR technology. It is a new technology developed in many fields that integrates many disciplines. It is also a combination of various technologies, such as real-world environment modeling technology, interactive technology, display technology, real-time 3D computer graphics technology, etc[1]. With companies such as Microsoft, Google and Samsung launching their own series of virtual reality products, virtual reality technology has an increasing impact on people's lives. Applying virtual reality technology to the tourism industry can give users a better virtual travel experience.

From the current development of virtual reality technology, in the tourism industry, it is more used in tourism-related basic services to solve some problems existing in the current tourism industry and enhance the tourism experience. At this stage, it is only to solve the decision problems before the trip, such as the choice of attractions, hotel reservations, etc. With the VR 360-degree panoramic video display, users can experience it directly to make quick decisions. When VR hardware becomes powerful, it will reach the stage of mature online travel platform and truly realize online travel. For example, the domestic online high-end travel service platform Zan Nadu launched the first domestic travel VR APP in 2015.

This paper designs a virtual roaming system, which aims to provide users with a first-person perspective to travel without leaving home. The main building area of Nanjing Agricultural University was selected as the tourist attraction, because the main building was a building during the Republic of China, with beautiful scenery and very ornamental. Using 3ds Max for modeling, combined with the Unity 3D engine, the main building area roaming system is designed. Users can roam autonomously in the system and enjoy the scenery of the main building area.
2. Overall system design

2.1. System design planning
The system uses 3ds Max as a modeling tool and Unity 3D engine as a development platform to build a regional roaming system for the main building. In the roaming system, users roam in a first-person perspective and enjoy the scenery of the main building. The main work content is as follows:

(1) In the 3D modeling software, the method of 3D modeling is studied to realize the creation of the internal model of the scenic spot. The main building is modeled with 3ds Max, in order to make the model look more realistic, material and texture processing is important;
(2) Using Unity3D's own terrain generation tool to generate terrain, import the already built main building model onto the terrain, and place it according to the actual position and angle;
(3) In Unity3D, use C# programming technology to write a script to realize the roaming function, and use the W, S, A, D keys of the keyboard to move back and forth in the scene;
(4) Considering the actual situation, the collision detection function should be implemented in Unity3D;
(5) In Unity3D, add bird calls as scene sound.

2.2. System development process
The implementation of this system can be divided into three phases. The first phase is the research phase, which is mainly to do some preparatory work. Including collecting pictures of the main building and collecting photos of the walls, doors and windows in case of post-laying[2]. The second phase is the stage of virtual scene construction, which includes the creation of the main building model and the construction of the internal scene of Unity 3D. The third phase is the implementation phase of interactive roaming. In this phase, in Unity 3D, the interactive function is implemented in code, and the first person roaming can be performed in the scene. The last phase is the stage of releasing, which is mainly to release the system for the PC platform. The technical roadmap is shown in figure 1 below:

![Figure 1. Technology roadmap.](image-url)
3. System virtual environment creation

3.1. Creation of the external model main building
The main building is a very important part of the roaming system. Here, 3ds Max is selected as the modeling tool, and the built-in commands of 3ds Max are used to create the model. For the main part of the main building, build with the built-in standard basic body cuboid; for doors and windows with its built-in geometry doors and windows. After the construction is completed, the model is modified by polygon modeling. Polygon modeling technology is simple and convenient, and adapts to the real-time display requirements of virtual roaming systems [3].

In nature, the surface of an object always has a variety of properties, such as color, transparency, surface texture, and so on. In 3ds Max, in addition to styling, an object is also represented by its surface properties, which is to create materials and textures for the model. Models are given lifelike materials and textures that faithfully reproduce the look of the object itself in a three-dimensional virtual world. Finally, the main building model is shown in figure 2.

![Figure 2. Main building model.](image)

3.2. Unity 3D internal scene construction
Terrain is generated using the terrain tool that comes with Unity 3D. Before creating, import the downloaded terrain resource package, including some trees, textures, and so on. Right click on the Hierarchy panel and click on 3D Object to select Terrain to create a terrain.

Adding sound effects to a scene can set off the atmosphere and immerse yourself in it. In this system, you need to add a bird call to the scene. First import the prepared audio file into the audio source folder, then create an empty object to be used as the audio sender, add the Audio Source component to the Game Object, and drag the sound file directly to the Audio Clip property of the Audio Source. Then, according to the actual situation of the scene, set the scene to improve the scene, such as whether to loop. The Audio Listener component is automatically mounted on the Main Camera and does not require excessive setup.

4. Based on the implementation of Unity 3D roaming system

4.1. Introduction of the 3D model main building
In 3ds Max, export the main building model to a .FBX file and name it zl. Copy the file zl.FBX to the Assets folder and open Unity 3D. You will find that it has automatically generated the shader of the material imported into the main building of the model. The working interface of Unity after importing the main building is shown in figure 3.
4.2. Design and implementation of interactive roaming in Unity 3D
In a virtual roaming system, role interaction is very important. After importing the main building model, you need to write C# script to realize roaming in the first person perspective. Through the W, S, A, D keys of the keyboard, you can move forward, backward, left and right. Collision detection is also required so that the character can stop when encountering an obstacle.

The specific approach is to build a virtual character, here with a cube instead, adjust the size of the cube is almost human height[4]. Create a sub-object camera of the cube, adjust its position, place it on the head of the cube, and switch the viewing angle to the first person perspective. Then create a C# script in the scripts folder and drag the script directly onto the Inspector panel.

Collision detection is a very important part of a roaming system that makes the scene more realistic. If you do not join the collision detection, there may be cases where the character passes through the wall[5]. The simulated character collides with the main building. At this point, two important physical components are needed, the rigid body component and the collision body component Collider. The moving object is added with the rigid body component and the collision body component, and the target object is added with the collision body component. When the object moves, it will directly collide with the target object, but it cannot be hit, and the collision mode of the character and the main building can select this.

4.3. Release of the roaming system on the PC platform
Unity 3D is cross-platform. After the system is completed, it can be distributed to multiple platforms, such as PC, Mac, iOS, Android, etc. This system is mainly released for PC platform. After the system is completed, perform Build Settings operation on it to generate an .exe executable file and a data folder, both of which are indispensable and inseparable.

4.4. System operation interface
After the system is completed, the system should be tested to see if the expected functions can be achieved. Run the .exe executable.

After entering the system, you can hear the sound of the bird singing. After the character is stable, you can see the picture shown in figure 4.

Next, test the character's roaming, hold down the W key, and find that the character moves forward. The scene seen by the character is as shown in figure 5.

Hold down the S key and find that the character can move backwards, and the test of the character's autonomous roaming backward movement is completed.

Hold down the A key and find that the character moves to the left. The scene that the character sees at this time is shown in figure 6.
Hold down the D button and find that the character can move to the right, and the test of the person's autonomous roaming to the right is completed. Moreover, when hitting the main building, the character will stop and the collision function will be realized.

![Figure 4. Screen entering the system.](image)

![Figure 5. Moving forward scene.](image)

![Figure 6. Scene moving to the left.](image)

5. Conclusion
Applying virtual reality technology to the tourism industry can help users make travel decisions in advance, choose tourist attractions, book hotels, etc[6]. Users can also choose to enjoy 360-degree panoramic roaming at home. No matter which method is chosen, virtual tourism will provide users with virtual tours and enjoyable travel experience.

This paper establishes a virtual roaming system. There are still many shortcomings in the design and implementation of this system, and it needs to be modified. For example, in the Unity 3D engine, there is also a first person controller and a third person controller, which can control the movement of the character, realize the roaming function, and in addition to moving back and forth, can also realize the jump of the character and control the line of sight with the mouse. In future work, these controllers can be used to achieve a better roaming experience in a virtual system.

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