

Design and Implementation of Augmented Reality Interaction for Swimming Course in Colleges and Universities

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Abstract: With the development of augmented reality, many smart terminals have begun to use augmented reality which focuses on sports, medical cosmetology, education and teaching. This overwhelming trend also shows that augmented reality will be used widely. In the information age, the traditional teaching method of physical education cannot meet the needs of contemporary teaching. By taking advantage of its simulation, operability and openness of virtual reality technology of augmented reality, a new idea of digital teaching has been opened up and has effectively improved the teaching quality. Because of its hand-held devices with strong portability and low energy consumption, virtual teaching is widely used in different countries and regions and will contribute to the advancement and development of augmented reality. Touch screen operation is the most natural, directest and easiest human-computer interaction between human and mobile devices, and it contains rich interactive information. Therefore, augmented reality based on mobile devices has gradually become a research focus in the field of human-computer interaction. The interaction in this paper is based on the application of augmented reality in mobile devices.

1. Introduction

At present, the development of augmented reality has presented the key technologies of display technology, tracking registration technology and interactive technology, among which the most important and fundamental technology is interactive technology. Due to the smart mobile terminal devices' strong portability, low energy consumption and high popularity, the computer is no longer the core of the technology in the process of further human-computer interaction, and the user has become the key to software design. This change will contribute to the advancement and development of augmented reality. Touch screen operation will become the most natural, directest and easiest man-computer interaction between human and mobile devices. Therefore, augmented reality based on mobile devices has gradually become a research focus in the field of human-machine interaction. Augmented reality has been the focus of educational technology research. As the latest development of information technology, it can greatly improve the level and efficiency of swimming teaching if it is properly applied in swimming teaching in colleges and universities. Through consulting relevant literature on augmented reality, it is found that the development of augmented reality in China is still greatly different from that in western developed countries. In this research, implementation of the real-time interaction between real scene and virtual object in the augmented reality effect of swimming course can change students' static cognitive style of theoretical course into a dynamic cognitive one and improve their interest in swimming course.

2. The design of augmented reality for swimming courses in colleges and universities

2.1 Teaching design of swimming course in colleges and universities

2.1.1 Teaching Characteristics

Practice training: Students' practical ability can be cultivated through their experience of swimming course activities in the reality-virtual interaction environment and further understanding of movements. The reality-virtual interaction can not only stimulate students' interest in learning,

but also carry out the teaching and experience of the project under the condition of insufficient space. Task - driven teaching: The whole teaching revolves around the task of " How to master swimming skills". In the interactive part of the augmented reality application in swimming course in colleges and universities, we can enable students to watch 3D and master the basic action essentials, and drive students' learning motivation through the augmented reality interactive experience so that they can actively participate in the augmented reality swimming teaching. Emotional education: In swimming teaching, we cultivate students' interest in swimming courses, deepen their understanding of the key points of swimming skills in the process of watching relevant materials and personal experiences, consolidate their mastery of basic swimming skills, and enhance their motivation to learn swimming courses.

2.1.2 Teaching background

Swimming is a kind of sports with strong skills and complicated movements. Its main technical movements include breathing, leg movements, arm movements, leg and hand movements, breathing and body movements with the key points of the leg and arm movements and the difficult points of breathing and body movements. The interactive design and application of augmented reality swimming teaching in colleges and universities not only provides the theoretical basis for students and the direction of key and difficult points of learning, but also accelerates the speed of them to master the movement in practical training. The application of augmented reality design for swimming courses in colleges and universities is aimed at colleges and universities that have opened swimming courses for the college students aged around 20, who have a basis of self-study and interest in swimming or want to master this skill. The application design can solve the problem that it cannot be solved through demonstration teaching that the action essentials are not fully mastered, the relevant theoretical knowledge and action essentials are not correct. The students' interest and passion for swimming learning also contribute to the development of the swimming teaching model of augmented reality. The interactive part of augmented reality in the virtual teaching platform is equipped with the display of 3D video tutorials, which, together with the virtual somatosensory experience, makes teaching more vivid and easier for students to accept, and also deepens their understanding of swimming.

2.1.3 Teaching objectives

(1) Overall objective. The teaching design objective of this topic is to sum up the experience of many researchers in swimming teaching through interactive media under the guidance of constructivism and swimming teaching theory, make full use of the new technology of augmented reality to promote swimming teaching, and construct an augmented reality swimming interaction design based on training students' swimming ability, satisfying their needs and promoting their ability to apply what they learn. (2) The knowledge objective which reflects the main body of students: The design provides a new learning environment for students, and the internal detailed 3D swimming video course facilitates students to carry out autonomous learning based on swimming course teaching in colleges and universities. Interesting incentive means: The design provides interesting incentive mechanism through 3D video and reality-virtual interaction, so that students can learn in a relaxed and pleasant environment and master swimming knowledge and basic action essentials to achieve the purpose of entertaining. (3) Ability objective. This design finally enables students to master the theoretical knowledge and action essentials of swimming courses by the augmented reality design of swimming courses in colleges and universities so as to cultivate their self-learning ability and exploration spirit. (4) Emotional objective. The design trains students to love swimming, promotes their all-round development. They pay attention to the study of swimming courses and master the basic skills of survival and rescue.

2.2 Design of augmented reality

Augmented reality (AR) is a virtual environment in which a realistic sense of sight, hearing, force, touch and motion is created by computers, and it enables users to " immerse" in the environment through various sensing devices so as to realize direct natural interaction between

users and the environment. It is a computer advanced human-machine interface characterized by interactivity and conception. More generally, it is a brand-new human-computer interaction technology, which superimpose real environment and virtual objects on the same picture or space in real time and exist at the same time through camera, sensor, real-time calculation and matching technology. Users can not only feel the "immersive" realism experienced in the objective physical world through the virtual reality system, but also break through the space, time and other objective constraints and experience that they cannot experience personally in the real world.

3. The implementation of augmented reality design for swimming courses in colleges and universities

3.1 The implementation of virtual environment scene interaction

Add 3D Sky System-Skybox. Skybox is a kind of visual technology that makes the scene look wider, which fully wrap up the camera's viewport with seamless closed texture. The more common closed texture is the combination of sky and terrain. Different types of textures can also be set according to the scene requirements. All backgrounds in the first viewing angle are filled with the closed texture. The typical skybox texture is a regular hexahedron, and after unfolding, it is a cube texture with six edges joined seamlessly, with a continuous background seen from the inside perspective. The texture of the skybox can also be made of spherical surface in addition to the cube. The design of augmented reality for swimming courses in colleges and universities is based on the interactive operation between mobile terminal applications and human. Like many augmented reality applications, not all application scenes need interactive display of virtual objects and real scenes, such as the application main interface. At this time, the skybox can be used to beautify the main interface, and interactive operation settings such as scene switching buttons can also be added to the main interface to form a visual operation interface so as to make interactive design more convenient and flexible. In the method of adding skybox to Vuforia augmented reality application, it is also necessary to shield the image of camera.

As a part of augmented reality design for swimming courses in colleges and universities, Skybox has its important function. First of all, it can be used as the background of the scene main interface in the application. The background with swimming as the theme not only conforms to the consistency of this design for swimming courses in colleges and universities, but also enables users to quickly understand the objective of this design application. In addition, the skybox can use the swimming pool as a closed texture, so that when the virtual object is a character model for swimming technical action display, it can naturally fit with the surrounding swimming pool texture environment, does not appear abrupt, which has a stronger sense of substitution for swimming lessons. The improvement of the visual effect of technical movements in swimming courses will stimulate students' interest and motivation in swimming courses.

3.2 Implementation of virtual object interaction

Interactive control of virtual objects on a mobile terminal needs to be operated by a touch screen. Rotation, translation and scaling are three basic interactive operations, which mainly involve the projection matrix of virtual objects and cameras. Therefore, the rotation, translation and scaling of a virtual object are mainly affected by the corresponding relation of the projection matrix. One of them will change the visual effect of the virtual object at the mobile terminal interface. Rotation, translation and scaling are the basic control methods of touch screen interaction at the mobile terminal as well as an essential interactive function design in augmented reality design for swimming courses in colleges and universities. When a virtual model showing swimming technique action is identified or a virtual model showing swimming exercise aids is identified, the virtual model can be rotated through touch screen operation, so that the swimming technique demonstration of the virtual model and the features of swimming exercise aids can be viewed in all directions, and the essentials of swimming technique and the use characteristics of swimming exercise aids can be analyzed and studied, so as to achieve better learning effect of swimming

course. The virtual model can also be translated through touch screen operation, so that it can be located at the screen position of the mobile terminal for watching, or at a position that is closely integrated with the real environment, in order to obtain a better effect of reality-virtual superposition. The interactive operation of scaling the virtual model can enable users to grasp the overall state of the virtual model and more clearly understand local details. Interactive operation control of rotation, translation and scaling on virtual objects enables the design of augmented reality in swimming courses in colleges and universities to play a full interactive effect.

3.3 Other interactive designs

Switch between augmented reality scenes and ordinary scenes. In the project of augmented reality applications, we not only make scenes with augmented reality and ordinary scenes without augmented reality, so many scenes need to be switched with each other. Besides this, in order to switch augmented reality scenes with ordinary scenes, we do not choose functions of their components, that is, ordinary scenes instead of augmented reality scenes.

Conclusion: Augmented reality is the product of the combination of virtual reality and real environment, which registers in three dimensions with the information in known real environment, then fuses the computer-generated virtual information with the real environment, and displays the effect of the fusion by display device to deepen the user's understanding of virtual information. Of course, the display of information is only a part of augmented reality. On the basis of the display of information, human-computer interaction will make augmented reality more usable and experienced, which is also an interactive design method for augmented reality needed to provide in the study of physical education courses in colleges and universities. It can realize the real-time interaction between the real scene and the virtual object in the augmented reality effect of swimming course, complete the dynamic adjustment of the virtual object in the real video scene with the visual effect of virtual-real integration, thus effectively realizing the integration of augmented reality and physical education teaching, and providing more information technology support for swimming teaching.

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