Research on the application of computer artificial intelligence technology in the display control system of art museum

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Abstract. This paper mainly uses the application of computer artificial intelligence technology in the intelligent exhibition hall, so that the exhibition hall can intuitively and objectively show the contents to the visiting guests, through the display screen controlled by computer big data and other real devices in the hall together It can effectively make the audience in the application of advanced technology equipment, so as to realize the rapid understanding and use of the equipment, and increase the technological nature of the exhibition hall. The virtual theater display system with strong interactivity and realistic effect builds an interactive platform that crosses the limitation of time and space, which is more convenient for the comprehensive display system of information exchange in the art exhibition hall of the 3D art museum.

Keywords: Computer, artificial intelligence, art gallery exhibition, display system.

1. Introduction

When people browse the various artworks in the art exhibition halls, due to conditions and time constraints, they cannot observe ancient artworks at close range and for a long time. In order to solve the space and time limitations of historical art exhibition halls, digital art exhibition halls came into being. The scope of the definition of digital art exhibition halls is divided into narrow sense and broad sense. The reproduction of art exhibition hall exhibits through digital technology is a digital art exhibition hall in a narrow sense, and it covers virtual exhibitions that only exist in the real world in the network, that is, the broad sense [1]. Digital Art Exhibition Hall on the Internet. As a comprehensive result of technology application combined with art display, digital art exhibition halls have one of the most important characteristics-interactivity. The interactivity of digital art exhibition halls determines whether visitors can have a high-quality visualized virtual interactive experience during the visit. The rapid development of science and technology has made multimedia technology and VR technology more and more mature. At present, interactive technology has developed from interaction in a static two-dimensional interface to interaction in a multi-dimensional information space. The basis for achieving this leap-forward development is facing users in a virtual environment. Multi-level, dynamic behaviour implementation research and design. Therefore, a dynamic panoramic virtual display system of digital art exhibition halls based on visual interactive technology is designed to facilitate viewers to obtain and understand art exhibition hall information more efficiently.

2. The overall design and functional division of the software

2.1 System architecture

This system adopts the current popular object-oriented technology, that is, divide the whole system into multiple objects and encapsulate them in corresponding classes. Among them, the geometric shape modelling category mainly includes the standard geometric shape modelling category that comes with the system and self-defined revolving body modelling class, variable cross-section crank modelling class, and ball missing spherical crown and other irregular shape modelling classes [2]. These classes encapsulate information such as modelling, rendering, texture, and realistic processing. At the same time, these classes also provide various corresponding Method, the encapsulation of the

object is well realized; the interactive function class includes the existing picking operation class, the mouse interactive function class and the custom keyboard navigation function class; the animation effect class includes time-based animation and Morphing animation And Billboard animation; the multimedia category includes material function, lighting function and sound; the division of function in the system is shown in Figure 1 (picture quoted in Collaborative Visualization of an Archaeological Excavation).

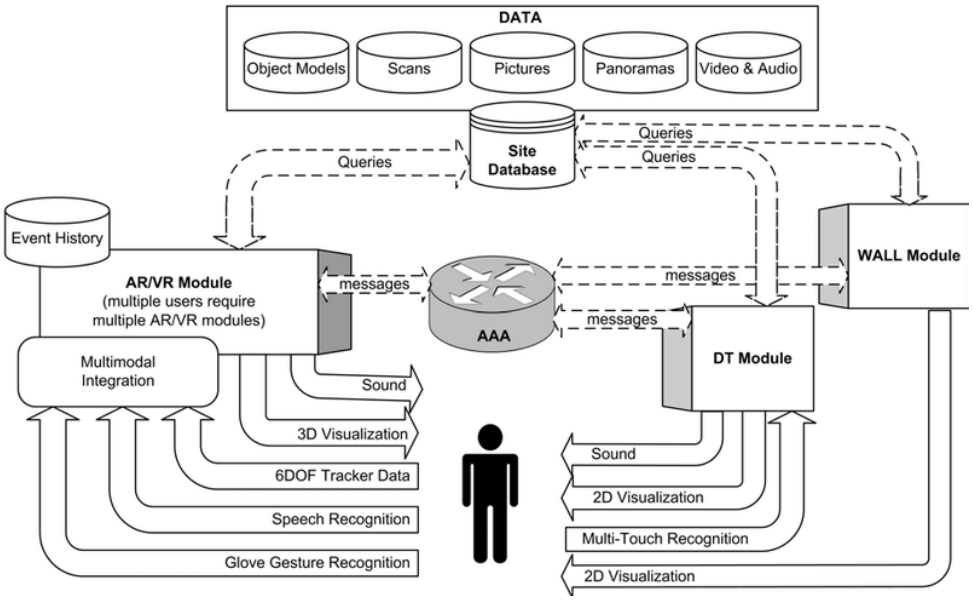


Figure 1. The functional class division diagram of the virtual art gallery

In order to fully reflect the characteristics of virtual reality, that is, real-time interaction and realistic immersion, multimedia technology has been added to the software design and functions such as interface operations have been appropriately increased, so that people, the real world and the virtual environment can be organically combined. Produce a more realistic effect.

2.2 Implementation process

According to the overall design of the Digital Art Exhibition Hall, the system is implemented according to the process shown in Figure 2 (picture quoted in Digital Twin and Web-Based Virtual Gaming Technologies for Online Education: A Case of Construction Management and Engineering).

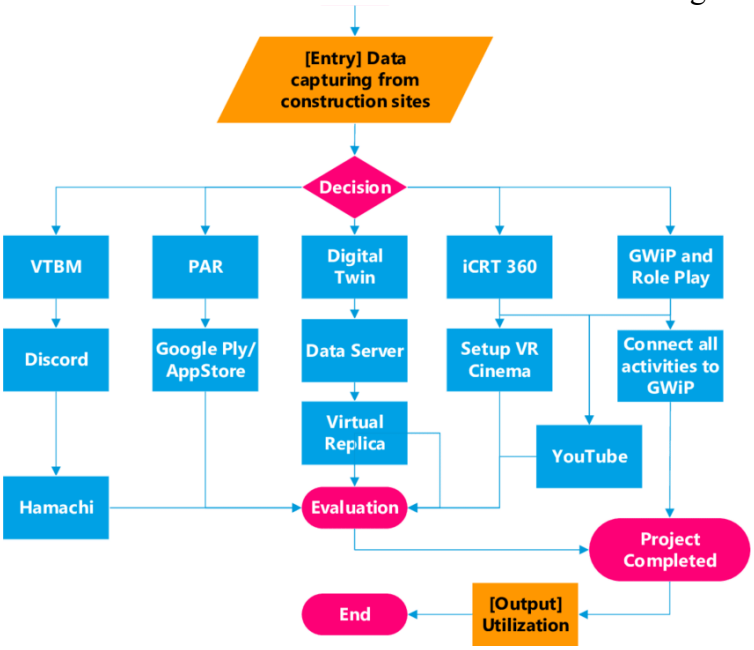


Figure 2. System implementation flow chart

First, obtain the actual geographic data of the anatomical art exhibition hall through the drawings of the venue, electronic photos, etc., draw the CAD base map of the venue structure, take the electronic photos of various directions required to establish the three-dimensional model of the human body structure, and organize the collected data. Secondly, import the dwg format file into 3DSMAX to build the three-dimensional model of the indoor scene, and use the modelling method of geometry and polygon to build the model of each part of the human body structure [3]. Add a picture file in 3DSMAX to realize the surface texture mapping effect of the model. After the model is rendered, a three-dimensional scene model database with realistic effects is obtained. Use the Max Exporter plug-in again to export the 3D model to generate the nmo file, import the generated file into Vitriols, and design the interactive roaming, navigation map, collision detection, database and other functions. Finally, complete the integration and optimization of the overall scene of the digital art exhibition hall in Vitriols, generate come files, and dynamically load come files in HTML files to realize online publishing.

3. Development of virtual roaming module

The specific implementation process is shown in Figure 3 (picture quoted in A Study on Immersion and Presence of a Portable Hand Haptic System for Immersive Virtual Reality) [4].

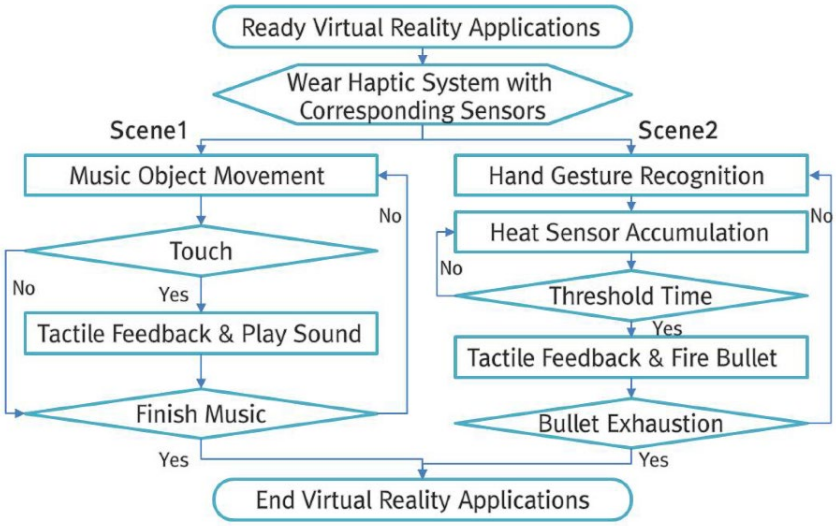


Figure 3. Flow chart of virtual reality system development

3.1 Virtual scene construction

Virtual art exhibition hall scene model making is a very important part of the development of virtual reality roaming module, because the quality of the model determines the effect of the virtual scene after it is built, and it is directly related to the experience effect of the art exhibition hall roaming system. In this article, all art exhibition hall buildings are implemented using 3dsMax modelling software. In the process of making architectural models, both the realism of the model and the speed of the system must be considered [5]. Therefore, a combination of fine modelling and simple modelling is used to construct a virtual art gallery three-dimensional landscape. There are two types of scene models for art exhibition halls. One is complex models, such as furnishings and exhibits in art exhibition halls. The production requirements for this kind of model are very delicate, and the details should be properly retained when modelling. There is also a simple model, such as roads, trees, etc. The production of this model is very simple. You only need to make a rough outline and you can rely on textures to achieve three-dimensional effects.

3.2 Virtual roaming

When the art gallery scene is built, import the Unity platform and add the virtual roaming interactive function to realize the virtual roaming of the experiencer in the art gallery scene. The experiencer can walk forward and backward through the up, down, left, and right buttons, or through the headset [6]. The device performs viewing angle conversion, or chooses multiple methods such as running and walking to allow users to get a better experience.

3.3 Enhanced interactive module development

Compared with VR technology, AR technology can make the art exhibition hall navigation system create richer interactive methods, because AR technology can superimpose virtual information in the real world, so it can enhance the objects and environment of the real world [7]. The development of the enhanced interactive module is mainly divided into three steps: First, the real scene video image is collected through the camera. Second, track and register the detected signs. Finally, the virtual information is superimposed on the real scene to enrich the information display of the exhibits in the art exhibition hall.

3.4 Interactive experience

The art exhibition centre focuses on cultural communication. The construction of an interactive platform for communication between audiences and exhibits will greatly enhance the interactive experience of visitors. The combination of augmented reality technology and virtual reality technology will interactively design the interface and behaviour of the system, allowing exhibits to interact with each other [8]. Visitors establish a new interactive experience relationship, allowing visitors to interact with the exhibits, discover and explore during the visit. The interactive experience mainly includes the interaction between people and the space environment and the interaction between people and the exhibits.

3.5 Calculation of virtual button coordinates

The origin of the marker's two-dimensional coordinate system is at the upper left corner of the marker, the Y coordinate is the vertical direction, and the X coordinate is the horizontal direction. The pixel is (1500, 1050), and the button size is (200, 75). Vuforia SDK uses the right-handed coordinate system, Define a three-dimensional coordinate system with the coordinates of the centre point of the marker (0, 0, 0). The coordinate X is positive to the right, the coordinate Y is positive in the plane of the marker, and the coordinate Z is perpendicular to the plane of the marker and the centre point is upward. Positive [9]. The original pixel coordinates in Table 1 are the coordinates of the upper left corner and the lower right corner of the button rectangle.

Table 1. The conversion of virtual keys from 2D coordinates to 3D coordinates

Button	Original pixel coordinates	Three-dimensional coordinates
Red	-90,850	(-108.68, -53.52)
	-290,925	(-75.75, -65.87)
Blue	-475.85	(-45.28.-53.52)
	-675,925	(-12.35, -65.87)
Yellow	-840,850	(76.57, -53.52)
	-1,040,925	(47.75, -65.87)
green	-1,215,850	(76.57, -53.52)
	-1,415,925	(109.50, -65.87)

Take the red key as an example, use the similarity ratio to calculate the X value and Y value after the two-dimensional coordinates in Table 1 are transformed into a three-dimensional coordinate system. That is, 90/750=(123.5-X)/123.5, X=108 .68 Calculate the Y value in the same way, judge the positive and negative, the transformed coordinate value is (-108.68, -53.52). The three-

dimensional coordinate data in Table 1 is the value obtained by transforming the original coordinate system into the three-dimensional coordinate system.

4. System realization and effect display

Using the Vuforia feature point detection and matching algorithm, the position and ID of the marker in the image are recognized and detected through calculation, and corresponding virtual information is generated on the marker, so that visitors can pass through the augmented reality artwork display system [10]. The selection of buttons to visit the exhibits, including the selection of exhibits, the movement of the exhibits, the text information of the exhibits, etc. The system is equipped with 4 buttons, and visitors can control them by touching the corresponding buttons as shown in Figure 4. Shown (picture quoted from Grabar: Occlusion-aware Grabbing Virtual Objects in AR).



Figure 4. The effect diagram of the virtual model appearing when the red and blue buttons are triggered by a finger

When the visitor presses the "Red" button or the "Blue" button, the corresponding kneeling figurine and standing figurine model will be displayed on the sign. When the visitor presses the "Yellow" button, the kneeling figurine can be controlled to rotate. When you press the "Green" button, you can control the translation of the standing figurines as shown in Figure 5 (picture quoted in Grabar: Occlusion-aware Grabbing Virtual Objects in AR). The system solves the problem of the previously used unimproved AR Toolkit when occluding part of the information of the marker. The problem of virtual objects disappearing. Even if the visual field of the visitor is not all within the range of the marker, the virtual object can still be displayed, which is closer to the observation of the human eye, but the unimproved AR Toolkit cannot achieve this effect. This advantage can be very good. It is suitable for art exhibition halls. In addition, the real-time performance of the system is better. During the operation, the generation of virtual objects does not appear to be delayed.

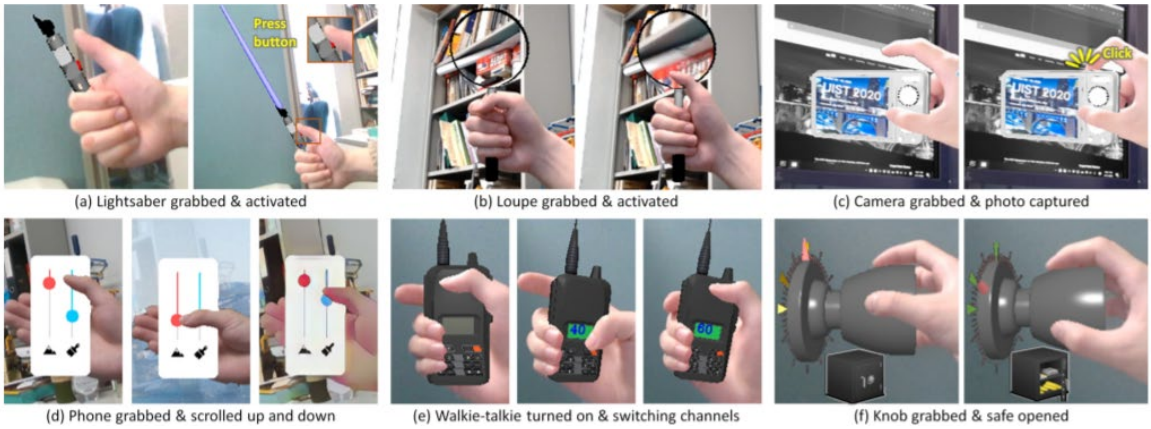


Figure 5. The rendering of the virtual model that triggers the yellow and green buttons to appear

5. Conclusion

This paper constructs a dynamic panoramic virtual display screen display system for digital art exhibition halls based on visual interaction technology, and realizes the panoramic display system of digital art exhibition halls through the project library management module, digital art exhibition hall design module and digital art exhibition hall controlled by computer artificial intelligence technology. Allow visitors to use a linear algorithm to calculate the number of clicks, and build a tag cloud component based on the weight of the number of clicks to provide interactive communication. The results show that the system in this paper can not only effectively display the panorama of the art exhibition hall, but also has the advantages of comprehensive project information, technological innovation, independent operation, time saving, animation display and other advantages compared with the physical art exhibition hall. It can realize all-round, high-efficiency and high-precision virtual display.

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