An Online College Student Art Exhibition App Based on Virtual Reality Technology

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Abstract. In recent years, with the rapid development of computer technology, virtual reality products showing a flourishing trend. It brings people into an immersive, interactive virtual reality world, we will apply it to the design of students’ art exhibition App. Art college students will create many valuable works of art. Under the situation of the country's vigorous promotion of innovation and entrepreneurship, we design a VR art exhibition marketing app to promote and sell students' excellent art works through online display, which can motivate students to create and collaborate independently, improve their professional skills, and enable They engage with society as early as possible to increase employment. The online exhibition sales app for college students' art uses network technology to show the functions of the real exhibition hall in the form of digital virtual reality. It uses the information structure of the Internet, and combines the work and business of traditional physical exhibition halls with marketing activities on the Internet to build the information exchange bridge required by exhibition halls. This app uses Unity 3D technology in conjunction with HTC Vive devices to design and implement a virtual pavilion. The model was created using 3DS MAX software, the material texture was drawn using Substance Painter software, and the interface UI was produced using Adobe Photoshop software to ensure a high degree of simulation of the virtual pavilion[1].

Keywords: VR, Artwork, Virtual Marketing

1 Introduction
At present, with the continuous popularization of the Internet, the development of virtual pavilions is extremely rapid[2]. For example, the online pavilion of the Shanghai World Expo includes various network forms. As early as the new century, the online pavilion has begun to sprout. From the 2008 Olympic Games and the 2010 World Expo online pavilions, we can see that the production technology of these international large-scale pavilions is very mature[3]. In addition, the online pavilions in life have sprung up, bringing great convenience to life, proving that the application of VR virtual reality is maturing. The online pavilion brings people not only a simple presentation of the physical pavilion, but also provides more channels for academic exchanges, and highlights the social value of the physical pavilion. Compared with physical pavilions, online pavilions have many advantages, such as being economical, eliminating the overhead of offline pavilions, and being able to watch them anytime, anywhere; in terms of convenience, online pavilions provide people with Convenient, many
people may not be able to go to the real pavilion for viewing due to various reasons. The online pavilion solves this problem well. Moreover, the online pavilion is also spatial and interactive. It will introduce products and introductions. The presentation is more vivid and concrete. It is no longer a single view, but also a multi-angle display. In addition, sharing resources will be more extensive, and you can also participate in the interaction of exhibits, learn from each other's experience, and increase user experience.

In college life, students will be exposed to many courses and learn to explore and produce many outstanding works with innovative and creative meanings. These works are actually very valuable. "Art Creation Space" is a physical art sales store established by our school's art department for the majority of teachers and students in the school. However, there are many disadvantages of physical stores, such as few people know, practicality and propaganda are not ideal, and space is limited. So, I have the idea of implementing it as a virtual exhibition APP. Compared with a physical store, it will have better circulation and use less economic costs, which can maximize the benefits\cite{4}.

This type of online pavilion not only has a wealth of product resources, allows users to visit multiple times, and it is of educational significance to visit and study online\cite{5, 6}. With the development of online virtual pavilions, and the increase of marketing efforts, the commercial value of virtual pavilions will also increase\cite{7}. Every year, the artworks created by teachers and students of the school are put on the Internet for design and production. Users can browse and learn without leaving the home through the APP, and can purchase and share online, not only the flat feeling, It is three-dimensional and interactive, giving people a feeling of being there.

2 System Requirements Analysis

When the user opens the virtual exhibition hall app, he can directly enter the virtual exhibition hall to roam and watch the artworks sold in the exhibition hall. When a user wants to know a certain work, there will be three related modules: work information, work display, and work sale. The simple design can increase the user's favor and generate the initial favor for the APP.

If the user selects the information of the work, he can see the detailed introduction of the work and the author's detailed introduction, including the concept of the design work, the preliminary idea, the design process, and relevant information of the author, so that the user can better understand the work.

If the user chooses to display the artwork, he will first see a brief picture of the artwork. He can choose to watch 2D or 3D, and appreciate the work from the plane and three-dimensional perspectives, to avoid problems caused by careful observation. If the user is interested in the painting, you can see the detailed drawing of the object in the painting. You can choose to view the painting in two-dimensional or three-dimensional. Each work is set to rotate $360^\circ$, which is convenient for users to watch the works.

If users have the intention to purchase works, they can choose to book or buy online. The user can see the market price of the work in the price market and judge it. When there is an intention, you can also communicate with the author of the work online, and even customize the artwork to increase a good user experience.

Based on the above description and analysis of college students art virtual exhibition platform for a simple flowcharting, shown in Figure 1.
According to the design analysis of the flowchart of the virtual exhibition platform, the user activity diagram is drawn, as shown in Figure 2.

3 System Design

3.1 System Process Design

Based on the system analysis of this virtual exhibition app, we design the process of the operation of the app as follows.

When the user opens the artwork virtual exhibition app, first, the user needs to log in to verify, and then enter the virtual exhibition hall to roam and preview the entire artwork. While watching, if you have a favorite artwork you can carry out detailed observation, you can also pick it up for 360° careful viewing. If you like, you can add it to the shopping cart. Finally, you can settle the shopping cart.
3.2 Functional Structure Design

1) Login Function Module Design
The login function is to ensure the security of user information. You need to enter the user name and password to verify with the system. The login interface uses the most basic UGUI functions in Unity3D, uses Button components to implement the jump function, and uses the Text function to write the user name and password login font.

2) Weather System Function Module Design
The weather system module is a special system design of the virtual exhibition APP for college students' arts. Each time the user logs in, the environment they are in is different. The skybox system is used to generate ten types of weather information, making the scene environment more realistic.

3) Discount Product Module Design
Different discount product information will appear after each login, discount product information will be publicized on the small blackboard at the virtual exhibition entrance.

4) Visit Tour Function Module Design
The virtual exhibition APP for college students' art is a VR project that uses HTC Vive devices to debug content. This function is implemented by adding VR Origin preforms to the program, including Camera and Vive Controllers in ViveRig. Users can roam the pavilion by clicking on the ground with the Vive handle.

5) Artwork Introduction Function Module Design
The introduction function of the artwork is an important part in the design of the art exhibition app. By clicking on the artwork model, a model introduction of the work will appear. The introduction includes: the name of the artwork, the design ideas and content of the artwork, the price information of the artwork. The product click interaction function mainly uses the functions in UGUI, Add the shopping cart function and the model preview function using the Button component, Among them, the text introduction part uses the Test text component and the Image image component.

6) Artwork Preview Function Module Design
The preview function of the work is also one of the most important functions in the art virtual exhibition app. When the user previews the artwork model, he can use the left-hand handle to control the model for viewing. By sliding the selection button on the handle, the artwork model can be zoomed in and out, and the model can be fully rotated by 360 °. We need to position the model in the center of the handle, so that the artwork model will not be unclear because of the distance.

7) Buy Product Functional Module Design
The function of purchasing goods is a special function in the art virtual exhibition app. After visiting the virtual showroom, filter your favorite works and paintings and you can add them to your shopping cart. The shopping cart function uses Unity3D’s UGUI. The button added to the shopping cart and the artwork model preview function use the Button component. The text introduction part uses the Test text component. Finally, you can make purchases in the shopping cart. Click on the purchase item, and the QR code scanning interface will appear. You can scan the code through the interface to purchase.

4 3D Scene Design of Virtual Exhibition

4.1 Virtual Exhibition Graphic Design

The virtual exhibition and sales platform for university students' art is based on the field investigation and measurement of the physical store of "Yichuang Space". After adjusting the actual layout and optimizing the space, it is redesigned and planned. The graphic design of the exhibition is shown in Figure 4.

![Fig 4. Graphic design image](image)

In addition to designing the floor plan of the virtual exhibition hall, we also conducted a field survey of the physical storefront of "Art Creation Space", taking pictures of the artworks and the indoor environment to ensure the authenticity of the exhibition hall and the richness of the exhibition artworks And has a certain artistic atmosphere. Field visit photos are shown in Figure 5and 6.

![Fig 5. Physical store image](image)
4.2 3D Scene Structure Construction

According to the graphic design drawings prepared earlier, we carried out the planning and design of the work placement, and built the three-dimensional model renderings of the exhibition hall structure, as shown in Figure 7.

After the construction of the scene structure is completed, we set up the internal scene and made the artwork model. I use the 3DS MAX modeling software for the virtual artwork model. This software can not only efficiently model but also quickly optimize the model. A three-dimensional modeling of the artwork is performed, and the artwork model is completed, and the UV and the texture are drawn. After the production of each artwork model is completed, according to the planning and design of the exhibition hall, the exhibition hall of the artwork is placed, the production of the texture ball is completed, and the entire construction of the entire art exhibition hall is completed. Deploy lights and reflectors.
5 Conclusion
The virtual exhibition app for college students' art makes full use of the four advantages of virtual reality: multi-perception, immersion, interaction, and autonomy\(^{[8]}\), so that virtual art can be more vividly displayed and buyers can understand the works more vividly. This article effectively combines the art exhibition hall and virtual reality technology, and realizes the functions of operation management\(^{[9]}\), display style design, exhibit position conversion, payment management, and other exhibition hall expansion in the virtual exhibition hall. On this basis, the basic system framework of the virtual exhibition hall was proposed, and the design scheme of the virtual exhibition sales app for the artwork of college students was completed\(^{[10]}\).

Acknowledgements
This work was supported by 2017RQ158, 2018C01007

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