An Augmented Reality Implementation Method Based on Unity3D

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Abstract

Through computer graphics and visual technology achieving the superposition of virtual objects in real scenes, augmented reality technology is able to present the sensory effects of real-time interaction. It has broad application prospects and application value. At present, there are two main ways to achieve augmented reality. One is the underlying code, which combines OpenGL and OpenCV libraries to realize augmented reality. The second is the secondary development of related content through the corresponding software and SDK package. In this article, augmented reality will initially be completed through Unity 3D and Qualcomm's Vuforia SDK.

Keywords: Augmented Reality, Vuforia SDK, Modeling, Unity3D.

1. Introduction

Augmented reality technology is a technology developed on the basis of virtual reality technology, which uses computer graphics and computer vision to superimpose virtual objects into real scenes, allowing users to perceive a real scene and virtual scenes seamlessly. Meanwhile, with the new environment, the user is presented with a sensory effect of real-time interaction[1].

Augmented reality was first applied in the military field. But with the continuous development in recent years, it has been widely applied to more fields. In the medical field, doctors can use augmented reality technology to accurately locate the patient's lesions for easy surgery. In the field of television broadcasting, important data on the sports field in the live sports competition can be superimposed on the TV screen through augmented reality, providing more information to the audience. In the field of education, augmented reality technology will change the traditional education model and create a more vivid and interesting learning scene for students. Augmented reality has broad application prospects and great application value, therefore it has very significant research significance[2].

2. Background

Many research institutes at home and abroad have achieved certain results in the direction of augmented reality. The first pioneer in the world to study augmented reality was Ivan Sutherland[3]. In 1992, Steven Feiner published a paper on the prototype of the AR system at the International Conference on Graphic

Images, which was subsequently widely cited by the American Computer Society[4]. In 1999, the University of Washington released the open source augmented reality development kit-AR Tool Kit. With the release of this development kit, a large number of augmented reality applications are beginning to emerge. In 2014, Google launched "Google Glass". In addition to the functions of sending messages, taking photos, talking, viewing maps, video chats, setting calendar reminders, etc. through voice control, its most prominent feature is the use of augmented reality technology to attach environment information on display devices. In 2015, Microsoft released the AR head-up Microsoft HoloLens, which is not subject to any restrictions - no cables, earpieces, and no need to connect to a computer. Microsoft HoloLens has the features of holograms, high-definition lenses, stereos, and more, allowing you to see and hear holograms around you. Apple announced the ARKit at WWDC 2017, which helps us implement AR technology in the easiest and fastest way.

3. Implementation Methods

There are three core technologies of augmented reality technology, including three-dimensional registration technology, display technology and intelligent interaction technology[5].

- Three-dimensional registration. In order to realize the combination of virtual and real, the position of the augmented reality real-time tracking camera is calculated for the position of the camera image and the position of the virtual image appearing in the real scene.
- Display technology. Depending on the real world, virtual images or models present a virtual and fused world to the user.
- Real-time interaction. This refers to an interaction between the user and the virtual object, and the information flow and feedback can be timely and effective between the two. The main implementation methods of augmented reality are two categories in the general direction. The first is through the underlying code, and the second is the secondary development of related content through the corresponding software and SDK package.

3.1. *Underlying Code*

Relatively speaking, OpenCV realizes the recognition and positioning of Marker, and then superimposes virtual objects under the camera image through OpenGL to realize augmented reality. As shown in FIG.1, the feature points in the real-time scene are extracted by using a related feature point extraction algorithm. Then, the relevant feature point data is obtained after detection and description, and the Hamming distance is used for matching, and the RANSAC algorithm filters the matching points to obtain the final matching point data. Then, according to the conversion of the coordinate information, the position of the virtual information in the real scene is determined, thereby realizing the augmented reality[6].

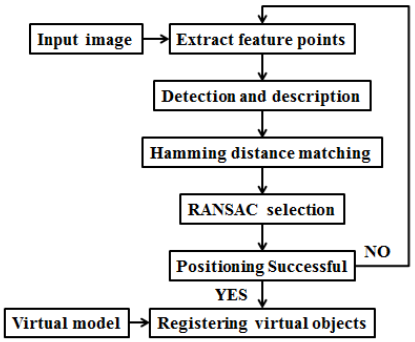

Fig. 1. Underlying implementation

3.2. *Secondary Development*

With some mainstream AR SDKs, such as Easy AR, Vuforia[7], Metaio, AR Kit and so on, the implementation of augmented reality is achieved through the related AR engine. Users of the AR SDK need to know the functions that the SDK can implement, the platforms they support, and the stability of implementation. Secondary development is currently a mainstream choice for AR development, not only to achieve faster results, but also to build practical applications.

4. Achievement Based on U3D

Augmented Reality have been achieved through Unity3D[8] and Qualcomm's Vuforia SDK.

4.1. *Unity3D*

Unity3D is not only a 3D animation software, but also a a very compatible platform. It is capable of making games as well as realizing virtual reality and augmented

reality. We chose it because it is compatible with many development environments and offers a variety of plugins that are necessary for later higher levels of development.

4.2. *3ds Modeling*

Fig. 2. 3D model of Knight

Figure 2 shows the 3D model named Knight. Using 3D modeling software called 3ds Max to build 3D model, it can be exported to a format file that Unity3D can open.

4.3. *AR Engine*

At this point, we should focus on implementing augmented reality with Unity3D. In some SDKs such as AR Kit, Smart AR, Easy AR and Vuforia, we choose Vuforia to create a location-based AR application with no markup type, which can meet the requirements of Unity3D. This SDK can provide a AR-camera which could realize the superposition of virtual objects in real scenes. Meanwhile, the SDK can make identify map which is able to be identified by the AR-camera. Based on this SDK, we will add location-based functions and other functions. Figure 3 shows one of the identify map.

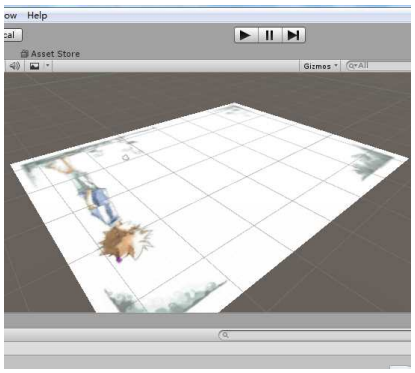

Fig. 3. Identify map

5. Experiment and Results

This experiment uses Win10 system, and the graphics card model is GTX960. The software is Unity3D-2018.2.10-f1, and the development kit is Vuforia-unity-6-2-10.

5.1. *Building Environment*

In our research, we first import the Vuforia SDK into U3D and then apply the AR Camera and Image Target. When we get the KEY under Vuforia's official website, we make a recognition map and import it, and then import the 3D model generated by 3ds Max.

5.2. *Results*

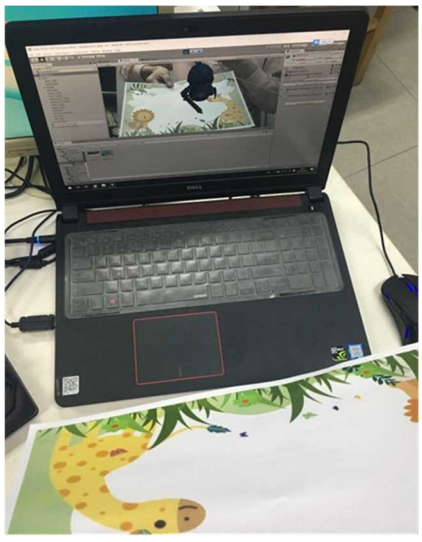

Fig. 4. Displaying the Knight Model by AR

Figure 4 shows the experimental results. U3D is able to display the Knight model above the recognition map

and let the model do some action. Once the natural image inside the camera being read, the model will continue to be displayed even if the position changes or the angle changes. In addition, the Knight is able to complete some designed actions when the Knight is displayed. However, when the recognition map is too close to the camera, the model will appear outside the screen and cause invisibility.

6. Conclusion and Future Work

In this study, we tried to make an application using Unity3D. Future tasks include advanced application features such as adding instruction windows, implementing some instructions, the creation of other models, and some of the problems actually used. We hope to achieve more functionality in the future work.

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