Comparative Analysis of Internet of Things-Based Simulation and Real Field Teaching Modes in Different Campus Golf Rooms Exploring E-Learning Perspectives

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Abstract. At present, golf is not only a sports event, but with the popularity and promotion of golf worldwide, many people regard it as their leisure way of amateur entertainment under the Internet of Things implementation model. However, the high cost of venues and sports makes many people afraid. Therefore, to make golf training intuitive and intelligent, golf trainers have become a new way of practice and sports. Through the golf trainer, the golfer can not only correct his swing and make his swing more and more standard but also let the golfer grasp the strength of the putt. It not only plays the role of training but also can experience the fun of golf anytime and anywhere, with excellent development potential. This paper generates a virtual 3D golf course scene using graphic image processing technology and 3D modeling technology. Through the interaction of vision, hearing, touch, and other aspects, people can feel immersed and compare it with the real-scene teaching mode. A total of 48 classes of G171 (19 boys, seven girls) and G172 (16 boys, six girls) in the social sports major of the Department of Physical Education are taken as teaching experimental objects; the control participatory teaching mode and the traditional "transfer acceptance" teaching mode are the only variables. The experimental results show that the simulation system can play a perfect role in golf training.

Keywords: Internet of Things; golf; Scene simulation; Teaching comparison; E-Learning Perspectives
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1 INTRODUCTION

Playing golf is a sport with unique charm. It is an activity for people to exercise their bodies, cultivate their sentiments, and improve their skills in the natural and elegant green environment. It originated in Scotland at the beginning of the 15th century and then spread to Britain. It was introduced to India, Australia, New Zealand, Canada, South Africa, Thailand, and the United States at the

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beginning of the 19th century. It was introduced into Asia in the 1920s. According to the "Pill Classic," players who beat pills respect each other and consider how to hit the ball from the other's point of view, and it is a very gentlemanly sport [19]. The painting of the "pushing pills mural" in the Yuan Dynasty also proves that "beating pills" is the present golf.

Contemporary golf courses are built in the original Scottish style. The golf course is generally built on the coastal sandy land where grass grows. There should be green grass and flat beaches, and rolling mountains and streams are indispensable. Edinburgh (located in Scotland) is the first golf club in the world. In the early 1990s, with the in-depth development of reform and opening, many foreign investors, including Hong Kong, Macao, and Taiwan, flocked to some emerging regions in the south to invest and develop, promoting the rapid development of the local economy, and a large number of influential consumers appeared at the historic moment. Many golf courses have been established in Guangzhou, Xiamen, and other places. However, due to the shortage of golf course resources at that time, there was a case of speculation on membership cards. Now, the golf market is up-and-coming, so golf courses are opening in succession all over the country. There are nearly 30 golf driving ranges in Shanghai alone. However, for quite a long time, golf has been positioned as a high-end consumer good by many golf courses and equipment dealers. However, with the increasingly fierce competition, each stadium, under the pressure of operation, has reduced the consumption standard to attract more customer resources. Therefore, for most golf enthusiasts, going to the golf course to play golf is within reach. In January 1986, China held the "Zhongshan Cup" golf invitational tournament for the first time. At present, golf is rising in China [26].

With the arrival of the Internet of Things+, the 5G information age, and the new curriculum reform, traditional classroom teaching will be significantly changed, and the teaching methods and means, such as flipped classrooms, simulated teaching, and micro class, which came into being at the historic moment, will gradually be carried out in various colleges and universities. Flipped classroom and simulated teaching are compatible. Teaching is done online and offline, with pictures and texts, and teachers and students switching. It reflects that teachers are the leading role, students are the main body, and students' personality is highlighted, which can gradually enable students to form the consciousness of lifelong sports.

Based on the above practical application background, the golf motion parameter measurement system, and analyzing the difference between the simulation system and the actual teaching system, this topic designs a golf motion parameter measurement system to retain the advantages of high measurement accuracy of radar sensors. On this basis, it can improve the detection rate of the measurement system for low-speed golf balls, reduce the system's false alarm rate when there is external interference, and make the output result of the measurement system more accurate and reliable.

The sensor fusion of the golf simulation teaching system can meet the improvement requirements of the measurement system's current radar sensor measurement. By adding redundant measurement sensors based on existing radar sensors as an auxiliary measurement method of radar sensors, the multi-sensor system is used to measure the golf ball's motion state and motion parameters. The results obtained by multiple sensors in the system are fused and analyzed to achieve reliable detection of the golf ball's motion state, accurate measurement of the golf ball's motion parameters, and improvement of the golf ball's motion parameter measurement system. Improve its reliability and environmental adaptability.

The information obtained from the golf simulation teaching system is redundant and complementary, and the way to get information is low-cost. Considering the characteristics of several golf motion parameter measurement sensors, the visual sensor has the advantages of being non-contact and easy to use. Among them, the monocular optical measurement sensor only uses one camera for image acquisition and measurement; compared with other motion parameter

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measurement sensors, it has the advantages of simple structure, convenient calibration, low cost, large field of view, convenient installation, debugging, etc. It can improve the motion parameter measurement system at a lower price, and the scheme is easy to realize.

To sum up, the comparative analysis of simulation and real-field teaching modes based on the Internet of Things in different campus golf rooms has vital practical significance.

2 RELATED WORKS

In foreign countries, the research on virtual golf teaching simulators began in the 1990s [2]. It is pointed out that the American series of golf simulators focuses on accuracy and the authenticity of course simulation. Accuracy mainly refers to two aspects of accuracy. First, the accuracy of golf movement data collection. American series products mostly use data sensors based on radar technology and high-speed camera sensor technology for collecting golf movement data. Secondly, the accuracy of virtual golf physical motion simulation can broadly reflect the reality of golf simulators to users[25]. The main representative product is the indoor golf simulator based on a high-speed camera sensor developed by an American company, which is also the simulator designated by the Tour. [9] According to the analysis, Korean golf simulators prefer the simple entertainment of game consoles. Their user interfaces are relatively simple, and the simulation colors of golf courses are more colorful. Still, the scene's reality could be better than the American series of simulators. The data sensors used are mainly infrared detection technology. The representative products are golf simulators based on infrared detection technology developed by Korean companies.

In China, the research on virtual golf teaching simulators needs to be on time, and it is nearly more than years late compared with foreign countries. At present, the domestic market mainly sells foreign golf simulators as agents. There are also a few domestically independently developed products, such as the blue-sky elf golf simulator based on photosensitive detection technology and the golf simulator developed by Beijing Sport University. [4] It is found that compared with foreign products, the golf simulator independently developed in China still has a big gap, mainly reflected in the acquisition accuracy of data sensors, the simulation accuracy of golf ball motion trajectory, and the authenticity of golf course simulation. However, the products independently researched and developed in China also have considerable market competitiveness with their relatively perfect after-sales service and low prices. Classroom satisfaction, extracurricular participation, enthusiasm, final score assessment, and the participatory teaching model can improve teaching efficiency and enable students to master relevant knowledge and skills faster.

A relatively comprehensive discussion on analog teaching was made, pointing out that analog learning is a combination of various modern network technologies (such as teaching platforms and virtual classrooms)[16],[21],[24], a combination of multiple teaching theories (such as cognitivism and constructivism) and multiple teaching designs, and a combination of various teaching technologies (such as videos, courseware, question banks) and face-to-face teaching to achieve specific teaching goals, The purpose is to achieve efficient teaching results. [3] The simulated teaching is applied to undergraduate pharmacology teaching. The simulated learning course reduces the time for classroom teaching of fundamental principles so that more time can be spent understanding more complex principles. Research shows that imitative learning is feasible in undergraduate pharmacology teaching, which improves students' interest in this course, improves learning quality, and provides support for teaching. Students believe this "integration" is more meaningful than pure online learning. [23] The key factors of implementing simulated learning in higher education are concluded. About 50 factors are summarized into ten categories of critical factors and four hybrid learning perspectives to identify the key points of the contemporary hybrid learning structure system. Simulated learning can be regarded as a mature educational concept today, but it still needs to be adjusted according to the characteristics of various disciplines.

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Taking the mechanical course as an example, mixed teaching is adopted, and the student's academic performance is taken as the measurement index[22],[5]. It is concluded that the students under mixed teaching have gained more concepts and higher performance, and all kinds of indicators are better than in traditional education.

To sum up, the author believes that at this stage, the participatory and simulated teaching models have made specific achievements and accumulated particular experience in the research and application of golf teaching in multiple projects and even courses of various disciplines on different campuses. However, the author found that the application and study in golf courses could be more robust by referring to diverse literature. Based on the characteristics of the participatory teaching model, virtual teaching model, and golf project, the author believes it is feasible to compare the two teaching models and introduce the better one to golf-specific teaching in physical education departments of ordinary colleges and universities in China.

3 GOLF VIRTUAL TEACHING MODEL BASED ON THE ENTITY OF THE INTERNET OF THINGS

The virtual golf teaching simulation system applies distributed virtual reality technology in sports training [18]. It mainly uses computer 3D graphic image simulation technology, physical simulation technology of ball movement, ball movement data acquisition technology, and high-definition display technology to conduct a 3D visual simulation of virtual golf course scenes, golf ball flight trajectory, collision effect, and flight data, as shown in Figure 1.

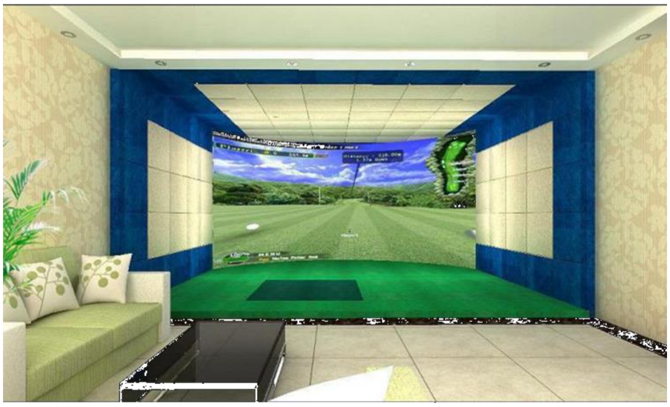

Figure 1: Schematic diagram of virtual golf teaching simulation system.

The virtual golf teaching simulation system consists of hardware and software systems. The hardware is divided into a computer hardware system, a high-definition display screen, a golf sports data acquisition system, a high-definition projection system, golf equipment, and a high-definition audio system. The software mainly includes a 3D visual simulation module, user data display module, swing posture video analysis module, physical special effect simulation module, and user interface interaction module [14]. Through hardware and software, golfers are on an actual golf course and use real golf equipment to hit real golf balls. The system collects golf ball data and processes it to display the flight scene of golf balls in the air on a large projection screen in real time. With clear and realistic 3D scenes, bright and natural colors, and accurate data measurement and analysis, golfers can enjoy visual enjoyment that cannot be felt on the actual court, so they can feel immersive, as shown in Figure 2.

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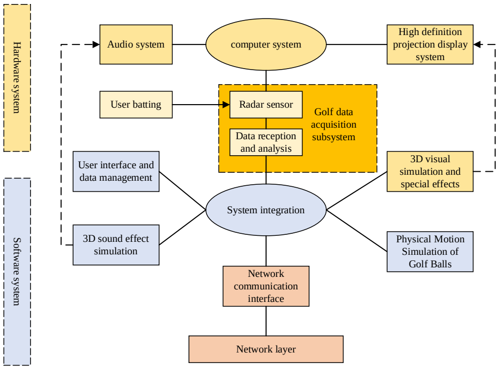

Figure 2: Overall structure of virtual golf teaching simulation system.

The virtual golf teaching simulation system research focuses on data sensors and graphic simulation technology [27]. Data sensors primarily collect accurate real-time golf movement data or human-hitting posture data. At present, relevant foreign golf simulator manufacturers mainly use radar sensor technology, infrared detection technology, and high-speed camera acquisition technology, among which the stereo high-speed camera acquisition technology is the most advanced [17]. Graphic simulation technology mainly simulates more honest and natural golf scenes and more accurate golf physical motion effects. Currently, there are many schemes for virtual golf simulation, such as self-developed graphics development or mature game engines, as shown in Figure 3.

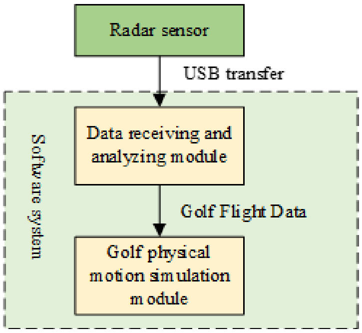

Figure 3: Virtual golf teaching simulation radar measurement subsystem.

As shown in Figure 3, data reception and analysis are mainly based on the function library of radar sensors. This part is primarily responsible for the reception and analysis of expensive radar data and provides initial data for this system's golf physical motion simulation module [8]. The function library offers a wealth of function interfaces. Developers can receive and analyze golf ball flight data collected by radar sensors by calling this drag function interface and then transfer the analyzed data to the golf ball physical motion simulation module for golf ball physical motion simulation [11]. The radar sensor has the highest measurement accuracy. It is an electronic device that uses radar waves to measure golf ball motion parameters. It is a civilian product of military high-speed flying object detection technology [10]. The radar sensor adopts phased array detection technology and uses a microstrip patch antenna to transmit and receive electromagnetic wave signals. The application of this technology makes the radar equipment easy to integrate, small, high in sensitivity, and able to achieve high-precision detection of targets. The radar sensor has excellent advantages in speed

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measurement and position detection. It is widely used in high-precision speed measurement occasions such as virtual golf [6],[15],[20],[7],[1]. The radar sensor can measure a series of initial hitting and swing data, such as ball speed, elevation of initial movement, horizontal deflection angle, initial ball reverse rotation, lateral rotation, and club speed, from multiple points in an all-around way. Electromagnetic waves complete the measurement process, and the radar sensor has strong adaptability to the environment. The measurement principle of the radar sensor is shown in Figure 4:

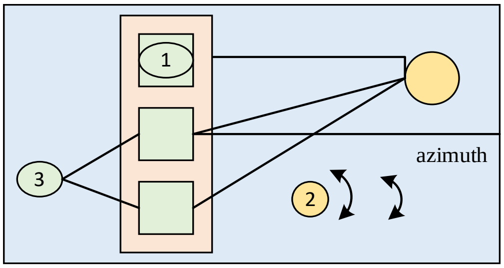

Figure 4: Radar sensor of virtual golf teaching simulation system.

The 3D visual simulation and special effect rendering subsystem of the virtual golf teaching simulator developed in this paper is based on computer graphics simulation technology and is designed and implemented under the platform using the VISUAL 2008 development environment and 3D graphics rendering engine. The subsystem first loads the 3D scene model generated by 3D modeling software and then uses the 3D graphics rendering engine to uniformly manage, schedule, and dye the entire 3D scene. Finally, the rendering display module displays the dye results of the whole scene in real-time through the display device. The system structure of the subsystem is shown in Figure 5:

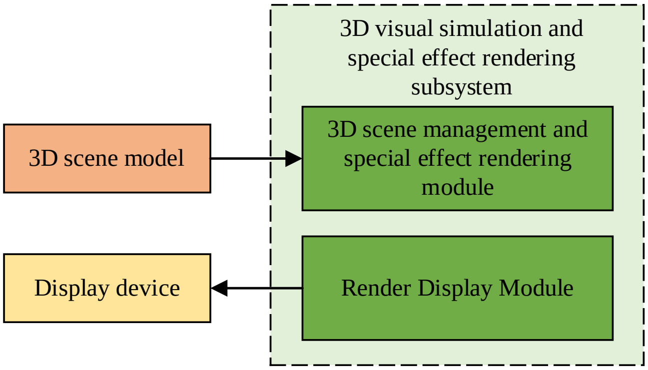

Figure 5: Virtual golf teaching simulation 3d simulation subsystem.

The final rendering result of the 3D simulation is shown in Figure 6. In the golf swing video processed in this paper, because the camera has been shooting in real-time when the players are moving, there are many non-motion video clips, so it is necessary to segment the video behavior sequence of the captured video. Complete golf swing behavior sequences are segmented when the video behavior sequence is segmented, laying a foundation for the subsequent golf swing action comparison analysis. Video behavior sequence segmentation can extract players' complete golf swing behavior sequence and separate it from the redundant non-golf swing behavior sequence to improve the efficiency of subsequent human behavior analysis.

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Figure 6: Final rendering result of 3D virtual golf teaching simulation.

After the interested behavior sequence is obtained through behavior sequence segmentation, it is necessary to analyze the behavior sequence. In traditional sports training, coaches often explain a static action of the students, or coaches demonstrate correct action with one essential action by one, which requires more attention to the more critical frames in the behavior sequence in the subsequent behavior analysis. For this reason, it is necessary to extract key frames from video behavior sequences before motion analysis. After the keyframes are removed, the golf swing action sequence and key action frames are compared and analyzed to detect the wrong actions of the students, and the corresponding guidance is given.

The primary function of a virtual golf teaching simulation system is golf training; of course, it can also play a role in entertainment. Training functions mainly include swing and putt training, two leading indicators of golf [7]. The system realizes the training by setting up the practice field scene and the putter field scene. In the three-dimensional scene of the driving range, swing data are collected through serial transmission, mainly including initial speed, angle, deflection angle, etc. A series of algorithms studied in the system are used to analyze and simulate relatively accurate swing data, and the golf ball's trajectory after swing is displayed [1]. In this way, after each swing, the golfer can master his swing strength by observing the movement distance of the ball and master his swing action standard by following the angle of the ball. The putter data are collected through a serial port in the putter 3D scene, mainly including putter speed, deflection angle, etc. Through a series of algorithms to analyze and simulate the relatively accurate putter data. It also shows the movement of the ball behind the putter. In this way, after each putt, the golfer can master his putt force by observing the movement distance of the ball and master his angle of exit by following the deflection angle of the ball. In this way, repeated training can make our drill action more and more standard to master the strength and angle of the push rod well. In the simulation scene, we can play anytime and anywhere. This is suitable not only for ordinary golf enthusiasts but also for professional golfer training. For example, the structure of putt training is shown in Figure 7.

The swing training takes the PC as the processing core. All the data collected by the laser receiver tubes are transmitted to the PC through the serial port. The operation and use of the software are realized on the PC. The data acquisition mainly uses laser infrared technology. There are three groups of laser transmitters and laser receivers on the golf trainer: two groups located in the horizontal direction at the bottom of the golf trainer and one at a 60 ° angle between the vertical and horizontal direction.

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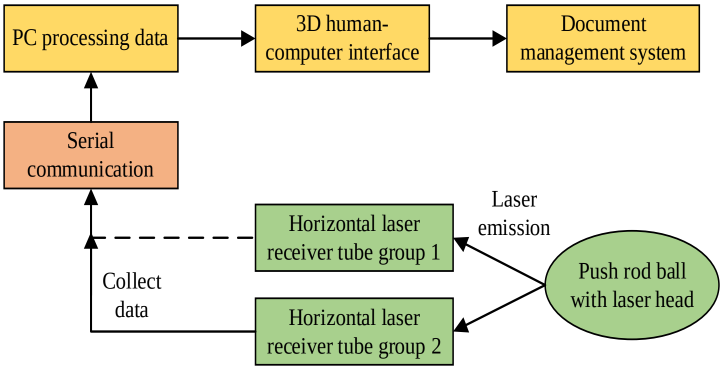

Figure 7: Putter training structure of virtual golf teaching simulation system.

In addition, this system leads out a sound acquisition controller, which is used to collect the hitting sound. When hitting the ball, two groups of lasers in the horizontal direction will manage the two groups of numbers and send the two groups of numbers collected and processed through the serial port to the golf trainer software for processing to calculate the speed and offset angle of the ball. At the same time, a group of numbers will be collected in the vertical direction, and the data collected and processed through the serial port will be sent to the golf trainer software for processing to calculate the height of the ball. The data will be displayed in the 3D human-computer interface after processing. And simulate the teaching movement of golf.

4 METHODS

In this study, 48 students from Class G171 (19 boys, seven girls, a total of 26) and Class G172 (16 boys, six girls, a total of 22) of Grade 2017 in the social sports major of the Department of Physical Education were selected for the teaching experiment. Class G171 is the experimental class, and Class G172 is the control class.

Research hypothesis 1: students' academic achievements in particular subjects. All students were assessed in a closed-book examination of golf's specific theory, and the results were analyzed. It was expected that the results of the special theory examination.

Research hypothesis 2: students' practical participation ability. By comparing students' performance in the middle and later stages of the teaching experiment and the scores of each index measurement scale, participation and autonomy are expected to be found.

Figure 8 for the design of relevant experiment contents:

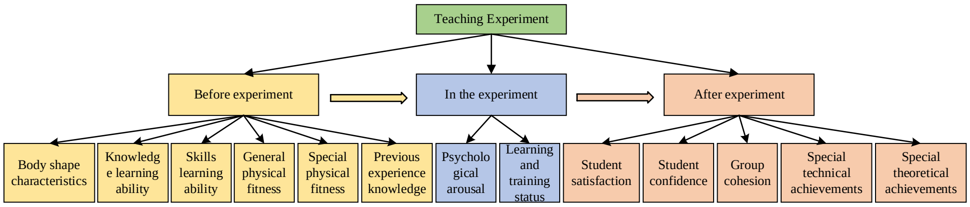

Figure 8: The content design of the simulation and real-scene teaching mode comparison experiment is based on the Internet of Things in different campus golf rooms.

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The experiment content is designed according to the experiment's purpose and specific conditions (as shown in Table 1). The teaching experiment in this study compares the students' theoretical knowledge learning and understanding ability through their college entrance examination scores in the early stage of the experiment to determine the differences between students in this respect. The physical college entrance examination results can determine the differences between students' physical quality and physical learning ability. The selected general biological and exceptional physical fitness indicators were to compare students' physical fitness differences before the experiment. In the later stage of the experiment, the differences between the two teaching modes in students' unique skills and theoretical learning were determined by a quantitative comparison of students' skill scores and academic scores. To investigate the students' learning attitude, enthusiasm, and other aspects, and compare the differences in students' golf learning interest and learning effect between the two classes.

Special quality		*Test Name*	*Three sexual tests*			*Evaluation by an expert group*
			reliability	*objectivity*	*Effectiveness*	
Special strength quality	*Upper limb strength*	*push-up*	*0.97*	*0.99*	*Acceptable*	*Valid*
	Lower limb strength	*Standing long jump*	*0.95*	*0.77*	*0.98*	*Valid*
	Lumbar abdominal strength	*Sit-ups with knees bent*	*0.91*	*0.96*	*Acceptable*	*Valid*
Special endurance quality	*Lumbar and abdominal endurance*	*1 min sit-ups*	*0.92*	*0.99*	*Acceptable*	*Valid*
Special flexibility	*Torso flexibility*	*Sitting forward flexion*	*0.95*	*0.99*	*Acceptable*	*Valid*
	Shoulder joint flexibility	*Shoulder turn test*	*0.65*	*0.99*	*Acceptable*	*Valid*
	Special balance quality	*Balance pad squatting*	*reliable*	*objective*	*Acceptable*	*Valid*

Table 1: Physical fitness measurement indicators for comparison of golf teaching experiment.

In the experiment, we measured the students' learning state, emotional changes, sports psychological arousal, and other aspects with the psychological scale, quantified the scores, sorted out, and analyzed them. In the later stage of the experiment, the student's mastery of special theoretical knowledge was investigated using tests, and their satisfaction, self-confidence, and collective cohesion after the whole teaching experiment were measured. The specific categories of questionnaires are shown in Table 2.

Questionnaire name	*Questionnaire significance*	*Questionnaire*

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		application
Student Psychological Arousal scale	*To understand the psychological arousal intensity of students in golf teaching.*	*Mid experiment*
Student Training Status Detection Scale	*To understand the physical and mental state of students in golf teaching.*	*Mid experiment*
Student Learning Satisfaction Scale	*To understand the students' satisfaction with teaching after the teaching experiment.*	*The later stage of the experiment*
Table of cohesive strength of student groups	*To understand the students' subjective attitude towards the class group after the teaching experiment.*	*The later stage of the experiment*
Student Self Confidence Scale	*Understand the subjective experience and evaluation of students' self-confidence after teaching experiments.*	*The later stage of the experiment*

Table 2: Details of golf teaching experiment survey questionnaire.

The expert group conducted research by demonstrating the experimental measurement indicators, practical design arrangements, variable control, questionnaire design, student practice performance, and other aspects. Finally, it carried out relevant sorting, quantification, and statistics. The specialist group demonstrates and analyzes the feasibility, effectiveness, reliability, and authenticity of the experiment arrangement and control. In the process of indicator confirmation before the experiment, the validity of the experimental indicators was confirmed by the expert group under the demonstration of the general physical fitness indicators, particularly biological fitness indicators, and related questionnaires by drawing on the research results of others in combination with the needs and purposes of the experiment. The specific demonstration results are shown in Table 3.

Expert group			*Expert group 1 (N=7)*	*Talented group 2 (N=8)*	*Talented group 3 (N=7)*	*Talented group 4 (N=7)*
Argument content			*Experimental feasibility and design*	*General physical fitness indicators*	*Specific physical fitness indicators*	*Validity of measurement scale*
Demonstration results	*excellent*	*Number of people/people*	*6*	*6*	*7*	*6*
		Proportion/%	*85.72*	*75.01*	*100.00*	*85.72*
	good	*Number of people/people*	*1*	*2*	*0*	*1*
		Proportion/%	*14.29*	*25.01*	*0.01*	*14.29*
	differenc	*Number of people/peopl*	*0*	*0*	*0*	*0*

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	e	*e*				
		Proportion/%	*0.00*	*0.00*	*0.00*	*0.00*

Table 3: Confirmation of the effectiveness of the comparative indicators of two different teaching situations.

It can be seen from the expert argumentation results in Table 3 that this study has good argumentation results in terms of the feasibility of experimental design, the selection of general physical fitness indicators, the selection of particular biological fitness indicators, and the effectiveness of the questionnaire scale. All experts agree with the experimental argumentation in the four parts, indicating the feasibility of the experimental design, the selection of general physical fitness indicators, The selection of particular biological fitness indicators, and the validity of the questionnaire can support the research content and needs. This research is scientific and practical.

5 CASE STUDY

The main content of the fundamental situation analysis of the experimental object is to analyze and compare the observed object's basic body shape, knowledge, understanding ability, and skill-learning ability. The indicator analysis after the experiment is mainly to compare the learning satisfaction, self-confidence, group cohesion, exceptional theory scores, special skills scores, and other indicators of the two classes of students after the teaching experiment and find out how the teaching results of the two teaching models differ. Finally, the phenomenon and problems in the experimental process are analyzed to reflect on teaching.

5.1 The Simulation Degree of Virtual Teaching Model Conforms to the Expected Assumption

As the virtual golf teaching simulation system provides many virtual golf course models, the user can select a specific scene through the interface. When the user determines the course selection, the application will load the particular course model and other 3D models from the course database and other model databases according to the interface selection results, as shown in Figure 9.

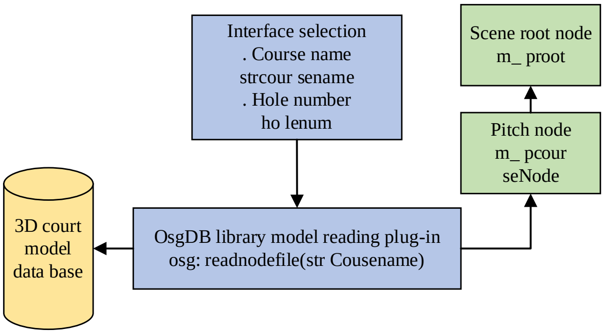

Figure 9: Loading of golf simulation teaching system scene model.

As GULEVENTHANDLE provides extensible virtual functions, user-defined interactive event processing can be achieved through class derivation and virtual function reconstruction. This paper also implements interactive event processing based on the GULEVENTHANDLE class's derivation and the handle function's reconstruction. The primary process is shown in Figure 10:

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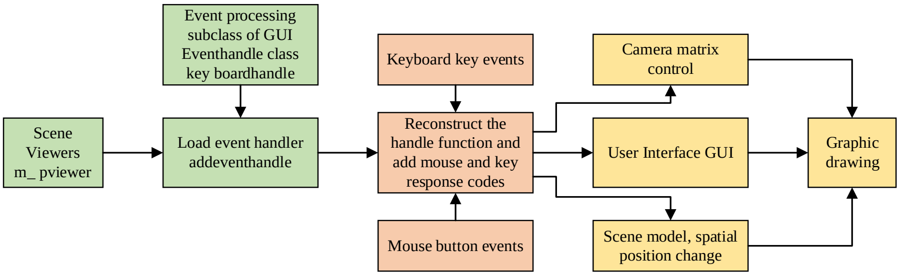

Figure 10: Final flow of spatial processing experiment of golf simulation teaching system.

From the perspective of the molded node tree structure, the entire tree model contains N sub-nodes, and there is a leaf node below each node, so the whole tree model has a node. However, from the perspective of model texture, the tree model has only two textures: the trunk and branch texture and the other is the leaf texture. Therefore, based on the perspective of texture use, the tree model can be combined into a model with only two leaf nodes; this reduces the number of display lists required for rendering, thereby improving rendering efficiency. The node tree structure of the merged tree model is shown in Figure 11:

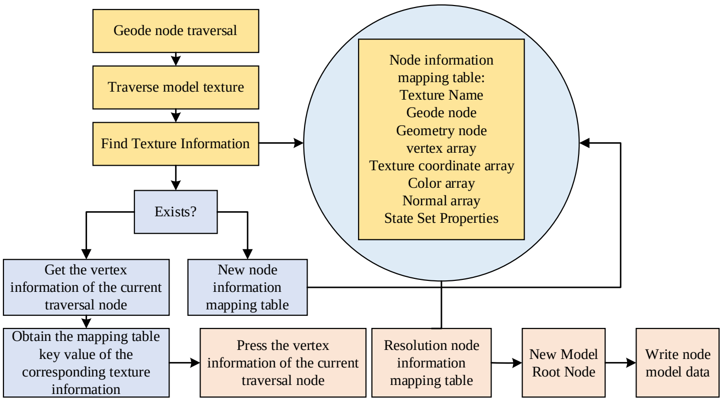

Figure 11: Final implementation path of golf simulation teaching system.

The rendering performance data is shown in Table 4:

	Frame rate	*Number of triangular faces*		*Number of Geometry*	*Number of Drawable*	*Number of LODs*
Before model optimization	*4.94*	*780866*	*Unique*	*404*	*404*	*0*
			Instance	*59172*	*59172*	*0*
Before model optimization	*59.96*	*800895*	*Unique*	*79*	*79*	*0*
			Instance	*3677*	*3677*	*0*

Table 4: Comparison of rendering performance data before and after model optimization.

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From the analysis of performance data, after the model is combined and optimized, the stall speed has been dramatically improved from 4.39FPS to 59.92FPS, which achieves the performance of real-time rendering. It can be seen from the chart data that although the number of triangular patches increased after model merging, the overall number has significantly decreased, and the frame rate has dramatically improved. From this, the number of scenes largely determines the rendering efficiency of the scene, which conforms to the expected assumptions.

5.2 Virtual Teaching Method is More Suitable for Students' Learning Habits

Before the virtual golf teaching, all the experimental subjects were interviewed individually about their cognition of golf. Through the survey, the student's understanding of golf, participation in golf, and learning and training in golf before the course were known, as shown in Table 5.

Student cognition	*Standard Classification*	*Experimental class (G171, N=26)*		*Control class (G172, N=22)*	
		Number of people/people	*Proportion/%*	*Number of people/people*	*Proportion/%*
ask for information	*understand*	*0*	*0.00*	*0*	*0.00*
	Do not understand	*27*	*100.00*	*23*	*100.00*
Participation	*Participated*	*0*	*0.00*	*0*	*0.00*
	Not involved	*27*	*100.00*	*23*	*100.00*
Learning	*Learned*	*0*	*0.00*	*0*	*0.00*
	Not Learned	*27*	*100.00*	*23*	*100.00*

Table 5: Student learning feedback on the virtual teaching method.

Combined with factors such as golf virtual teaching conditions, the expert group finally determined that the unique physical fitness test indicators mainly include upper limb strength, lower limb strength, back muscle strength, waist abdominal muscle strength, waist abdominal muscle endurance, trunk flexibility, shoulder joint flexibility, exceptional balance, special body coordination, exceptional movement sensitivity, extraordinary movement speed, etc., and conducted a significant test on the statistical data of various physical fitness, To determine whether there are essential factors affecting the experimental results in the specific biological fitness indicators of the students, as Table 6.

group	*index*	$\bar{X} \pm SD$		*Mean difference*	*P*
		Experimental class	*Control class*		
schoolboy	*Standing long jump*	*260.89± 10.65*	*256.63± 10.77*	*4.27*	*0.233*
	Sitting forward flexion	*112.32± 88.62*	*136.38± 64.52*	*-24.07*	*0.355*
	10s vertical and horizontal bracing	*5.58± 0.62*	*5.56± 0.52*	*0.03*	*0.788*
	Balance pad squatting	*25.95± 6.12*	*25.75±*	*0.21*	*0.112*

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			5.79		
	Push-ups ◆	59.63± 16.78	61.81± 21.41	-2.19	0.738
	Shoulder turn test ◆	105.47± 13.32	100.56± 7.65	4.92	0.202
	1min sit-ups ◆	48.37± 8.03	47.13± 5.53	1.25	0.605
	Long throw test ◆	22.19± 3.48	21.01± 4.55	1.19	0.391
	Knee bending sit-ups ◆	21.90± 2.33	22.24± 2.91	-0.35	0.701
	Rapidly tap with both hands ◆	79.47± 5.22	81.31± 2.45	-1.85	0.183
girl student	Standing long jump	195.00± 13.64	196.33± 5.62	-1.34	0.829
	Sitting forward flexion	157.29± 50.41	145.50± 47.63	11.79	0.676
	10s vertical and horizontal bracing	5.14± 0.69	4.83± 0.42	0.32	0.336
	Balance pad squatting	27.43± 3.52	28.00± 5.38	-0.58	0.823
	Push-ups ◆	47.86± 12.06	54.50± 16.09	-6.65	0.414
	Shoulder turn test ◆	93.71± 11.39	87.00± 8.54	6.72	0.282
	1min sit-ups ◆	45.71± 10.68	45.50± 5.66	0.22	0.617
	Long throw test ◆	10.29± 1.55	10.50± 2.39	-0.22	0.853
	Knee bending sit-ups ◆	15.53± 2.27	15.78± 1.12	-0.26	0.808
	1min sit-ups ◆	69.14± 5.28	72.83± 4.03	-3.69	0.191

Table 6: Improvement of students' physical quality after virtual teaching.

Significant differences between boys and girls in upper limb strength, lower limb strength, back muscle strength, waist abdominal muscle strength, waist abdominal muscle endurance, trunk flexibility, shoulder joint flexibility, exceptional balance, special body coordination, particular movement sensitivity, exceptional movement speed, and other unique physical qualities, which has no significant impact on the experimental results. The influencing factors of the observed object in the aspect of particular physical fitness are controlled by the virtual model. In other words, the model is beneficial for improving students' physical fitness [12],[13].

Students' psychological and physical working state in the process of participatory and virtual teaching is an important aspect that affects students' learning efficiency and participation. According to the learning and training status of teaching experimental objects under different teaching modes, the "Student Training Status Detection Scale" is used for self-reported measurement, and the student's answers are quantified according to the scoring method. The Student Training Status Test

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Scale has been used twice, the first time in the sixth week of teaching and the second time in the tenth week of teaching, to ensure the reliability and effectiveness of the results of teaching experiments and measurement results. The Student Training Status Test Scale is divided into emotional stress subscale, self-perception subscale, fatigue subscale, self-efficacy subscale, self-regulation subscale, physical recovery subscale, psychological exhaustion subscale, and psychological fatigue subscale, as shown in Table 7.

group	*index*	$\bar{X} \pm SD$		*Mean difference*	*P*
		Experimental class	*Control class*		
for the first time	*Emotional stress*	*1.73*	*3.50*	*-1.78*	*0.000*
	Self-perception	*6.15*	*4.78*	*1.38*	*0.002*
	Fatigue degree	*2.96*	*3.40*	*-0.45*	*0.009*
	Self-efficacy	*6.04*	*4.55*	*1.49*	*0.000*
	Self-regulation	*5.81*	*4.32*	*1.49*	*0.000*
	Physical recovery	*5.96*	*4.32*	*1.65*	*0.000*
	Psychological exhaustion	*1.77*	*3.27*	*-1.51*	*0.000*
	Psychological fatigue	*1.88*	*4.00*	*-2.13*	*0.000*
The second time	*Emotional stress*	*2.23*	*4.10*	*-1.88*	*0.001*
	Self-perception	*5.50*	*4.27*	*1.24*	*0.004*
	Fatigue degree	*3.23*	*4.18*	*-1.96*	*0.021*
	Self-efficacy	*5.23*	*4.005*	*1.19*	*0.005*
	Self-regulation	*5.62*	*3.86*	*1.77*	*0.000*
	Physical recovery	*5.54*	*3.86*	*1.69*	*0.000*
	Psychological exhaustion	*2.19*	*3.77*	*-1.59*	*0.001*
	Psychological fatigue	*2.38*	*4.68*	*-2.13*	*0.000*

Table 7: Comparison of final tests of two teaching methods.

The traditional teaching mode has a poor ability to maintain students' psychological vitality and interest in learning, and students' long-term participation in teaching under the conventional mode will have serious resistance to learning activities, which will affect the development of teaching activities and the efficiency of students' learning.

6 CONCLUSIONS

Golf enthusiasts can break through the limitations of space, time, environment, and other factors that golf is subject to and can get a real golf experience indoors. As golf is a multi-player competitive sport, higher requirements are put forward for the function of the golf simulation system, that is,

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whether golfers in different geographical locations can realize long-distance golf competition in the same virtual course. This is precisely the problem of distributed virtual reality technology, which conducts in-depth research on the rendering of virtual golf scenes and special effects but also conducts research on the distributed virtual golf teaching simulation system based on network technology, aiming to research and realize the distributed virtual golf teaching simulation system that can provide online golf competition functions. The experimental results prove that the golf virtual teaching mode in golf exceptional teaching can effectively improve the students' mastery and understanding of the special theoretical knowledge and technology after the phased learning and help students to connect the learned knowledge and skills more widely, promote the interactive learning between disciplines, and promote the integrity and interactivity of students' learning. While prioritizing practical skill application and interpersonal development, ensuring a comprehensive and effective e-learning environment in campus golf education.

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