Research on the Application of VR Technology in Taekwondo Teaching

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Abstract. As VR (virtual reality) technology gets better and better, VR reality course teaching realizes the transformation of teaching scenes, cultivates students' interests, and effectively improves the teaching effect. Under the background of the extensive promotion of VR, virtual reality technology has been applied in physical education teaching and training. The "immersive" taekwondo teaching mode under the application of virtual reality has broken the existing teaching forms and teaching methods. Through the integration of VR technology into taekwondo teaching, it can help to complete difficult demonstration movements and clearly express complex technical points, which can better optimize the teaching effect. This study applies VR technology to Taekwondo teaching, combines the characteristics of VR technology, analyzes the industry pain points of VR applied to Taekwondo teaching, and designs a 3D interactive system of VR technology applied to Taekwondo teaching.

Keywords: VR technology · Taekwondo · teaching

1 Introduction

With the development of science and technology, education informatization has been gradually promoted, VR technology provides people with multi-sensory experience in a way beyond the senses, and has been applied and developed in different industries, and the application of practical new technology in the field of education has gradually become a trend. The application of VR in the field of education can reduce the cost of creating multiple teaching scenes, assist the design of teaching scenes through immersive effects, effectively reduce sports injuries, and accumulate event-level practical combat experience, which is of great significance to improve Taekwondo teaching. Relevant researches have shown the application of VR technology in college physical education [1], tactical training of young male football players [2], and physical education teaching model [3]. On this basis, this study focuses on Taekwondo project teaching, combines the innovative model of VR + Taekwondo teaching, analyzes the industry pain points of VR applied in Taekwondo teaching from the perspective of technology maturity, operation cost and scene integration, and proposes the promotion strategy of VR applied in Taekwondo teaching on this basis.

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2 VR + Taekwondo Teaching Innovation Mode

With the unique characteristics of "shuttling through time and space, immersing yourself" [4]. According to relevant research, the first step of education is to attract students' interest through educational methods and means. Therefore, the industry believes that the most suitable for integrating VR into education is the education field. Through the integration of VR into education, all disciplines can break through the limitations of space and teaching facilities, vividly present the contents explained by teachers in front of students, give students an immersive experience, and share rich educational resources in different regions, so as to achieve better quality and fairness in education [5, 6].

Taekwondo, has the value of fitness, mental health, physical cultivation, self-defense and entertainment [7]. Taekwondo teaching focuses on the teaching of Poomsae, competition and stunts. Among them, there are 25 sets of Poomsae. Competitive teaching is the basis of large-scale Taekwondo competitions, specifically including the teaching of leg techniques such as front snap kick, turning kick, hammer kick, side kick, double chop kick, reverse kick, tournado kick. On the basis of competitive teaching, stunt teaching aims at watching and performing, and exercises such as bouncing and flexibility, which are carried out from physiology and psychology [8].

The focus of Taekwondo teaching is on the standard of movement, correct posture, supplemented by a sense of strength and rhythm. VR is applied to build a scene of on-the-spot experience, immersive participation and interactive sharing through simulating scenes and pictures, create a teaching environment of real Taekwondo Poomsae, competition and stunts, so as to stimulate students' enthusiasm for learning, monitor physical performance data, improve the accuracy of movements, assist students to better experience the power skills and improve explosive power [9, 10].

3 Methods and Materials

3.1 Research Method

The 3D reconstruction of multi-sensory Taekwondo teaching human-computer interaction interface based on VR technology is divided into three steps as a whole, one is the in-depth data processing of human-computer interaction interface, the other is the 3D reconstruction of human-computer interaction interface, and the third is the optimization of human-computer interaction interface.

3.2 Empirical Research

This study combines the survey data of 7 universities in Chengdu and uses Kano model to rank the importance of. Based on the following formula, the VR elements are calculated and applied to Kano model, the attributes of each element are calculated, and their importance is assigned, as shown in Table 1.

$$\text{Better/SI} = (\text{O} + \text{A})/(\text{O} + \text{M} + \text{A} + \text{I})$$

$$\text{Worse/DSI} = (\text{O} + \text{M})/(\text{O} + \text{M} + \text{A} + \text{I})$$

Table 1. Module importance of VR technology applied to Taekwondo teaching

Primary index	Secondary indicators	Importance	Primary index	Secondary indicators	Importance
Hardware	Motion track recognition	0.9039	Software	3D modeling	0.7800
	Environment identification	0.9175		Optical field imaging	0.9269
	PC technology	0.3141		Quasi-holographic	0.8805
	Environmental display	0.8108		3DMAX model	0.7266
	PC work	0.7217		Natural interaction	0.7209
				Sensing technology	0.7361
				Virtual display of teaching scene	0.8387
				Teaching scene rendering	0.8723
				Human-computer interaction scenario	0.9410

Source: drawn by the author

4 Pain Points of VR Applied to Taekwondo Teaching

4.1 VR Technology Maturity

According to the product life cycle theory, VR technology products are still in the growth period of product life cycle, as shown in Fig. 1.

In terms of hardware equipment, due to the limitations of reality technology, image processing performance, transmission efficiency and battery performance, the average weight of VR hardware equipment is 500-700g. In terms of software, the production cycle

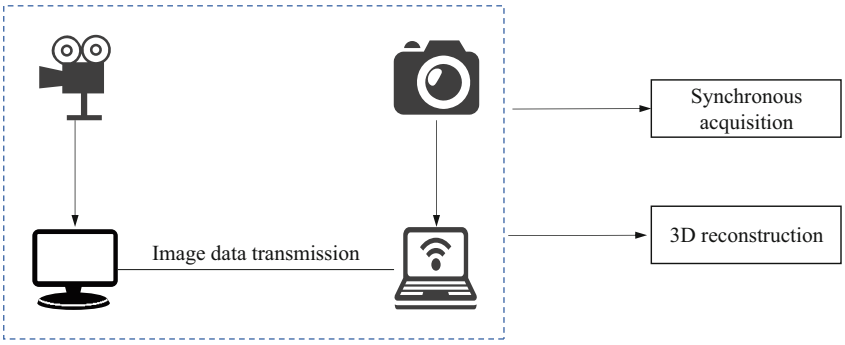

Fig. 1. Virtual reality interactive system platform model diagram. Source: drawn by the author

of VR scenes is long, the update of common software is slow, and the richness of content experience is limited to a certain extent. At the same time, due to the conflict between the image presented by the software and human visual perception, users are prone to produce 3D vertigo effect. In the field of scene interaction, the goal of VR technology is to achieve interactive experience and immersive experience, but at present, it is difficult to fully achieve the immersive effect only through visual and auditory and tactile effects. VR technology itself is still in the development stage, and it will take some time to mature, and there are still barriers to achieve perfect integration with other industries.

4.2 Higher Operating Cost of Teaching VR Equipment

As a new technology that can provide users with immersive experience, VR hardware equipment has not yet reached the mass production stage. At present, there are many colleges and universities applying VR technology equipment to teaching scenes, but the actual operating frequency of the equipment is low, which is precisely because of the high operating cost. VR technology provides personalized experience. The use of VR equipment in physical education can achieve the excellent effects of on-the-spot experience, but the operation cost is in direct proportion to the number of users. At the same time, VR technology has a long research and development cycle, the image scene with clear picture quality and obvious image edge boundary needs to be produced for a long time, which is difficult to fully meet the requirements of Taekwondo teaching for the smoothness and accuracy of technical and tactical movements. Therefore, the high operating cost of VR technology software and hardware has made those who try VR technology in the industry prohibitive.

4.3 Integration Degree of "VR + " Sports Projects Needs to be Improved

VR can achieve picture presentation, scene reproduction, and integration from the perspective of other industries, and display the scene in appropriate ways and angles. The application of VR in the field of education will flatten the theoretical knowledge, which can achieve advanced visual communication effect and improve students' learning interest and learning effect. The dynamic characteristics of physical education put forward higher requirements for operation effect of VR equipment. Visual display and interactive experience provided by VR equipment can provide students with infectious learning effects. However, due to the gap between the scenes constructed by VR and the actual competitive scenes, the integration degree of VR and the real scenes of sports projects needs to be combined with the real characteristics of the projects.

5 Conclusion

5.1 Refined VR to Meet the Demand for Lightweight Sports Equipment

Relevant researches show that headwear devices weighing less than 400g can bring better wearing experience to users. As a new form of deep digital and intelligent technology, VR has been developed iteratively, and solutions have been put forward in light

weight, optical materials, user emotional experience and other aspects to achieve green development, conform to human engineering design, and mobilize user participation from the perspective of multi-sensory. It provides a more portable experience for Taekwondo teaching in the three links of Poomsae, competition and stunts, and meets the development needs of VR applied to Taekwondo teaching.

5.2 Innovate School-Enterprise Cooperation Mode and Strengthen Value

The application of VR is conducive to the optimization of Taekwondo teaching. In order to solve the pain point of high operating cost of VR equipment and expand the school-enterprise cooperation mode, the school can purchase technology from VR manufacturing enterprises, and comprehensive universities can also provide technical talents for VR manufacturing enterprises. Through the innovative school-enterprise cooperation mode of both sides, Taekwondo teaching is supported with better technology, and talents and excellent reserve resources are cultivated for enterprises.

5.3 Deep Integration of Poomsae, Competition and Stunt Training Scenes

VR provides the possibility to simulate real competitive scenes. Through operational methods and means, it deeply digs the teaching points of Taekwondo, integrates classic training methods, and integrates Poomsae, competition, and stunt training scenes into VR scenes to improve the training effect and cultivate students' interests. Based on the research content, the framework of VR technology applied to Taekwondo teaching is constructed. The application of VR focuses on the development of VR, restores the real environment, and enables the smooth and complete display of preset scenes during human-computer interaction. Therefore, virtual simulation technology and reality are the entry of environment interaction and the core of virtual reality technology, as shown in Fig. 2.

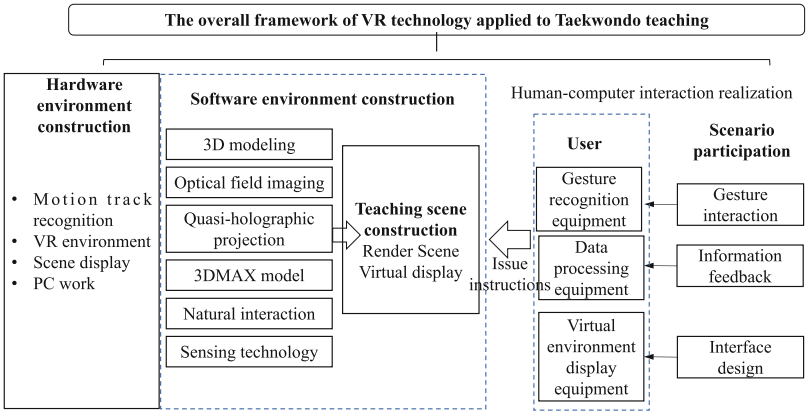

Fig. 2. VR technology applied to Taekwondo teaching framework. Source: drawn by the author

Subsequent researches can be carried out based on wearable devices, which focus on display devices in the virtual environment, gesture interaction devices for designers and data acquisition and processing devices.

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