Application of AR Technology in the Construction of Physical Education Environment in Colleges and Universities

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Abstract. With the rapid development of augmented reality, many intelligent terminals begin to apply augmented reality technology, mainly in sports, education and teaching fields, etc. This extensive application trend also proves that augmented reality has a good development prospect. In the information age, the traditional teaching methods of physical education can no longer meet the actual needs of classroom teaching, so it is necessary to introduce virtual reality technologies such as augmented reality to improve the overall efficiency of teaching. The application of AR technology can not only stimulate students' learning enthusiasm, but also improve classroom teaching quality, which has a positive impact on the establishment of a good physical education teaching environment. Based on this, this paper introduces the definition of augmented reality technology in detail, and analyzes the application of augmented reality technology in education, and realizes two applications from developing physical education games and interactive virtual environment scenes, so as to provide reference for the construction of physical education environment in colleges and universities.

Keywords: AR technology · University education · Physical education · Teaching environment

1 Introduction

Augmented reality refers to a new technology that superimposes virtual objects in real scenes to achieve the organic integration of them. Based on virtual reality, augmented reality is the core direction and discussion focus of computer graphics and vision research at present. Augmented reality can be regarded as a supplement of virtual information to real scenes, which is different from virtual reality in that it completely replaces real scenes with virtual information. It has been widely concerned by people and has been applied in various industries. Among them, physical education in colleges and universities has also begun to actively introduce augmented reality technology, which can be used to build a more advanced teaching environment, stimulate students' interest in learning, improve classroom teaching quality, innovate teaching methods and strengthen physical education for students. Therefore, how to apply AR technology to the establishment of physical education teaching environment in colleges and universities is the focus of many scholars.

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2 Overview of AR Technology

2.1 The Meaning of AR Technology

Augmented reality refers to superimposing physical information, such as vision, smell and touch, which can't be felt in a specific time and space of the original display world, on the real world after simulation by using science and technology, so that human senses can perceive it, and then achieve sensory feelings beyond reality. University scholars in Toronto use the definition of virtual reality continuum to explain the areas between the real world and the virtual world, which means that the space between the virtual world and the real world can be called mixed reality, and its real world elements account for a relatively large proportion of augmented reality in the whole, on the contrary, it is augmented virtual reality.

AR technology is a new man-machine interaction technology developed from virtual reality technology, so there are certain similarities between them in technical means and forms, which makes them easily confused. The differences between augmented reality technology and virtual reality technology are mainly reflected in the following three aspects: First, augmented reality thinks that the space collected by muscone and transmitted to the display of terminal equipment is the real space. Secondly, in terms of technology, AR technology will organically integrate virtual three-dimensional models or graphic images with real scenes, so as to achieve the reinforcement effect on the real world, and make users feel that virtual objects belong to the components of the real world. Moreover, AR technology also has more accurate registration accuracy [1]. Virtual reality is to build a completely new virtual world, to minimize users' feelings about the real world. Users can use some special digital facilities to interact with virtual images in the virtual world, to strengthen users' immersion, and to make users completely immersed in the virtual world.

3 Application of AR Technology in Educational Work

AR technology can superimpose virtual information on real objects, which is helpful to realize visualization and deepening of teaching. Moreover, the effect is very plentiful and the operation is simpler. Users can make information feedback as soon as possible after inputting instructions. Therefore, AR technology has a very good development prospect in interactive teaching and ability evaluation. In education, the application of AR technology is mainly reflected in the following four aspects:

Firstly, skills training. The AR technology is especially recognized and favored by users in the field of skill training. The related applications have appeared since 1990s, which can provide users with a relatively complete learning environment and help them accumulate rich operating experience. Nowadays, in the field of skill training, head-mounted AR technology equipment is mainly used to complete operation or learning. Users use the operation flow prompted by the head-mounted AR technology equipment to carry out learning. When users use some items during actual operation, the program can also provide text prompt information for users [2].

Secondly, build a model. The model based on AR technology can provide users with a more intuitive image, and users can observe the changes of the model from different

positions and angles by manipulating the model. This method is closer to reality. For example, the LearnAR developed by foreign scholars is a very novel teaching tool. The original intention of its research and development is to cultivate users' independent learning habits and abilities. The novel visual experience strengthens the interaction between users and applications, so that learners can get richer experiences. This software contains theoretical knowledge of different disciplines such as physical education, mathematics and English.

Thirdly, AR books. Traditional books have many advantages, but at the same time they can't overcome the shortcomings, such as limited theoretical knowledge, limited content richness and lack of interactivity [3]. AR books are the product of the development of AR technology to a certain extent. The visual content of information and the interaction between people and books all form a strong attraction for readers. Not only that, AR books overcome many defects of traditional paper books, and readers can read many rich book contents only with some simple facilities. The diversified interaction makes reading no longer a boring activity, which improves students' learning enthusiasm and learning efficiency.

Fourthly, AR technology education games. Nowadays, many scholars at home and abroad have developed diversified AR technology education games, which are attractive to users and can stimulate users' enthusiasm. Not only that, AR technology education game realizes entertaining and entertaining, which makes users finish learning activities unconsciously, changes the boring teaching environment of traditional teaching methods, and improves students' learning level.

4 Specific Application of AR Technology in the Construction of Physical Education Teaching Environment in Colleges and Universities

4.1 The Construction of the Yangtze River for AR Technology Teaching

AR technology can not only realize the superposition effect of virtual objects in the real environment, but also make people's ideas and operations truly integrate into real life, creating a more realistic learning environment for students. Taking swimming teaching and training in colleges and universities as an example, teachers can establish a virtual environment and realize scene interaction. This paper introduces the addition of three-bit sky system-Sky box. Sky box is a kind of visual technology that can make the scene display wider and wider. Through the closed texture processing technology of seamless docking, the camera viewport is completely wrapped with 360 without dead angle. The relatively common closed texture is the organic combination of sky and terrain, which can be designed into different types of textures according to the actual needs of the scene. In the first perspective, all backgrounds are filled with closed texture. The common Sky box texture is a regular hexahedron, and after unfolding, there are six square textures with seamless edges, and a continuous background can be seen from the internal perspective (see Fig. 1 for details). The Sky box can be spliced not only with cubes, but also with spheres [4].

The interactive design of AR technology in swimming courses in colleges and universities is based on mobile applications to realize the interactive operation between

Table 1. Four Clear Flags attributes

attribute name	Attribute
Sky box	Sky box
Solid Color	Solid color, the background color of the current camera.
Depth Only	Depth only
Don't Clear	Unknown color or deep cache

people. Like many AR technologies, not all scenes need virtual objects to interact with real scenes, such as using the main interface. At this time, the sky can be used to beautify the main interface, and interactive operation designs such as scene switching buttons can be added to the main interface to form a visual operation interface, which makes the interactive design more convenient and flexible. In the method of adding sky and sky to Vuforia augmented reality, the picture of the camera should also be evaluated. Clear Flags property refers to the empty area on the screen that will display the Sky box of the current camera. The default rendering design is the Sky box, and the rendering design path is set to Edit -> Render Setting. The labels under the four types of Clear Flags properties are shown in Table 1.

In the design, the Clear Flags property of ARCamera—Camera is designed as Sky box, which adds the effect of Custom Sky box to Camera. It is directly added on ARCamera, which can't achieve its effect. Teachers can make a swimming continuous auxiliary device. To ensure that the internal environment of the device is not cut, it is necessary to design a camera with a depth of 0 to draw the environment, and make a swimming contact auxiliary device with another camera with a depth of 1. The clearing mark of the swimming aid camera needs to be set to Depth Only [5].

Sky box is the link of establishing a good teaching environment for swimming courses in colleges and universities, and using AR technology to complete interactive design, which plays a very important role. In the application process, it can be used as the plane background of the scene. The background with swimming as the theme not only satisfies the identity of the design for useful courses in colleges and universities, but also enables students to understand the goal of this design as soon as possible. In addition, the Sky box can use the swimming pool as a closed texture to make technical actions in virtual objects or 3D models, which can better integrate with the surrounding environment, avoid being too abrupt, improve students' sense of substitution, enhance the visual effect of technical actions in the course, and stimulate students' enthusiasm for learning.

4.2 Sports Games Based on AR Technology

Teachers can design game software based on AR technology for students, guide students to carry out sports activities independently through sports game software, establish a good sports atmosphere, and gradually cultivate students' autonomous learning ability and awareness of lifelong sports. Cognitive theory holds that learners should adopt a personal or collaborative approach in a more realistic situational environment, and

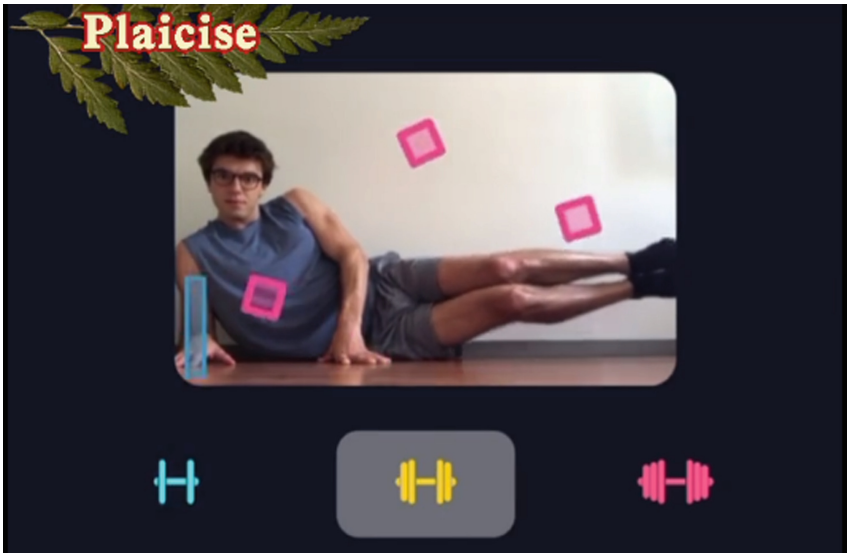

Fig. 1. Plaicise game

autonomous learning through different types of resources provided in the situation can effectively promote the improvement of individual ability. Educational games simulate the real environment through the task of stories, so that learners can acquire the knowledge contained in educational games by themselves or through cooperative methods during their study. Under this learning mode, students' learning process is very pleasant, and the knowledge contained in the games will be absorbed when they finish the games. Therefore, the relationship between situational cognitive theory and educational game design is very close. With the wide application of AR technology, teachers can try to use AR technology to strengthen the interaction between students and situations, build a better learning atmosphere for students and make the classr more interesting [6].

For example, a teacher can design an AR game, which is based on Plaicise (Fig. 1). The rectangle is designed as a character, and the small square is designed as a bee. The background of the game is set that the character is attacked by bees. It is necessary to control the character to avoid the bee attack from the right side by swinging his legs. Avoidance is success, and being hit is failure. In this way, students are more willing to exercise. The game design needs to use 3D models and animations, and 3ds_Max software can be used to make models and animations. During this period, 3D virtual scenes, characters and objects need to be built. With regard to the design of the role circle, the designer can first draw the shape of the bee, and then draw three views of the sealed model after the shape is completed, which lays the foundation for the subsequent modeling [7]. Then, the hand-drawing will be introduced into the computer by scanning or photographing, and then imported into the three-view window of 3ds_Max software respectively (as shown in Fig. 2).

The models in the game are not completely static, and some models have certain actions in the game, so we need to pay attention to the animation. In 3ds_Max, you can

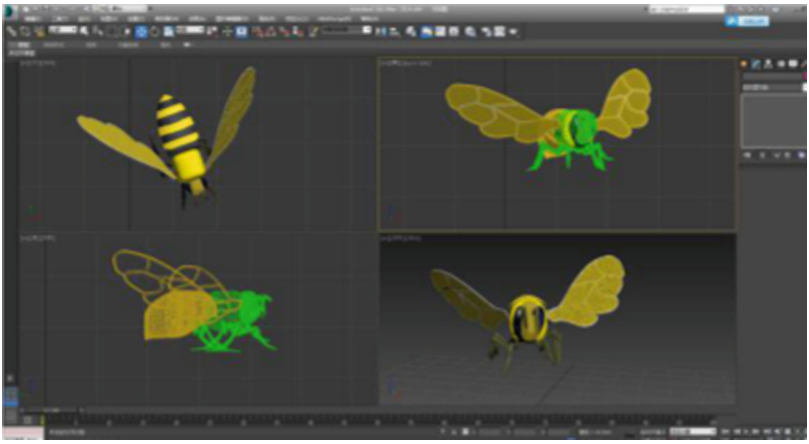

Fig. 2. Bee attack model

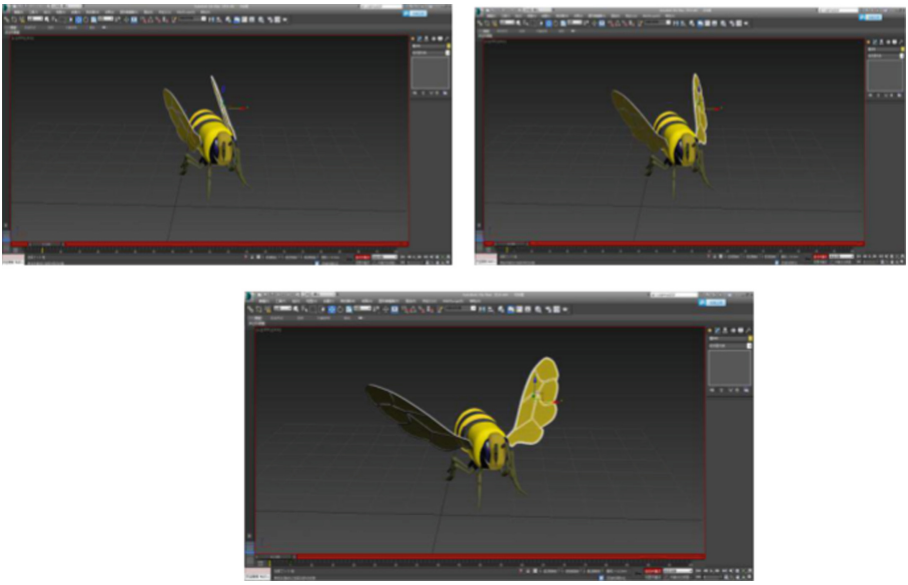

Fig. 3. Animation effect of bees

use the timeline to set key frames for the model, and use the key frame design to realize animation (as shown in Fig. 3), and you can set the animation effect of bees flapping their wings.

5 Conclusion

AR technology will be widely used in the field of education in the future, and its application threshold will be lowered. As AR technology matures, its application in physical

education in colleges and universities will be more extensive and comprehensive. Therefore, as a college physical education teacher, we should fully understand the connotation and application of AR technology, build a more relaxing and ideal learning environment for students, cultivate students' awareness of lifelong learning and improve students' classroom teaching efficiency.

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