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Retraction

Retracted: Design of Hybrid Teaching System for Aerobic Exercise Class of Recreational Sports Major

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] S. Yang and X. Mao, "Design of Hybrid Teaching System for Aerobic Exercise Class of Recreational Sports Major," *Mobile Information Systems*, vol. 2022, Article ID 1491480, 12 pages, 2022.

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Research Article

Design of Hybrid Teaching System for Aerobic Exercise Class of Recreational Sports Major

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In recent years, the social economy has achieved remarkable development, and the income of residents has increased substantially. With the increasing income, residents begin to pursue a high quality of life, and the ways of entertainment also begin to become diversified. In this context, leisure sports have gradually come into the public's view, and more and more people have started to participate in leisure sports. Aerobic gymnastics, as a popular form of fitness, is an important carrier to carry out national fitness sports and promote national health, and the development of national fitness sports cannot be carried out without scientific and effective aerobic gymnastics teaching, training, and guidance. At the present stage, the traditional aerobics teaching content and teaching methods of leisure sports majors are difficult to meet the needs of students learning. Therefore, the hybrid teaching system of aerobics classes based on cloud computing and neural networks is proposed, which combines the advantages of a network teaching and traditional teaching to comprehensively and effectively improve the efficiency and quality of aerobics teaching and improve the classroom teaching effect. At the same time, it promotes leisure sports students to systematically master the basic theoretical knowledge, skills, and methods, improve the comprehensive ability of independent learning and inquiry learning, have the ability of leisure sports program guidance and aerobics teaching organization, enhance their employability, and cultivate "multidiscipline" students who can adapt to the needs of the times and engage in technical guidance of aerobics and participate in leisure sports market services in leisure fitness clubs, industry associations, and educational institutions. This course aims to cultivate "multidiscipline" applied talents who can work in leisure and fitness clubs, industry associations, and educational institutions.

1. Introduction

In recent years, with the rapid development of the national economy, residents' health awareness has been increasing, and people have a higher pursuit of quality of life, more rational participation in leisure sports activities, and more attention to the quality of leisure. Fitness clubs, golf courses, multifunctional sports and leisure centers, SPA pavilions, and other leisure venues have increased accordingly. The rapidly expanding leisure sports market has raised higher requirements from the safety and security of sports, the professional quality of practitioners, scientific fitness guidance, to the health conditions of fitness venues, medical supervision, nutrition consultation, fitness evaluation, etc. The service of the leisure sports industry is gradually scientific, professional, and standardized. At present, different levels of universities and colleges are opening leisure-related majors or directions one after another. Recreational sports is an emerging profession in the field of physical education in China, and the direction and idea of running the school, talent training mode, and way are yet to be thoroughly investigated [1–3]. The work process is a complete work procedure in which a work result is obtained to complete a work task. Work process-oriented teaching is based on the actual work of vocational job groups so that all elements of vocational activities can be infiltrated and integrated into the teaching process, in the school's teaching environment, teaching management, and other aspects, thus forming a

vocational curriculum system and teaching environment. The students trained through this environment are full of professionalism and become the talents needed by society. The principles of aerobics curriculum design are shown in Figure 1.

The combination of engineering in the leisure sports program adopts the integrated training mode of "teaching and doing." The key is to develop a systematic work process curriculum system. The construction of the work process systematic leisure sports curriculum system mainly includes the following five steps. According to the market and social demand research and analysis, establish the training objectives and locate the employment positions of graduates. Track and research the situation of enterprises and graduates, refinine typical work tasks, and carry out teaching design. On the basis of the preliminary analysis and generalization, carry out the arrangement of teaching action areas. Refine and sublimate the contents of the learning areas and transform them into competencies. Design the learning situation, select the carrier of the same category and build a typical model to promote it. The standard leisure sports industry chain includes leisure education, technical guidance of leisure sports, operation and management of sports and leisure venues, sports product design and services, and planning and marketing of leisure sports events. The profession is positioned to cultivate talents in leisure education, leisure sports venue operation and management, leisure sports project development, and leisure product promotion. Aerobics has the meaning of aerobic gymnastics in foreign countries, also known as aerobic gymnastics and aerobic dance, with the characteristics of aerobic exercise [4]. From the exercise purpose and task, aerobics can be divided into fitness aerobics, competitive aerobics, performance aerobics, and fitness aerobics; its audience is mainly the public, so it is also known as public aerobics or aerobic fitness exercise. According to Zou [5], aerobics is a component of aerobics exercise, which is a continuous exercise for more than 15 minutes with musical accompaniment. School regarded aerobics with aerobic exercise characteristics as aerobic gymnastics, using aerobics exercises or dance combinations and other movements to continuously complete more than 12 minutes of movement content with a certain exercise load. Aerobic gymnastics exercise is based on aerobic training, with health, strength, and beauty as the characteristics of the heart, fitness, beauty as the purpose, set music, dance, and gymnastics in one. Compared with other projects, aerobics most prominent feature is to improve the practitioner's cardiopulmonary function and promote the cardiovascular system to transport oxygen to all parts of the body so as to mobilize the body to participate in sports. Practitioners, each practice time at least 15 minutes, at least three times a week, practice and maintain a certain heart rate, in order to achieve good exercise results. During the exercise, the heart rate is controlled to within 60%–80% of the maximum heart rate. From the comprehensive view of the above scholars, aerobic exercise is summarized as follows: in the musical accompaniment, gymnastics, aerobics, dance, and other content, aerobic exercises as the basis of exercise, health, strength, and beauty as the characteristics of exercise are used, so as to achieve health, fat loss plasticity, and pleasure body and mind for the purpose of a fitness exercise [5–7].

Teachers play a leading role in knowledge transfer and skills teaching activities. Although this model is helpful for the successful completion of teaching tasks and students' systematic mastery of knowledge, the way information is transferred between teachers and students is one-way, resulting in a passive state when students receive knowledge. Second, in aerobics technology class teaching, many aerobics technical movements are following the music instantly, and students are facing difficulty comprehending and mastering aerobics technical movements in a timely and comprehensive manner, thus appearing irregular technical movements; over time will make students feel dependent, affecting the students' learning of knowledge and skills. Finally, in the current aerobics class the student knowledge and skills levels vary, some students in the class have a "not enough" phenomenon, and it is difficult to meet the needs of individual student development [8–10]. Therefore, the integration of blended teaching into aerobics teaching not only meets the trend of information technology teaching reform but also meets the development needs of students with different levels of knowledge and skills. This is of great significance to the change of aerobics teaching, the improvement of teaching quality, and teaching efficiency. The main contributions of this article are as follows. (1) It analyzes that, at this stage, the traditional aerobics teaching content and teaching methods of leisure sports majors can hardly meet the learning needs of students. (2) It proposes a hybrid teaching system of aerobics classes based on cloud computing and neural network, which combines the advantages of online teaching and traditional teaching to comprehensively and effectively improve the efficiency and quality of aerobics teaching and improve the classroom teaching effect. (3) This course aims to cultivate "multidisciplinary" applied talents who can engage in leisure sports market services in leisure and fitness clubs, industry associations, and educational institutions.

2. Related Work

2.1. Leisure Sports Profession. Accelerate the training of sports industry management talents, and point out that the relevant institutions of higher education should actively promote the reform of education and teaching to cultivate specialized talents to meet the needs of sports industry development. The emergence of the concept of leisure sports, on the one hand, shows the modernity of "sports" and another era of transformation of sports culture, or leisure sports is a concentrated embodiment of the conceptualization of contemporary society, economy, culture, and life concept and also highlights the development trend of commercialization, functionalization, and popularization of sports. In recent years, the development of leisure sports in China has been quite rapid, but while the Chinese people are vigorously carrying out leisure and fitness activities, a large number of people who participate in various leisure activities lack the necessary methods and means of leisure and

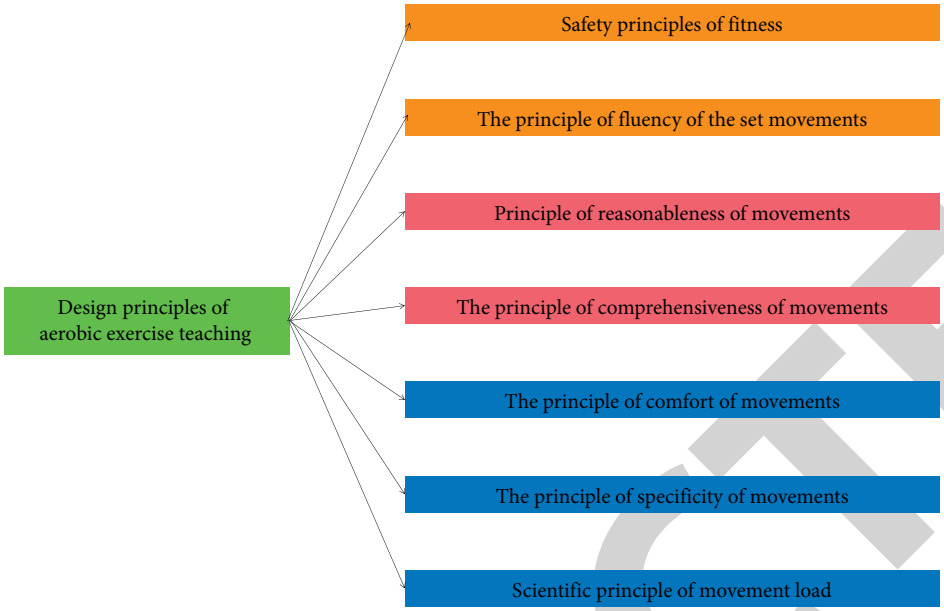

Figure 1: Principles of aerobics curriculum design.

recreation, so it becomes more and more necessary and urgent to cultivate leisure sports talents [11–13]. The evaluation system of leisure sports personnel training is a comprehensive and detailed assessment and inspection of the whole personnel training process and its results. Through the evaluation, we can find out the problems in the process of cultivating leisure sports talents and further propose targeted solutions, i.e., the evaluation also includes feedback, which is conducive to the refinement and consolidation of the advantages in the process of cultivating talents. It is both a way to supervise the cultivation of leisure sports talents and a means to guarantee the quality of leisure sports talents cultivation, and the ultimate goal is to promote the sustainable development of talents' cultivation. As an important part of the whole leisure sports personnel training mode, evaluation is throughout the process of training objectives, curriculum development, teaching organization and implementation, and leadership management of leisure sports professionals. Evaluation includes three types of evaluation as follows: predevaluation, process evaluation, and postevaluation. At present, the evaluation subject of Chinese higher education is relatively single. In order to improve the quality of higher education, the evaluation mechanism of multiple subjects should be introduced. The leisure sports profession emerged along with social development and once became a popular profession, so it is more important to absorb the evaluation subjects from the society or the market, so as to understand how the talents cultivated by colleges and universities, which are the main training subjects of leisure sports talents, can meet the needs of the public. In a word, the talent cultivation mode of leisure sports majors is a complex system consisting of talent cultivation goals and talent cultivation measures. Thus, a good evaluation system is built on the basis of a perfect and reasonable curriculum system, and each link of the talent cultivation mode of leisure sports majors is tightly interlocked and complementary, and only when each link is put into place, the goal of talent cultivation can be realized. Teachers and students are the two most important subjects in the teaching process. Teachers generally implement the whole teaching according to the syllabus, while what teaching methods or teaching methods are adopted in the teaching process will vary from person to person [14–16].

In a broad sense, teaching is education, but here, we take a narrow interpretation, that is, teaching is the activity carried out by teachers and students with certain teaching contents as the medium. The relationship between teaching and curriculum is extremely close. If the cultivation of leisure sports professionals is compared to a project, then the curriculum of leisure sports majors is a construction blueprint, and the teaching of leisure sports majors is a construction process. Therefore, after the curriculum system of leisure sports is designed, teachers and students need to participate in it and implement it with diversified teaching methods, so as to achieve the established goals of teaching or curriculum. Since recreational sports is an imported product and a newly emerged profession based on the degree of social development, teachers engaged in the teaching of recreational sports-related courses have higher requirements. In other words, they have to be aware of the current social context, learn new knowledge, master new skills, and constantly improve their professionalism. At the same time, they should adopt diversified rather than single teaching methods as much as possible in the teaching process to improve the art of teaching, enliven the classroom atmosphere, and motivate students to learn. On this basis, teachers should also pay attention to the combination of theory and practice, the combination of knowledge accumulation and intelligence development, the combination of teacher's dominance and students' subjectivity, etc. This is because teaching is not confined to the classroom, not limited to the transmission of knowledge, and not limited to

the dominance of the teacher, so teachers are fully capable of taking students out of the classroom, tapping into their intelligence, and even allowing them to act as teachers. The activity form of recreational sports provides these possibilities, so teachers can fully use various teaching methods flexibly in the teaching process to achieve the goals of teaching and thus achieve the goal of training recreational sports professionals. Compared with the more mature social sports guidance and social sports management majors, leisure sports majors are relatively new and have a late start and still need to be explored. With more and more people participating in recreational sports in China, the recreational sports industry also has more room for development. Then, the market demand for recreational sports talents is increasingly urgent. This requires the universities that have opened leisure sports majors and those that are going to open leisure sports majors to respond to the needs of society, adapt to the development of the times, and continuously improve the quality of the cultivation of the majors. On the other hand, they should reflect on the problems in the development of leisure sports majors, explore the distinction between them and social sports guidance and social sports majors, and furthermore improve the construction of the majors. Finally, they can better serve the leisure. On the contrary, we will reflect on the problems in the development of leisure sports and explore the distinction between it and social sports guidance and social sports, so as to further improve the construction of this major [17–19].

2.2. Hybrid Teaching in Aerobics Class. Blended teaching is a student-centered educational paradigm, whose core concept is a subversive innovation of mixing teaching elements to achieve the most optimal effect; its profound connotation is to provide students with appropriate learning content, appropriate learning techniques, and other multifaceted information at the right time and space; its core idea is to use different teaching methods, constantly optimize the teaching process, in the choice of teaching mode. Effective streamlining of costs: the core idea is to optimize the teaching process by using different teaching methods and to streamline the cost effectively in the selection of teaching modes. The learning theory of blended teaching is guided by behaviorism, constructivism, cognitivism, etc., and the teaching mode is to optimize and integrate teaching resources with the help of information technology and to obtain a good teaching effect. As a new idea of reform and innovation of education informatization in the era of "Internet+," blended teaching has been widely recognized [20]. To effectively grasp this learning paradigm, we should first grasp its basic features. Firstly, it is the integration of resources, environment, interaction, monitoring, management, and other teaching elements. Secondly, it is a mixture of the construction of curriculum teaching resources in accordance with students' cognitive process. Thirdly, the teaching concept is student-centered; the teaching method highlights autonomy and flexibility. Fourthly, it is the reconstruction of teaching structure, in the teaching process, highlighting the practical teaching design and highlighting the relevance and timely feedback. Lastly, the evaluation method is mixed with all-round and multiangle. Table 1 is a comparison of the differences among traditional teaching, online learning, and blended teaching.

In blended teaching, giving full play to the leading role of teachers as well as mobilizing students' subjectivity is the primary principle followed in the design and implementation of blended teaching. First of all, the focus of respecting student subjectivity is to stimulate the initiative of student learning. In the leisure sports professional aerobics class hybrid teaching design, the teaching environment, as well as the creation of the learning environment, should take into account the students' ideas, focus on student initiative, flexible use of learning resources, moderate the initiative of learning to students, the formation of the teacher's regulation and training in the teacher's autonomy, and the sense of dynamic acquisition of knowledge, and consciously form the habit of learning. Second, teachers help students learn as supporters, guides, and facilitators. The teacher's dominance is reflected in the control of the rhythm of the entire classroom, and the teaching design of the course is adapted to the cognitive laws of students, while providing students with rich learning resources, learning guidance, and convenient learning conditions to efficiently achieve teaching goals, highlighting the timeliness and efficiency of online instruction [21, 22].

The core point of aerobics is aerobic; therefore, in the actual exercise process, teachers should effectively integrate the concepts of aerobics as well as calisthenics and build a new concept on this basis to stimulate students' curiosity about aerobics and then motivate them to actively approach aerobics. Aerobic exercise not only helps students to develop a lifelong fitness philosophy but also helps teachers to achieve health-oriented physical education goals. Teachers also need to use network technology to build an interactive platform to share aerobic exercise resources to improve their teaching level. With the help of the network platform, teachers can communicate with each other about their actual teaching experience and share teaching resources so that they can learn from each other's strengths and complement each other's weaknesses, which will gradually improve the aerobics curriculum teaching system and make its teaching value fully reflected.

3. Methods

3.1. Model Architecture. The hybrid teaching system for aerobics classes proposed in this paper is based on a cloud computing platform. Cloud computing is a model for increasing, using, and delivering Internet-based related services; a model that allows fast and efficient access to resources, including networks, servers, storage, and application software, according to user needs through available and convenient network access and is characterized by being dynamic, easily scalable, and often virtualized. The cloud computing environment consists of a network environment where computing and storage coexist, on which cloud platforms and cloud services are hosted. The main architecture of the cloud platform consists of two parts as follows: the bottom layer is

Table 1: Comparison of the differences among traditional teaching, e-learning, and blended learning.

	Traditional teaching	E-learning	Blended learning
Teaching philosophy	Teacher-centered	Student-centered	Student-centered
Teaching method	Indoctrination	Inquiry-based	Teacher teaching + student inquiry
Teaching environment	Face-to-face classroom	Virtual classroom	Online + offline
Teaching resources	Book-based knowledge	Web resources	Book knowledge + internet resources
Teaching evaluation	Single evaluation	Evaluation single	All-round and multi-angle
Teaching interaction	Face-to-face communication	Network platform communication	Face-to-face + network communication

servers, storage, and network switching devices connecting them, and the upper layer is various system software and support software, including operating systems, virtualization software, distributed and parallel processing software, distributed storage, cloud-capable service programming interfaces, and various application service interfaces. And cloud services are based on the information technology needs of various industries to deploy and deliver application software generation to build a system model to combine cloud computing, cloud platform, and computer experimental teaching; the first step is to build a hybrid teaching system model based on cloud computing aerobics class. The hybrid teaching system of aerobic exercise class mainly relies on the cloud platform for development, and then various aerobic exercise class services and needs are arranged and deployed on the platform, the main users of the platform include students, instructors, laboratory managers, and teaching managers; according to the use of demand, the hybrid teaching system of aerobic exercise class based on cloud computing proposed in this paper is shown in Figure 2.

3.2. Image Visual Processing Module. One of the most prominent features of the cloud computing teaching system is that the system should be both audio and visual; then, the issue of image processing becomes the highlight of the system innovation. Using the parallel programming model and computing framework of the Hadoop MapReduce platform provided by cloud computing and the parallel computing of massive data sets, we can provide effective support for data-intensive applications and thus is very suitable for parallel digital image processing. However, due to the wide variety of image information to be processed by the hybrid teaching system, the requirements for real-time, interactivity, image clarity, and browsing speed are high, and only the built-in data types of Hadoop cannot directly act on the MapReduce framework to process images. Therefore, an image processing class is customized to meet the image requirements of this system in the cloud computing environment. A custom *ImageDisposal* class based on the MapReduce workflow is used to complete the processing operations of image information in the hybrid teaching system. The following is a schematic diagram of the image information processing process from a macroperspective. The flow of the vision processing module is shown in Figure 3.

The class mainly inherits the Writable interface, *WritableCompara* Janet interface, *InputFormat* class, *RecordReader* class, *InputSplit* class, and *OutputCollator* class from Hadoop, and specifies and overrides the corresponding interfaces and the inherited subclasses. The writable interface defines two methods, *DataOutput* and *DataInjanput*, which are overridden in the *ImageDisposal* class, which implement the write and read operations of the image information data. There are image location information, in which the upper left corner of the screen is the origin (0, 0) point of the plane right-angle coordinates, and the location of the left X-axis and down Y-axis coordinates, i.e., (x, y) point; image size information, which identifies the height and width of the image, and the scaling ratio adjusted randomly according to the size of the browser; image storage information, which is the complete storage path of the image, including the image name and *InputFormat* class *InputFormat* class mainly completes the definition of the input format because the image information is large, so *ImageDisposal* class uses a file as the data source for input, inheriting from the *InputFormat* class *FileInputFormat* subclass, resulting in a new subclass named *ImagedisInputFormat*, which is responsible for splitting the preprocessed image information that has been ordered in the split piece into records. According to the image information to be delivered in the hybrid teaching system, the user can define the size of the record in advance. In this system, for different types of images, such as images with high-definition requirements, images with fast transmission speed requirements, images with large storage space requirements, and small images with high resolution, the size of the record is divided into different bytes accordingly in order to meet the needs of various types of images. The key of <*key, value*> key-value pair is Text, which is used to store the storage path of the segmented subimage in the file; the value is a record of the *ImageDisposal* class.

3.3. Data Storage and Reading. HBase is an open source, highly reliable, high-performance, column-oriented, and scalable nonrelational distributed database. As part of the Hadoop project, HBase can run on top of the HDFS file system to store massive amounts of unstructured and semistructured loose data, while ensuring high fault tolerance and improving the reliability of the system. Unlike traditional relational databases, HBase uses simpler data types and data operations do not contain complex table-to-table linking relationships, only simple queries, deletions, insertions, and empties; in terms of the storage model, relational databases are row-based, while HBase is column-based, and files of different column families are isolated from each other; in terms of data indexing, HBase scans and accesses the entire database through only one index, the row key; in terms of data maintenance, an update operation in a relational database causes the original old values to be replaced, while when an

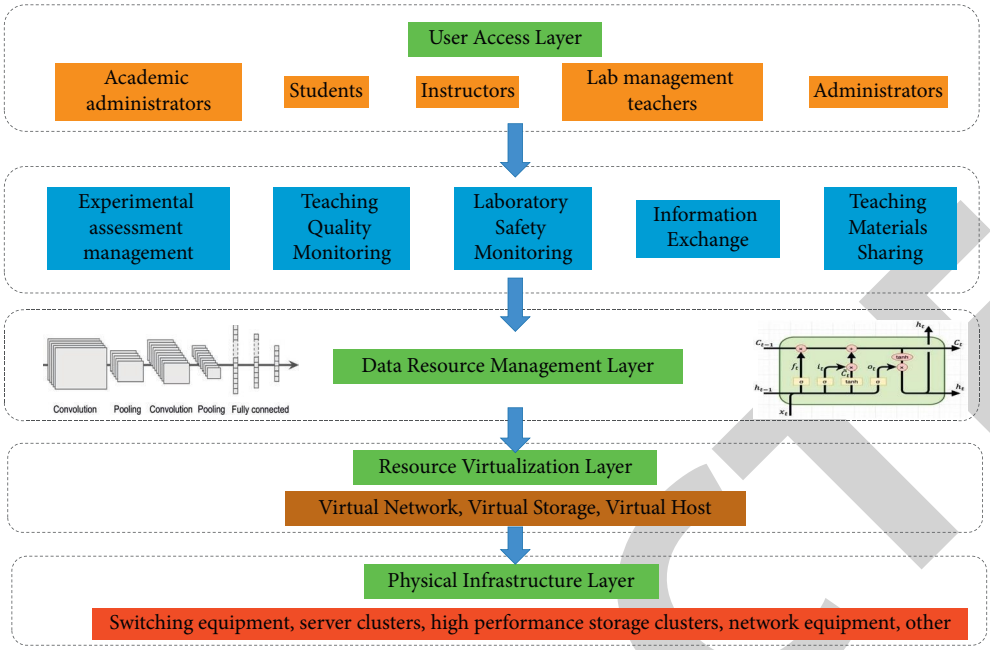

Figure 2: Model structure.

update operation is performed in HBase, the old data remain and a new version of the new data is generated. The system architecture of HBase is shown in Figure 4.

3.4. Aerobics Movement Correction System. According to the hardware framework and equipment selection results of the cloud computing system set above, in this design, the aerobics movement correction system module of the system is embodied in the way of the running process.

The processed image is stored in the unified database, and the processing is unfolded using the directional gradient histogram. Firstly, the motion image is transformed into the form of a static image, and the image is transformed into a grayscale map using a gamma algorithm, and the specific processing process is as follows:

$$A(x, y) = A(x, y)^{\text{gamma}}, \tag{1}$$

where $A(x, y)$ denotes the pixel value of the pixel point (x, y) in the image and gamma is set to 0.45 based on previous processing experience. Set the gradient of this data point to the first order derivative, and its quadratic function can be expressed as $f(x, y)$; then, its gradient formula can be expressed as follows:

$$\nabla f(x, y) = \begin{pmatrix} E_x \\ E_y \end{pmatrix} = \begin{pmatrix} \dfrac{\alpha f}{\alpha x} \\ \dfrac{\alpha f}{\alpha y} \end{pmatrix}, \tag{2}$$

where E_x denotes the gradient in the x-axis direction in the image and E_y denotes the gradient in the y-axis direction in the image, and the following formula is used to calculate the gradient of the pixel point in this design:

$$\begin{cases} E_x(x, y) = A(x+1, y) - A(x-1, y), \\ E_y(x, y) = A(x, y+1) - A(x, y-1), \end{cases} \tag{3}$$

where E_x and E_y are the gradient values of (x, y) in the horizontal and vertical directions, respectively, and $A(x, y)$ is the grayscale value of (x, y), and the gradient is calculated using the grayscale values of the four-pixel points of this pixel point cycle to obtain the gradient increase and motion direction of the athlete's training activities, and the specific formula is shown below:

$$\begin{aligned} E(x, y) &= \sqrt{E_x(x, y)^2 + E_y(x, y)^2}, \\ \beta(x, y) &= \arctan\left(\frac{E_y(x, y)}{E_x(x, y)}\right). \end{aligned} \tag{4}$$

Formula (4) represents the gradient increase of the training activities and represents the motion direction of the action. The above calculation part determines the basic content of the athlete's movement to provide the basis for the subsequent detection.

Based on the determined direction of movement, the approximate range, and direction of movement of the athlete are obtained. To make the results of this study accurate, secondary processing of the acquired images is performed using *OpenPose* software, a software module that allows for multiperson pose processing. In this processing, the athletes' movement joints were recorded using the *OpenPose* method, and the upper body joints and lower body joints of the movement were divided using the serial numbers. Using the

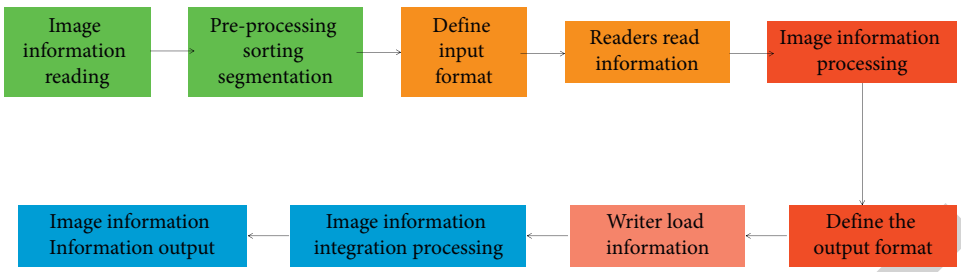

Figure 3: Vision processing module flow.

results of the above serial number setting, the acquired images are subjected to part closeness inference, and the image joint motion phase is set to $a \in [1, \ldots, A]$ using the convolutional pose machine, and the image joint motion structure is set to the branch input form. In the first stage, the $(W^1 = \chi^1(B))$ of the image of the joint part and its closeness to other joints can be expressed as $(P^1 = \delta^1(B))$, where χ^1 and δ^1 denote the processing of the convolutional layer of the system, respectively. In each stage, a feature extraction will be performed as the input value in this stage, which is used to generate more accurate prediction results of the athlete's movements, and the specific process can be expressed as follows:

$$\begin{aligned} W^T &= \chi^T\left(B, W^{t-1}, P^{t-1}\right), \quad \Delta t \geq 2, \\ P^1 &= \delta^1\left(B, W^{t-1}, P^{t-1}\right), \quad \Delta t \geq 2. \end{aligned} \tag{5}$$

Using formula (5), the inference process is completed. To avoid the corresponding loss of information in the image during the process, the corresponding loss function is set to control the operation process:

$$\begin{aligned} f_W^T &= \sum_{i=1}^{i} \sum U(l) * W_i^T(l) - W_i^*(l)_2^2, \\ f_P^T &= \sum_{i=1}^{i} \sum U(l) * P_i^T(l) - P_i^*(l)_2^2, \end{aligned} \tag{6}$$

where $W_i^T(l)$ denotes the label of the joint in the image, which is represented by two sets of output feature values, where one set denotes the x-axis in the image and the other set denotes the y-axis in the image, and each position denotes x and y of the location of the athlete action object in the feature image, and U denotes the binary mask, and $U(l) = 0$ means that the corresponding athlete action is not extracted in the image and by this binary mask for action. The constraint of the overall detection process can be expressed as follows:

$$f = \sum_{t=1}^{T} \left(f_W^T + f_P^T\right). \tag{7}$$

According to equation (7), the setting part is combined with the original software content to complete the software module development part. By combining software and hardware, the design of the automatic detection system for training movements of gymnasts based on posture estimation is completed.

4. Experiments and Results

4.1. System Development Environment. To implement the hybrid teaching system for the aerobics class proposed in this paper, the development environment should be deployed first. The development platform of the system is built in a small-scale virtual machine cluster environment. The technical architecture of the development of the system in this paper is mainly divided into four parts: basic environment, data center, server side, and client side. Therefore, to realize the intelligent teaching system based on cloud services proposed in this paper, the following development environment needs to be completed, as shown in Table 2.

4.2. Experimental Data. The dataset used in this test is a fitness gymnastics championship dataset, and this dataset is commonly used for target recognition, joint point recognition, motion target tracking, and other tests. The total number of images in this dataset is 100,000, and the number of joint motion images is about 50,000. To enhance the relevance of this system test, the movements to be detected in this system are set as follows, and the contents of this image are detected by the system designed in the paper and the system currently used. The object target training action in the above image is set, and this action is found in the dataset using the system designed in the paper and the system currently in use, and the detection results of the two different systems are compared. Since there are too many images in the test dataset, only the detection results of the corresponding images are shown in this test, and the detection accuracy of similar actions is presented in the form of percentages, so as to improve the authenticity and reliability of the test results. In the system detection time consumption test, 500 random tests are conducted to improve the reliability of the time consumption test. The training process performance improvement curve and loss convergence are shown in Figures 5 and 6.

4.3. System Function Testing. In order to ensure that the design and development of our cloud-based aerobics class hybrid teaching system can meet the needs of users and verify that the system is achieving the expected functions, we need to conduct functional testing of the system. As the current system development is only for the PC side, so the

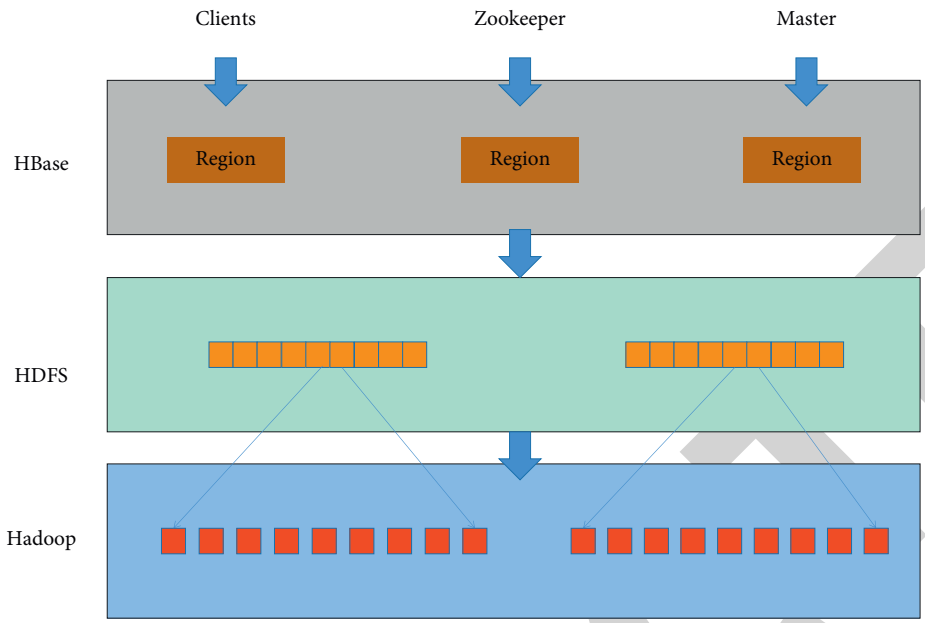

Figure 4: HBase system architecture.

Table 2: System development environment.

Name	Illustrate
Windows7	System development environment operating system
JDK	Required development kit for the development language Java
Eclipse	Development platform to realize code writing and debugging
NGINX	Provide load-balancing services
Tomcat	Provide WebServer
Hadoop	Provide distributed computing and storage environment
HBase	Basic database
MySQL	Extended database
VMware	Provide a virtual machine environment
vSphere SDK	Virtual environment management tool

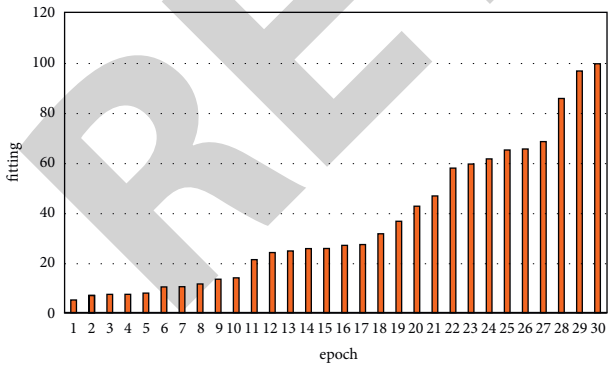

Figure 5: Performance improvement curve of the training process.

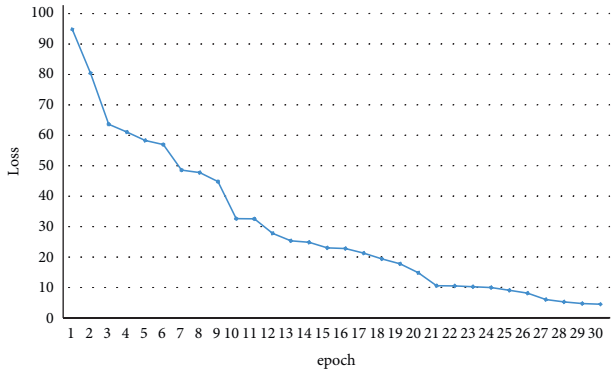

Figure 6: Training process loss convergence diagram.

test mainly uses the PC side for service access to the page, while testing the function, pay attention to the beauty of the page and whether the page response is adapted to the current device. Table 3 shows the detailed testing of the coarse-grained test cases for the core functions of the system.

4.4. Performance Testing. The development process of the system in this paper uses HBase, a nonrelational database for massive resource storage, which forms a high-performance cloud storage environment, and we conduct stress tests on the database below. The test results are shown in Table 4 and Figure 7.

Table 3: Functional testing.

Test case number	Test items	Test content	Test results
1	User registration	Visit the system registration page, select the user role, fill in the user information, set the password, and complete the registration	Pass
2	User login	Access the system login page, select the user role, enter the account password, and check whether you can enter the object's role space	Pass
3	Service management	Enter the system administrator space to check whether the service registration, service information configuration, service publishing, and other functions are normal	Pass
4	Resource storage	Log in to the system as a teacher or student to upload and download educational resources such as videos, documents, and audios	Pass
5	Remote classroom	Enter the system as teachers and students to complete online courses, answer questions, exams, etc.	Pass
6	Academic management	Log in to the system as an educational administrator to complete user management, review educational resources, teaching analysis, etc.	Pass

Table 4: Database stress testing.

Test metrics	Sequential write	Random read	Random write	Sequential read
Total elapsed time (s)	780	350	239	968
Speed (rows/s)	1312	3242	1033	4720

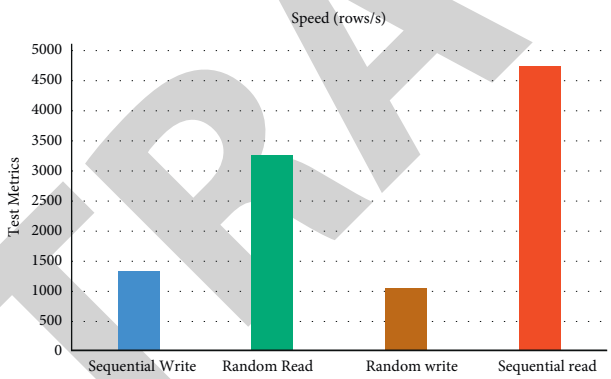

Figure 7: Database stress testing.

Table 5: Service stress testing.

Number of clients	Service 1 read interface	Service 2 write interface	Service 1 read interface	Service 2 write interface
500	5492	6231	3560	3880
1000	5621	5880	3324	3560
3000	5122	5630	3289	3989

From Table 4, it is also necessary to test the system services, and here two services, resource management and remote classroom, are selected for stress testing. The specific test method is to select the two types of interfaces provided by the services for reading and writing and to obtain the average value of the number of outputs per minute for each service in pages/min by changing the number of clients and sending requests within one minute. The test results are shown in Table 5 and Figure 8.

By analyzing the data in Table 5, the system can still run stably and meet the basic requirements of the design in the case of high concurrency of services.

4.5. Performance Comparison. The comparison results of tracking recognition accuracy obtained by the two systems after testing a series of videos of the database for different items are shown in Table 6 and Figures 9 and 10.

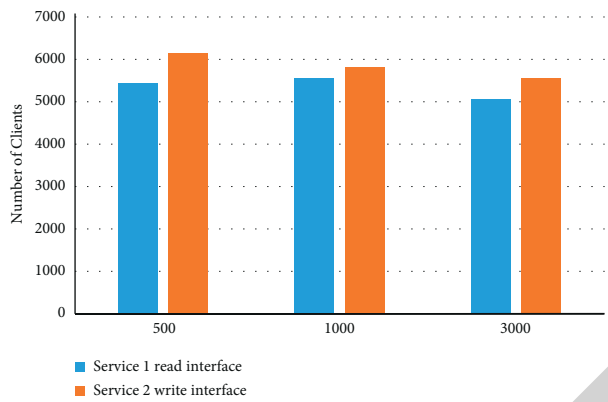

Figure 8: Service stress testing.

Table 6: Comparison of the tracking recognition accuracy of the two systems.

Test items	Accuracy of the original system		Accuracy rate of this system (%)
	Highest (%)	Lowest (%)	
Iris dataset	73.3	51.3	76.5
Wine dataset	61.5	58.6	66.4
Torso and noise	81.6	54.9	84.5
Lower extremities with noise	75.6	50.9	79.6

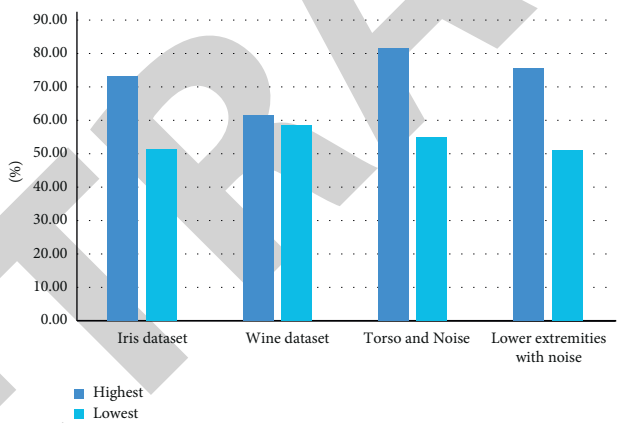

Figure 9: Comparison of the tracking recognition accuracy of the original system.

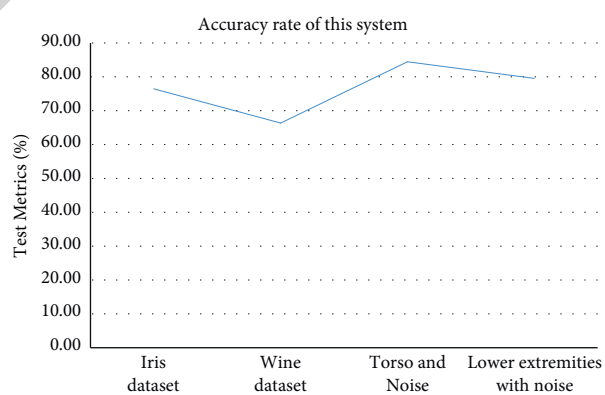

Figure 10: Tracking accuracy of the proposed system.

The designed system, in order to improve the tracking recognition performance in the actual application process, is tested on the same test data on the assumption that the original system has obtained the clustering a priori, and the tracking recognition results of the two systems are compared.

5. Conclusion

Under the background of "Internet+," the deep integration of information technology and teaching, the updating of aerobic exercise teaching methods, the positive learning experience of teacher-student interaction, and practice in teaching are the core of aerobic exercise class teaching design, and the teaching focuses on the cultivation of independent learning ability, teamwork ability, practical ability, and other comprehensive abilities. Meet the personalized development of students. The hybrid teaching of aerobics classes in leisure sports combines the advantages of traditional teaching and online teaching, and the teacher-led and student-led teaching methods such as task-based, project-based, inquiry-based, discussion-based, and interactive teaching methods become the main body of aerobics teaching method. By using a cloud computing platform, the hybrid teaching design of aerobics class for leisure sports majors, through 18 weeks of hybrid teaching practice of aerobics class, using the process and summative evaluation combined, in APP, WeChat exchange group, classroom, and other comprehensive, multiangle teaching evaluation, it is concluded that hybrid teaching can improve students' learning enthusiasm, improve teaching efficiency, and improve the teaching effect and has a facilitating effect on achieving teaching objectives. Students' satisfaction and recognition of the effect of blended teaching in aerobics class is high, which has a positive impact on improving students' learning attitude and motivates students to expect to use blended teaching in other physical education disciplines as well. The blended teaching of aerobics classes in leisure sports allows teachers to have more time for error correction, guidance, and communication in class and students to have more time for practice, which is more beneficial to the breakthrough of important and difficult points and the improvement of skill level. In addition, students discuss problems and submit assignments through the online platform, making teaching feedback timely and communication more convenient. In the future, we plan to carry out the design of a hybrid teaching system for aerobics classes in recreational sports using knowledge graphs.

Data Availability

The datasets used during the current study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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