Research Article

Research on College Physical Education and Sports Training Based on Virtual Reality Technology

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With the continuous development of society and the rapid development of science and technology, virtual reality technology is also developing rapidly. It has been widely used in all walks of life and is playing an irreplaceable role. Modern education has also begun to integrate with science. Sports are also constantly deepening the application of information technology. In order to make students have a new understanding of college physical education and sports training and improve the technical level and training quality of college sports athletes, this paper studies the application of virtual reality technology in physical education and sports training. In this paper, the semisupervised framework is used to implement motion input and interactive virtual scene algorithms. First, based on Q statistics, virtual simulation and differential selection algorithms are used to select athletic students with strong autonomous learning ability and then use the classifier's neighbor confidence. The formula selects the student with the highest learning level and marks it. Experimental results show that this method can effectively assist physical education activities and improve students' learning efficiency. Students' efficiency in sports has increased by 30%. At the same time, 2/3 of people believe that their interest in sports training has increased 80% and another 90% of college coaches believe that the use of virtual reality technology in physical education is very necessary, which can improve the technical level and training quality of college sports athletes and contribute to the reserve of Chinese competitive sports talents.

1. Introduction

Virtual reality technology can improve the basic conditions of physical education teaching, so that sports information can be effectively exchanged, and fully meet the actual needs of students' autonomous learning of sports knowledge. It is beneficial to improve the level of students' motor skills; interesting ways can also stimulate students' interest in learning and improve the efficiency of students' training. By satisfying the students' enthusiasm for physical education, the technical level of physical exercise, and the adequacy of physical education, it is of great value for realizing personal physical exercise. The combination of virtual reality technology in traditional physical education not only improves the effectiveness of physical education but also breaks the time and space limitations of physical education and sports training and encourages students to more deeply understand the problems encountered in education and training. Virtual reality technology can improve students' physical learning ability and promote students' independent thinking ability and the application value of high-quality physical exercise. Teachers can also effectively guide students' understanding of virtual reality technology and strengthen the relationship between teachers and students. Through interaction, teachers can better grasp the status of students' sports training and guide the smooth development of classroom teaching.

In the era of rapid development of information technology and continuous improvement of university network construction, the combination of virtual reality technology

and physical education training has become an important means of physical training. While using virtual reality technology, students can also enjoy professional teaching to obtain a large amount of educational knowledge and sports training skills knowledge and information. They can also learn about sports competitions, sports health, psychological and physiological information, traditional physical education, and sports. The training method can no longer be satisfied with the physical education in colleges and universities today.

Ding proposed that physical education in colleges and universities is an important part of the higher education system and the national health plan. Promoting the scientific and modern construction of the college physical education system is conducive to improving the scientific nature and effectiveness of higher education. Aiming at the problems of single teaching method and insufficient remote teaching ability in the current college physical education process, based on virtual reality technology, a virtual reality system for college physical education based on the Internet is designed and proposed: Internet of things, cloud platform, and mobile client. The system collects relevant data from the Internet of things, interacts with virtual reality scenes in real time, renders the scenes through the cloud, and experiences virtual reality through mobile terminals. The system has good application and promotion effects and provides a scientific reference for deepening the reform of college physical education, but it does not take into account the problems of cost and actual implementation [1]. Baiyu Zhou indicated that with the development of information technology, multimedia teaching has become the main trend of university teaching. At the same time, cloud computing can dynamically allocate computing resources based on the number of users and the complexity of applications. This article analyzes the application of cloud computing-based multimedia network teaching platform in college physical education. Through the questionnaire survey, the utilization rate of multimedia teaching in physical education is 75.6%. Multimedia technology has a positive impact on physical education, especially in terms of teaching philosophy (47.56%), teaching environment (39.02%), and teaching content (50%) and innovative methods (63.41%). Therefore, the innovation of college physical education models is the general trend, but the experiment did not point out the feasibility of the plan [2]. According to Ahmadi et al., sports analysis technology has been widely used to monitor potential injuries and improve athlete performance. However, most of these techniques are expensive, can only be used in a laboratory environment, and can only check a few trials of each movement. They proposed a new type of dynamic motion analysis framework that uses wearable inertial sensors to accurately assess all activities of athletes in a real training environment. They first proposed a system that uses discrete wavelet transform (DWT) together with a random forest classifier to automatically classify various training activities. The system has too high environmental requirements and it is almost impossible to gain popularity [3]. Their research results provide theoretical and experimental reference for this study.

The innovation of this paper is to realize the application of virtual reality technology in physical education and sports training by constructing a VR sports teaching model with a semisupervised framework and, at the same time, determine the implementation method through the QSCSA algorithm. Based on virtual reality technology and KINECT, a set of teaching and training system is studied. Therefore, the combination of college physical education and sports training with virtual reality technology can make students have a new understanding of college physical education and sports training and regard sports as an interesting activity and enhance the fun of training, save training venues, and improve training efficiency, which indirectly illustrates the necessity of virtual reality technology in physical education and sports training [4].

2. Research Methods for the Application of Virtual Reality Technology

Virtual reality technology (VR) has become a new term for advanced man-machine interface technology in the computer industry. It is dedicated to establishing network interaction, immersion, and imagination. At present, it has achieved success, enabling users to obtain a truly immersive high-end experience. It uses a variety of high-quality technologies, such as computer network technology, artificial intelligence, multisensor technology, and computer graphics. Virtual education in sports is considered to be a revolutionary development of educational technology. It creates a completely different learning environment, changes traditional teaching methods, and promotes interest in new ways of learning knowledge and skills. Interaction provides students with a transformation of learning. Most of the scenes of virtual sports equipment created by virtual information technology are virtual, and the training content can be constantly updated according to the needs of new equipment at any time, so that education can keep pace with the times [5]. At the same time, virtual reality technology has a strong interactivity; students can play freely in the virtual environment, wholeheartedly. It can improve students' skills in a very safe environment. In the virtual learning system, students can practice repeatedly until they learn.

In this article, in order to express the real performance of sports, virtual reality technology based on semisupervised training for athlete identification and prevention is introduced, and the application method is first determined by the QSCSA algorithm. Virtual reality technology can be used to find unmarked sports athletes, and then the classifier member committee calculates the trust of the nearest neighbors, so that unmarked sports trainees with high confidence can be included in the marked sports training [6]. This can effectively improve the generalization of the entire model. In the end, the virtual reality technology obtained after a series of screening and extrapolation is merged to make decision output.

2.1. VR Sports Teaching Modeling Method Using Semisupervised Framework

2.1.1. Selection Algorithm Based on Statistic Q.
The difference in virtual reality technology is defined as the error tendency of athletes' data to be distinguished by different classifiers. For example, f_i and f_j respectively represent two different virtual reality technologies. This article uses Q statistics to measure the difference between virtual reality technologies. The process is expressed as follows:

$$Q_{ij}\left(f_i, f_j\right) = \frac{N_{11} N_{00} - N_{01} N_{10}}{N_{11} N_{00} + N_{01} N_{10}}. \tag{1}$$

In the formula, N_{11} refers to the number of physical education students who can be correctly graded by f_i and f_j, N_{10} refers to the number of correctly graded f_j but the number of unqualified f_i, N_{01} refers to the correct grade of f_i and incorrect FJ, and N_{00} means f_i and f_j. The QSCSA algorithm strikes a balance between the number of people whose sorting is incorrect [7].

2.2. VRT Method.
The nearest neighbor confidence formula for participating in the virtual reality technology of sports athletes is evaluated, and the BL_M member classifier set is expressed as

$$H_M = \left\{BL_1, BL_2, \ldots, BL_{M-1} \mid BL_M \in H\right\}. \tag{2}$$

In the formula, H_M represents a classifier other than BL_M. If it is necessary to classify nonsporting athletes, the following basic assumptions must be met:

(1) The data comes from different universities;

(2) If the physical education students come from the same university, they are likely to be the same according to the category [8]. They can not achieve the results of our research; based on the above two assumptions, we can roughly know the confidence level of unmarked athletes.

Assuming there are two physical education students X_M and X_N, the measure of cosine similarity can be expressed by the following formula:

$$S\left(X_M, X_N\right) = \frac{X_M \cdot X_M}{\|X_M\| \|X_N\|}. \tag{3}$$

The H_M classifier can highlight a part of the unlabeled athletes added to the L_M training set of the BL_M member classifier [9]. At this time, for a certain type of confidence level, the following formula can be used to express the consistency of x_i^u and its neighbors marked as k, $\text{Conf}\left(x_i^u\right)$, as follows:

$$\text{Conf}\left(x_i^u\right) = \sum_{\substack{q=1 \\ q \neq m}}^{M-1} \sum_j^k S\left(x_i^u, x_j^l\right) \times \text{consistency}\left(BL_q\left(x_i^u\right), y_{x_j^l}\right). \tag{4}$$

Among them,

$$\text{consistency}\left(BL_q\left(x_i^u\right), y_{x_j^l}\right) = \begin{cases} -1, BL_M\left(x_i^u\right) = y_{x_j^l} \\ 1, BL_M\left(x_i^u\right) = y_{x_j^l} \end{cases}, \quad \left(x_j^l\right) \in \varphi_i^l. \tag{5}$$

It can vote according to the member classifier set H_M to get x_i^u mark:

$$\widehat{y}_u = \arg \max H_m\left(x_u\right)_{1 \leq c \leq C}. \tag{6}$$

3. VR Physical Education Training Simulation Experiment

On the basis of virtual reality technology and KINECT, a teaching and training system is being developed. The system uses virtual reality technology and 3D SMAX tools for the virtual model of the training field and uses CryEngine engine technology to convert the training field. Identify these actions and changes in the user's position through the virtual environment, and then transmit the results observed in the experiment to the VR glasses through the Bluetooth module, so that the virtual environment in the VR glasses can change the image and sound accordingly, so that user needs can be achieved. [10]. The motion recognition subsystem of the system is developed on the basis of KINECT. In the process of motion recognition, the influence caused by the user's height and body factors should be reduced, so the human bone tissue and ligament data are used through the motion recognition subsystem. The general idea of motion recognition algorithm is as follows: firstly, the position change between joints is described by bone function. According to the time series, the limited state and standard flow data of the whole motion joint position are collected and used as the reference standard. Finally, according to the DTW standard, combined with the real-time data collection and reporting standards, the movement is evaluated. The influence of individual differences on action recognition can be avoided. The specific steps are as follows:

Data collection: use the KINECT V2 bone tissue detection function to obtain the joint position data of the test athletes. Usually, the public part data is a real-time data stream, which is composed of three parts: bone tissue data stream, depth data stream, and color image stream [11], where the bone tissue data stream is used to determine human movement, and the in-depth data stream is used to change the user's position accordingly; the color image stream is used to build a virtual environment.

Bone tissue data stream processing: the newly acquired bone tissue data stream cannot be directly used to identify actions and must be deleted from the movement; after the movement is processed, the next step is to standardize the data. Finally, the joint angle feature uses the interface method to extract data from the bone tissue data stream.

Recognition of training actions: according to the standard actions of various sports courses, the common angle characteristics of each action are deleted, the limited action modes are opened, and the DTW standard matching algorithm is used to compare the action data collected by users in real education.

3.1. Filtering Experiment of Joint Position Data. The bone tissue tracking mode of the Ultra High Dynamics V2 tool can be used to receive the joint position of the test subject in the experiment. These joint position data will be used as initial data. After obtaining the preliminary test data and reducing the noise, the data should be processed to filter unnecessary noise and improve the accuracy of data recognition [12]. The common position noise filter passed by the tracking function is based on the time series data and the bone tissue data of 30 data frames between each frame of data collection, with a time interval of 30 mm. At this time, the bone data will jump and mutate because of the different speed of action, resulting in noise and continuous peak. Therefore, it is necessary to standardize the data collected by the filter.

3.2. Motion Recognition Experiment. When evaluating the similarity between joint motion characteristics and reference patterns, we generally use DTW. If the similarity of each action is higher than the predetermined standard value, it indicates that the action taken by the tester conforms to the standard. The identification process is as follows:

Selection of motion actions: link to the corresponding conditions according to the technical actions previously selected by the tester. At the same time, the motion collection database has been initialized [13].

Matching feature attributes: firstly, the movement of the athlete tester is decomposed, and the bone spatial angle features are subtracted from the time series to form a matrix. Then, DTW algorithm is used to compare the detected data with the reference standard. If they are similar, we can judge whether the decomposition satisfies the condition.

Appropriate fine movement: match and detect the bone tissue and joint characteristics of all time nodes of the technical movement, and after completing all the tests, judge the integrity of the overall movement based on all the test results.

Motion finite state machine matching: match and detect bone and joint features at all time nodes of technical motion. When all the tests are completed, the integrity of the entire operation of the tester will be judged based on all the test results [14].

3.3. Implementing Survey Experiments. After the success of the experiment, 30 volunteers were selected to experience virtual reality technology in sports training, and a feedback survey was conducted on their feelings and views of virtual reality technology in sports training by using questionnaire survey.

4. Application Analysis of Virtual Reality Technology in Sports Training

4.1. Feedback and Analysis of College Volunteers on Virtual Reality

4.1.1. The Influence of Virtual Reality on the Interest of College Sports Training. 15 volunteers thought that virtual reality technology made them very interested in sports training; 5 volunteers thought they were interested; 7 volunteers said they were not clear and could not determine whether it was helpful or not; 2 volunteers thought that virtual reality technology is not good for their own training; another volunteer thinks that virtual reality is very bad for their interest in learning [15]. On the whole, most college volunteers believe that the use of virtual reality technology in physical education training is beneficial to their interest in learning, as shown in Figure 1.

4.1.2. The Impact of Virtual Reality Technology on Sports Training Effects and Self-Confidence. 15 students think that virtual reality technology is very effective to improve the effect of sports training, 9 students think it is effective, 2 students are uncertain, 3 students think it is invalid, and only 1 student thinks that virtual reality technology is very unfavorable to improve the effect of sports training. Volunteers who think that it is beneficial say that virtual reality is a very interesting training experience, and training in a virtual environment is a very exciting process, which greatly improves training efficiency [16]. Students who think that they are disadvantaged said that there is a big gap between the practice in the virtual environment and the real training, and the training in the virtual environment cannot help them improve in actual shots; the students who think that it is very disadvantageous think that wearing VR glasses made them lose. The sense of direction and security becomes intimidating and unable to train normally. The above shows that although there are still various problems, the improvement in training effect brought by virtual reality is significant. There are 18 volunteers who think that virtual reality is very beneficial to their sports self-confidence; 3 students think it is good; 5 students are not sure; 1 student said that virtual reality is not conducive to their self-confidence in sports; the other 2 students said that virtual reality has no effect on their self-confidence in sports. The trainees said it was very unfavorable to them, as shown in Figure 2. Most of the students who think it is beneficial said that in the virtual environment, they can play freely and do not care about others' eyes. Even if they make a mistake, they will not be ridiculed. On the contrary, the students who think that virtual reality is not good for their self-confidence in sports said they feel that putting on the VR eyepieces may seem strange, and they are even more worried that the eyepieces falling during exercise will be laughed at by other students. However, judging from the overall statistics, virtual reality technology has a positive effect on students' confidence in sports [17].

4.2. Analysis of the Necessity of Implementation

4.2.1. Avoiding Accidents in Sports Training. For many highly antagonistic sports, such as taekwondo and boxing, it is often impossible to avoid injury accidents when training in reality. This also makes many colleges and universities abandon the curriculum of these programs. If students can use computer virtual technology to practice these dangerous sports items in the physical education class, they can avoid excessive injuries during training. In this nonreal simulation environment,
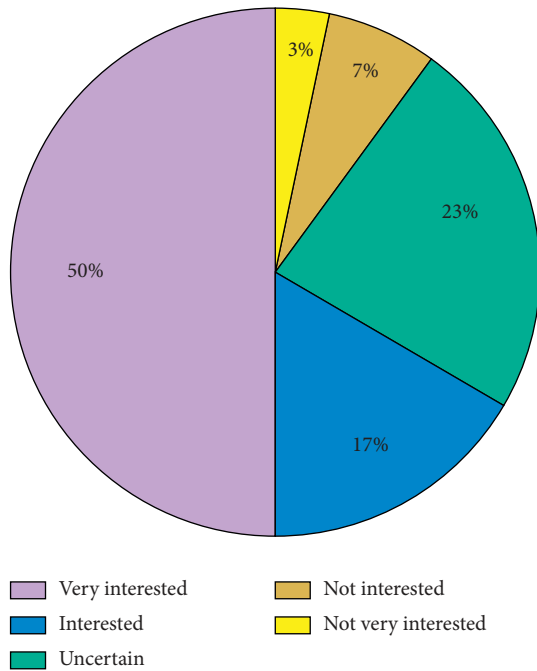
FIGURE 1: The impact of virtual reality technology on sports training interest.
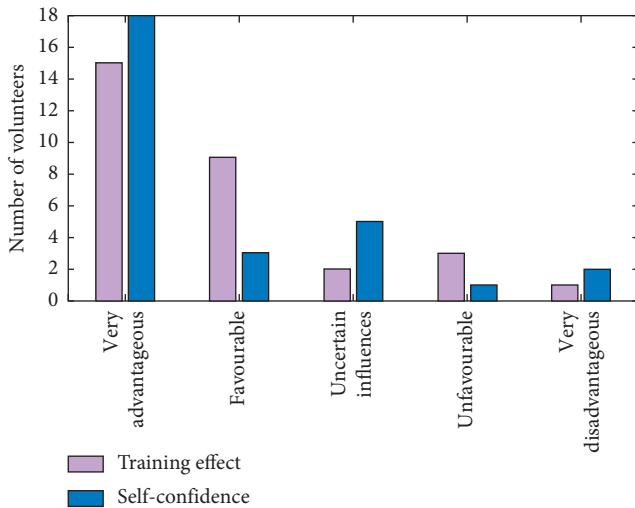

FIGURE 2: The impact of virtual reality technology on the self-confidence and effectiveness of sports training.

students can let go of their hands and feet to train the application of virtual reality technology in various fields of sports, without worrying about possible accidents on their hands or other. Not only that the computer virtual environment can evaluate the students' movements it can also correct the students' deficiencies in the training process in time and improve the quality and efficiency of training [18].

4.2.2. Avoiding Sports Injuries Caused by Difficult Actions. In recent years, sports technology has continued to develop, and the technical difficulty in various antagonistic sports projects has become increasingly difficult. This means that

many academics will be injured due to the difficulty of training these projects, and facts have proved this is true in real sports training. The use of computer virtual technology can circumvent this very well. The use of virtual reality technology for virtual action experiments can completely avoid the sports injuries caused by difficult and complex technical actions to students [19]. Participants can safely do various difficult movements in the virtual experimental environment.

4.2.3. Changing the Defects of Insufficient Material Conditions. In actual physical training and teaching, due to material conditions that cannot fully meet the needs of sports training, schools have to purchase equipment to build training grounds when funds permit. Since then, many sports trainings have to be cancelled due to funding problems. The use of computer virtualization technology can change this situation well. Students can perform sports training through computers and get rich sensory enjoyment, without is actually setting up a huge training venue.

4.3. Application Analysis of Virtual Reality Technology. The virtual reality system is mainly constructed by two parts: a human-machine interface device and a virtual reality engine. As the carrier of the virtual assembly process, it provides a large number of function libraries, so that users can easily construct virtual scenes and process various scenes [20]. This chapter briefly introduces the composition of the virtual reality system and the working principle and scene structure of the typical virtual reality development software WTK.

4.3.1. The Composition of the Virtual Reality System. Generally speaking, a complete virtual reality system mainly consists of the following parts: (1) virtual reality environment platform, mainly WTK, MultiGen, and other virtual reality development platforms; (2) virtual environment generation equipment, mainly some high-performance computing virtual machines, mainly computer equipment; (3) perception devices, mainly virtual peripherals such as data gloves, helmet displays, three-dimensional mice, and joysticks; (4) pose tracking devices, such as tracking locators. The typical composition of the virtual reality system is shown in Figure 3. Among them, the three-dimensional reconstruction technology is a direct technical means to obtain the participant's motion posture and construct the landscape in the pseudoenvironment [21]. Image-based 3D reconstruction technology passively captures scene information (including participants themselves) within the field of view by arranging a camera with a certain topology structure. Then, by analyzing the passive cues such as brightness, shadow, focal length, texture, and parallax in the image, three-dimensional reconstruction is carried out, which has less restrictions on the scale and position of the modeled scene.

4.3.2. Virtual Reality Development Software WTK. WTK is a cross-platform 3D image development toolkit, which is mainly used for the development of virtual reality
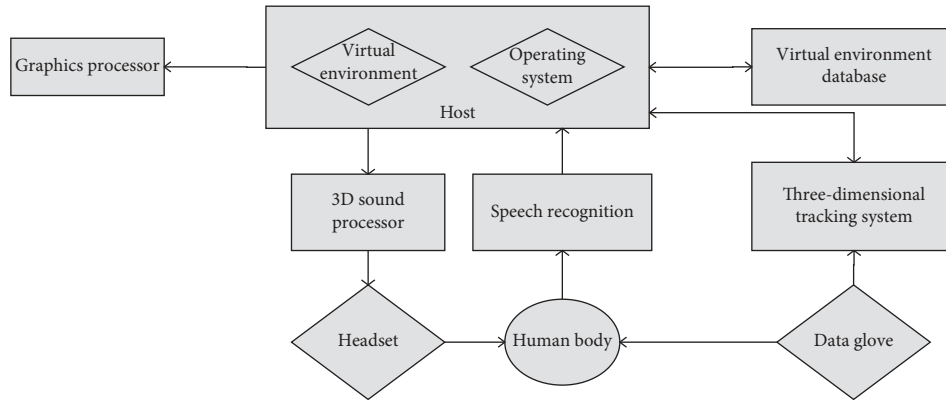
FIGURE 3: Typical composition of a virtual reality system.

simulation applications. The WTK function library contains a large number of C language function libraries, and users can programmatically call the functions in the library to construct virtual scenes. In terms of scene construction, WTK uses a hierarchical scene structure (called scene graph) to organize. WTK scene is composed of geometric model, light source model, pose model, and smoke model [22]. Some geometric models and light source models are created outside WTK, and some are created dynamically within WTK. The pose is used to describe the position and posture of the geometric model and the light source model. The smoke model is mainly used to model the effects of smoke, fog, etc. in the real environment. Using virtual reality technology to build a physical education and sports training system can use virtual reality development software WTK to more quickly apply virtual reality technology to college physical education, so that college physical education can develop rapidly, and students can experience the latest teaching mode, increase interest in sports training, and increase the efficiency of sports training.

4.4. Analysis of the Basic Situation of the Application

4.4.1. Cognition of Virtual Reality Training System by College Sports Teams. Due to the relatively large degree of difficulty of computer virtual reality technology in sports training, many aspects of virtual reality software have not been developed in the more complex sports virtual training [23]. Only a small number of sports research institutes have established virtual reality environments for sports training, and most sports academies' computer virtual reality is still at the theoretical stage. At present, except for the national trampoline team, national diving team, and national gymnastics team, computer virtual reality technology is used in daily training; most sports teams have not used it. This also leads to computer virtual

reality technology not being well applied to actual sports training. Through the investigation of the actual situation of coaches and athletes, the results of the questionnaire of computer virtual reality technology cognition are obtained. Most people know about the application of virtual reality technology in sports training, as shown in Table 1.

4.5. Application Analysis of VR Sports Teaching Based on Semisupervised Framework. The semisupervised framework of VR physical education is mainly based on the research of virtual reality technology and proposes an innovative method of physical education. The realization of this method is based on the semisupervised training framework. In the method proposed in this paper, the choice of virtual reality technology is achieved through the selection method based on Q statistics. When the feature and feature combination are different, the semisupervised training method proposed in the article and the supervised training method are compared and analyzed. The above results can be concluded that the proposed method performs well under the three standards, as listed in Table 2. Under different feature datasets, the accuracy of virtual reality technology is affected by unmarked sports students and marked sports students, as shown in Figure 4. It can be concluded from Figure 4 that in the process of physical education teaching, coaches are required to determine the best state of students' physical performance and the reasons for not achieving the best results, which is very important [24].

In the process of physical education, virtual reality technology can be used to find unmarked physical education students. Then, the effective evaluation of the sports level of sports students can be achieved through the setting of the neighbor confidence. The research results show that the integration of virtual reality technology into college physical education is one of the ways to reform and innovate college physical education.

TABLE 1: Computer virtual reality technology cognition questionnaire.

Occupation	Understanding the percentage of virtual reality training (%)	Percentages who think virtual reality training is important (%)	Percentages trained in virtual reality (%)	Percentages who think virtual reality training is helpful to them (%)
Coach	98	60	20	50
Training unit leaders	99	40	10	40
Junior athlete	95	80	5	80
Senior athlete	95	30	20	10

TABLE 2: Recognition accuracy under supervised training and semisupervised training strategies.

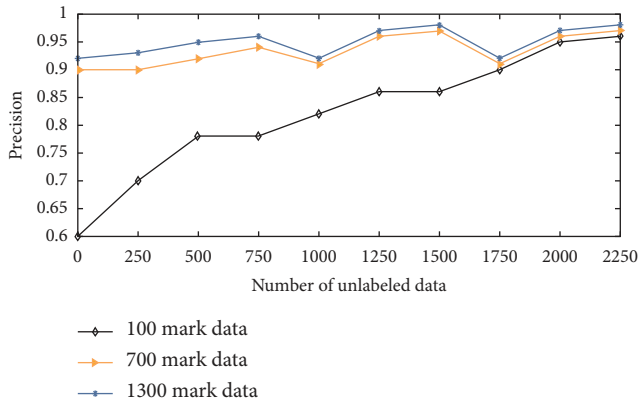| Feature descriptor	Precision		Recall		F-measure	
	Labeled	Art	Labeled	Art	Labeled	Art
JPCD + SRD	0.62	0.94	0.62	0.93	0.63	0.95
SRD	0.63	0.99	0.61	0.95	0.62	0.97
JPCD	0.81	0.98	0.82	0.96	0.71	0.97
Avg	0.71	0.95	0.73	0.98	0.63	0.96

FIGURE 4: The impact of different numbers of unmarked sports students on VTR.

5. Conclusions

Media technology is developing rapidly. Virtual reality technology is its main development trend. It is also an innovation and important development. People pursue reality and humanized media technology and desire speed, convenience, and intuitive information exchange, which violates the reality. The constraints of physical, physiological, and social conditions still have to overcome the constraints of time and space, and significant progress has been made in the field of two-dimensional virtualization. As a medium, virtual reality technology has various advantages of multimedia communication, overcomes the material limitations of traditional media, and provides people with an unprecedented immersive and amazing experience.

Nowadays, colleges and universities have begun to establish a university network in order to accelerate the development of education, but for more teachers, this is a severe challenge, for the continuous development of information technology, the arrival of the computer age, and the rapid development of sports modernization.

Information-based classrooms will gradually enter major universities. Through the above analysis, it can be seen that virtual reality technology will be further developed in the field of sports. The management of sports activities in the field of office automation through information technology will be used to establish a simulation laboratory to drive sports to a higher development direction [25]. Virtual reality technology can be used in sports skills, guidance, and management. The most effective way is to use multimedia technology for sports activities, which can improve the effectiveness of physical exercise.

Virtual reality technology is a bright jewel in the development of media technology. It has unique advantages in many fields. It hides huge research value and commercial market. It is in the new field of communication that virtual reality technology will bring to us. We must understand its development law, correctly guide its development direction, serve mankind, benefit society, and make people's spiritual world more complete. Finally, combining the fictional virtual world with the real world can realize the real value of virtual reality technology and make human society progress.

Data Availability

No data were used to support this study.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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