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Artificial Intelligence-Based Assessment of Physical Education and Training Effectiveness

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Abstract. The current physical education teaching has problems such as poor extraction rate of effective information and poor dynamic tracking effect in the process of daily training. Based on this, this paper combines multidimensional self-classification artificial intelligence algorithm and self-matching intelligent training method, designs a computer-aided analysis model of physical education based on multidimensional self-classification artificial intelligence algorithm, and studies how to improve physical education teaching efficiency and training effect through intelligent detection hardware and big data high-dimensional matching analysis technology. The application of big data high-dimensional matching analysis technology and multidimensional self-classification artificial intelligence algorithm in the design of physical education computer-assisted is introduced first, and a physical education based on multidimensional self-classification artificial intelligence algorithm is designed with physical education computer-assisted requirements, the analysis factors of skill indicators are selected and compared with the current mainstream sports analysis methods. The results of factor index analysis under different conditions were tested, the results show that the training results based on physical education teaching have the advantage of high analysis efficiency. With the help of AI artificial intelligence sensor, it has good practical application value.

Keywords: Computer-Aided Design; Multidimensional Self-Classifying Artificial Intelligence Algorithm; Physical Education; Intelligent Detection Hardware; Motion Recognition.
DOI: https://doi.org/10.14733/cadaps.2023.S5.75-84

1 INTRODUCTION

In recent years, China's sports industry has entered a new period of rapid development, which has put forward new demands on the development of sports [1]. Physical education plays an important role in the teaching of physical education in China. The use of intelligent computing technology can

effectively improve the technical level of physical education teachers, as well as the intelligent analysis of sports information, thus improving the quality of teaching [2]. Sports are the basis of competitive training and are the key to competitive training, which contains the load and intensity of training, and the success of training and otherwise depends on a reasonable training load [3]. However, the current competitive sports program has a certain systematization of physical and technical training, but the training of students' psychological and cognitive aspects is still in the fumbling stage, so it is difficult to achieve real time in the process of physical education using modern technological means and intelligent computing technology [4]. In contrast, today, with the rapid development of sports technology, computer technology has been used as an important tool for sports training assistance and improvement of athletic performance. The use of multi-degree-of-freedom self-classification techniques allows for effective real-time forecasting and simulation of future movements and can effectively improve the amount of realistic movement [5]. In this context, the integration of multidimensional self-classification techniques with adaptive intelligence training techniques can effectively reduce the operating costs of the system and significantly improve the quality and quantity of training [6]. Therefore, in this paper, we combine multidimensional self-classification AI algorithms and self-matching intelligent training methods to study a sports teaching and intelligent training model based on multidimensional self-classification AI algorithms.

To address the problem of information representation and feature extraction in physical education, this paper utilizes data mining techniques, combines multidimensional self-classification and intelligent adaptive techniques, integrates and predicts features using MCB techniques, and implements simulation of sports training CAD using multidimensional self-classification techniques. This paper is divided into four main chapters. Chapter 1 introduces the research background, basic ideas, main techniques and innovations of this paper; Chapter 2 is a review of the current domestic and international literature related to intelligent image representation and information extraction, and gives a brief review of the current research status and proposes the future work direction and orientation. Chapter 3 adopts an intelligent multidimensional self-classification algorithm, self-matching intelligent training and high-precision matching algorithm to select three relevant feature covariates related to action CAD quality, and constructs an intelligent algorithm for multidimensional self-classification based on this model. Chapter 4 shows the relevant experiments to validate the intelligence model of the research, and the results of the experiments are evaluated quantitatively and objectively in a quantitative way to draw relevant conclusions.

In the current intelligent training model of sports, a simple modeling and design software alone can no longer meet the actual needs, and new design tools must be applied to create realistic and fast-running virtual simulation systems. Therefore, the innovation of this thesis is that a computer simulation is used as a platform to establish an arbitrarily configurable motion control system in the context of virtual sports, and a virtual competitive sports teaching experiment is carried out with this platform. The whole process of its implementation is a fusion of artificial intelligence multidimensional self-classification algorithm, intelligent matching algorithm, self-matching intelligent training and massive data matching technologies to establish a highly simulated virtual experiment and experimental objectives to achieve the teaching objectives of the physical education curriculum. Through the simulation of the simulation experiment, the participants can feel the realism of sports in realistic sports training, so as to achieve the purpose of enhancing the realistic fitness effect. Finally, the key information in sports training is extracted, analyzed and correlated to match the

2 STATE OF THE ART

At present, most of the research on physical education in China still remains in the aspects [5]. In addition, when the traditional physical education videos are studied, they are all only for a certain part of the content, which has not yet formed a unified standard, lacks a unified research idea, needs further research and exploration, and the various methods used are not well identified [6]. In response to the current problem of less physical education in domestic colleges and universities,

Kantarjian et al. [7] used multidimensional self-classification technology and sports image feature capture technology to construct a set of real-time feedback models to form a hybrid deep learning method, which can provide more accurate and reliable prediction results compared with traditional methods. Kim et al. [8] found that a computer-aided design analysis based on motion correction model can effectively improve the error correction performance of college students, but further improvements to the model and a large number of samples are required to achieve a certain level of adaptivity. Liang [9] improved the existing cone-based motion training image analysis algorithm and proposed an algorithm with higher efficiency and higher accuracy based on Boyko's method, which also incorporates neural network techniques to obtain accurate recognition of motion training images by analyzing them, but the efficiency of recognition is low. Morrison and Lăzăroiu [10] proposed a method for fast recognition using motion display characteristics based on the motion characteristics, which requires the construction of a sports background image that does not contain a motion target and is able to change continuously according to the current background. In order to achieve fast and accurate interpretation in sports training, Schenk et al. [11] proposed an improved fuzzy image feature recognition method based on different motion characteristics in the same sports training and verified the effectiveness of the method experimentally. Shabashini et al. [12] proposed a new detection method that uses a depth-separable convolution method to obtain simplified feature map, which greatly reduces the computational effort and improves the detection speed of sports training. The current motion state recognition is closely related to the surrounding environmental factors. Traditional moving object detection methods are more effective and faster in the case of a single background, but they cannot be well applied to complex backgrounds. Therefore, in physical education teaching, it is necessary to design a data converter to convert one-dimensional time series data into two-dimensional image data, so as to better extract and learn the characteristics of sports samples. In dynamic analysis, the key decomposition nodes of images have a very important impact on the overall recognition accuracy. Because its recognition part often overlaps with Hung P of other dimensions. Other scholars combine the "pyramid" theory with traditional motion video to build a motion recognition model for fast recognition of motion video. Multi task training design is introduced, and a new training method is proposed based on it. The researchers put forward a DKDR model based on adaptive classification algorithm through practical teaching experiments of several PE teachers. This model has a high diagnostic accuracy, but it has a greater impact on the results of sports training, with fewer features. Therefore, it has produced a large error in the training and verification data, so it is also parallel. The application of this technology in the analysis of physical education teaching has proved to be effective.

Through the above research, it is found that the existing sports teaching and training analysis methods in the existing motion analysis can only identify specific motion video information. It can not distinguish different motion details, so it is not intelligent. In addition, when sports training is improved, the use of recognition when and the effectiveness of data mining are to be improved. Therefore, it is necessary to integrate multidimensional self-classified artificial intelligence with adaptive intelligence training to provide insight into the classification of sports analysis and training processes.

3 METHODOLOGY

3.1 Ideas for the Application of Big Data High-Dimensional Matching Analysis Techniques and Multidimensional Self-Classifying Artificial Intelligence Algorithms in Physical Education Teaching Analysis Models

Big data high-dimensional matching analysis technology is a kind of high-dimensional matching technology based on massive information, which enables multiple types of objects and images of objects by automatically recognizing the objects of images. In physical education, if intelligent parsing and depiction methods are to be applied for information extraction of motion, a variety of factors need to be considered, such as image load information, visual effect of the image, size of the image, and the degree of matching between the image and the text system. Therefore,

intelligent operations based on the high-dimensional matching technology of big data must be used. Based on the intelligent multidimensional self-classification technique, this study proposes a new large-scale data fusion method based on neural network. The computer-aided analysis technique, on the other hand, divides a set of data into groups according to certain relationships, divides the sequences into different types, and then uses different analysis methods. In simple terms, the data are divided into groups according to the similarity of tasks and contribution values, and then the new data are merged into the old data set for training, and then the relevant data and contribution values are divided into two groups. In this study, the data related to physical education is used as the observation target, and the model is trained by a large amount of labeled sample data, and the model parameters are solved to finally obtain a complete neural network model with the relationship between sports data as the observation index, while the data is stored and studied and analyzed by using the corresponding analysis software. The database studied by the artificial intelligence algorithm of multidimensional self-classification is a total of 10 million times of sports instructional videos published on the Internet, which include structured, semi-structured and unstructured data, and it operates in mode based on the gradual reduction of errors, and after the system has accumulated a certain amount of data, new data are then merged into the old data set for training. During the training process, the data in each training is further processed to randomly select some regions in the image for training to extract features, increase the amount of data, and avoid data duplication. The idea of combining big data high-dimensional matching analysis technology and multidimensional self-classification artificial intelligence algorithm in physical education teaching analysis model is shown in Figure 1.

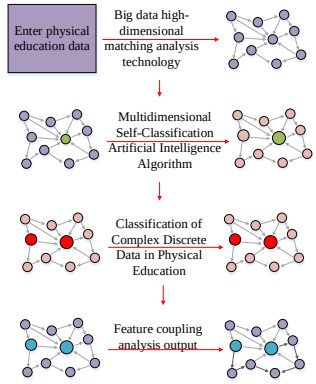

Figure 1: Application of high-dimensional matching analysis technology combined with big data and multi-dimensional self-classification artificial intelligence algorithm in sports teaching analysis model.

3.2 Construction of Computer-Aided Design Model for Physical Education Combining Multidimensional Self-Classifying Artificial Intelligence Algorithms

The combination of self-matching intelligent training method in this sports teaching video analysis model based on multidimensional self-classification artificial intelligence algorithm extracts global features and action features respectively, and uses the above two features to model actions to achieve simpler processing of complex data in sports teaching video information, so that data chain information and image information can be presented more intuitively and accurately to achieve better training results. The data analysis process of its physical education computer-aided design model is shown in Figure 2.

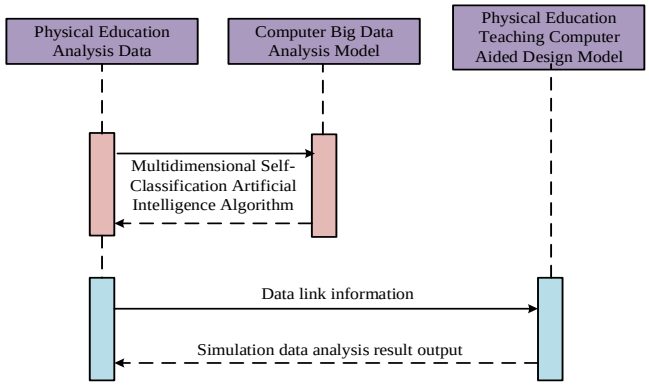

Figure 2: Data analysis process of computer aided design model for physical education.

First, suppose that there are n physical education objectives being processed, then the expression corresponding to the order of their positions in the three-dimensional space is

$$Q_1 = (\frac{q_1(1)}{l}, \frac{q_1(2)}{l}, \cdots, \frac{q_1(n)}{l}) \tag{1}$$

$$Q_2 = (\frac{q_2(1)}{l}, \frac{q_2(2)}{l}, \cdots, \frac{q_2(n)}{l}) \tag{2}$$

$$W_1 = (\frac{w_1(1)}{k}, \frac{w_1(2)}{k}, \cdots, \frac{w_1(n)}{k}) \tag{3}$$

$$W_2 = (\frac{w_2(1)}{k}, \frac{w_2(2)}{k}, \cdots, \frac{w_2(n)}{k}) \tag{4}$$

$$E_1 = (\frac{e_1(1)}{j}, \frac{e_1(2)}{j}, \cdots, \frac{e_1(n)}{j}) \tag{5}$$

$$E_2 = (\frac{e_2(1)}{j}, \frac{e_2(2)}{j}, \cdots, \frac{e_3(n)}{j}) \tag{6}$$

Where q, w, e is the coordinate information of the feature space trajectory corresponding to physical education, Q , W , E are the time points of physical education, and l, k, j, n is the total number physical education.

After combining the multidimensional free classification function $K(q,w,e)$ and the self-matching intelligent training method rule function $L(q,w,e)$.

$$Q'_1 = \frac{(q_1(1), q_1(2), \cdots, q_1(n))}{K(q,w,e) + L(q,w,e)} \tag{7}$$

$$Q'_2 = \sqrt{1 + \frac{(q_2(1), q_2(2), \cdots, q_2(n))}{K(q,w,e) + 2L(q,w,e)}} \tag{8}$$

$$W'_1 = \frac{(w_1(1), w_1(2), \cdots, w_1(n))}{K(q,w,e) + nL(q,w,e)} \tag{9}$$

$$W'_2 = \sqrt{1 + \frac{(w_2(1), w_2(2), \cdots, w_2(n))}{K(q,w,e) + n^2 L(q,w,e)}} \tag{10}$$

$$E'_1 = \frac{1 + (e_1(1), e_1(2), \cdots, e_1(n))}{n^2 K(q,w,e) + (n+1) L(q,w,e)} \tag{11}$$

$$E_2' = \sqrt{1 + \frac{(e_2(1), e_2(2), \cdots, e_2(n))}{(n+1)^2 K(q,w,e) + (n+2) L(q,w,e)}} \tag{12}$$

The expressions of the multidimensional free classification function $K(q,w,e)$ and the self-matching intelligent training method rule function $L(q,w,e)$ are

$$K(q,w,e) = 1 + \frac{2q + 3w + 4e}{qw + we + eq} \tag{13}$$

$$L(q,w,e) = 1 + \frac{2q^2 + 3w^2 + 4e^3}{q^2 w^3 + w^q e^w + e^2 q^2} \tag{14}$$

Where q, w, e is the coordinate information of the feature space trajectory corresponding to physical education, Q , W , E are the time points of physical education, and l, k, j, n is the total number of feature points. If there is a difference between the set signal and the signal in the physical education image, the correct matching result cannot be obtained. Therefore, it is necessary to combine the arithmetic function of multi-dimensional self-classification artificial intelligence to calculate logically according to the input signal and get the expected output signal. Then combining the error scale with integration and differentiation to get the prediction model and using this model to predict the output value of the future input values, the integral expression of the intelligent analysis in the process of sports teaching $A(x)$ can be obtained as

$$A(x) = \sqrt{1 + r[a(x) + \frac{1}{q + w + e} \int_0^{q+x} a(x)dt + \frac{da(x)}{dt}]} \tag{15}$$

Where $a(x)$ denotes the deviation, r denotes the control quantity, and q, w, e is the information of the trajectory coordinates of the feature space corresponding to physical education.

3.3 The Data Processing Process of Artificial Intelligence-Based Computer-Aided Design System for Physical Education

After completing the above process, the critical data required in the physical education teaching process can be obtained by using a computer-aided analysis program to judge the teaching process of the physical education course. The feature information and action recognition involved in the physical education teaching process were extracted from the three major categories (3 types each) of sports training videos for simulation, and the corresponding results are shown in Figure 3, Figure 4 and Figure 5.

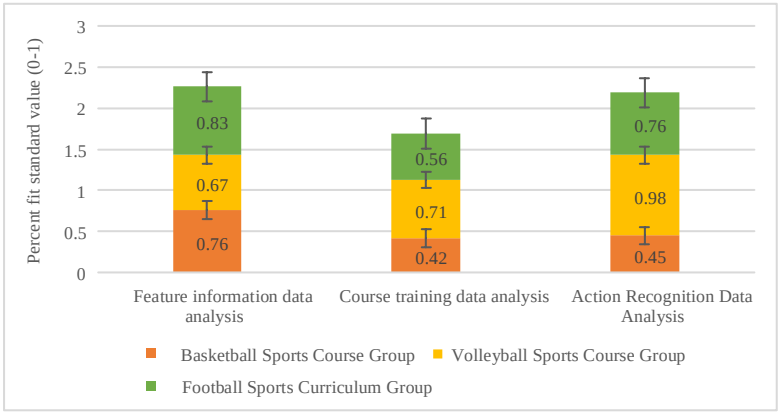

Figure 3: Artificial intelligence-based physical education data analysis group 1 simulation results.

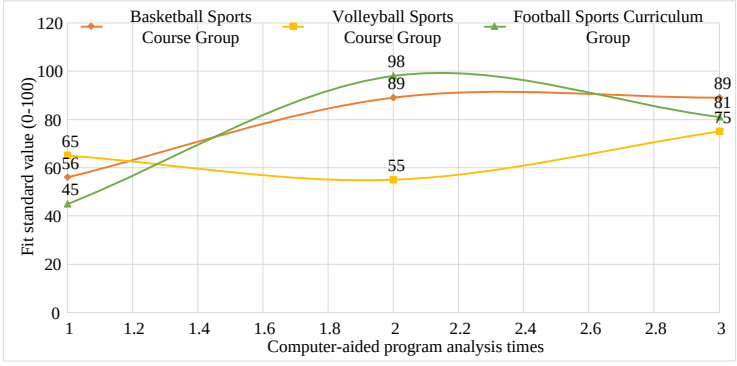

Figure 4: Artificial intelligence-based physical education data analysis group 2 simulation results.

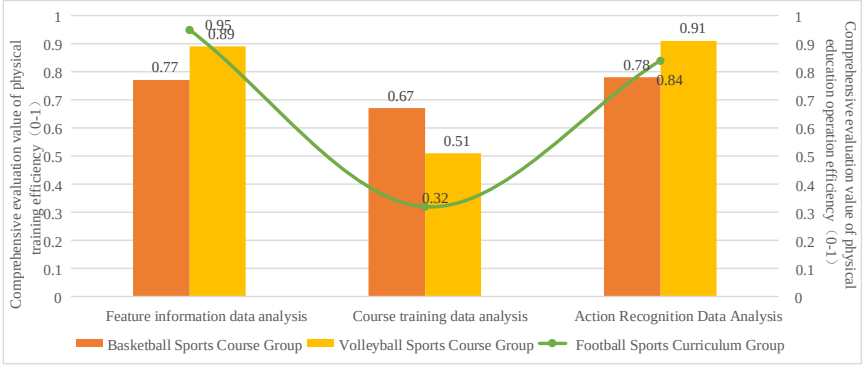

Figure 5: Artificial intelligence-based physical education data analysis group 3 simulation results.

As shown in Figure 3, Figure 4 and Figure 5, the training efficiency and operational efficiency will gradually decrease if it is not combined with the adaptive intelligence training method. Then the highest value of the characteristic information extraction coefficient of the multidimensional self-classification AI in the analysis results of the 3 main categories of sports teaching is only 5, and

the recognition accuracy of the sports recognition process for physical education is 0~0.6, which is caused by not considering the fast and rapid automatic matching in sports teaching, so the learning of the data is based on two independent basic physical education The relevance of the states in the process is determined. Using the intelligent training method of multidimensional self-classification, the process of sports teaching is analyzed by computer-aided design, monitored in real time with a sensing network based on the analysis of the IoT architecture, and then the artificial intelligence algorithm of multidimensional self-classification is used to perform the optimal operation, and the obtained results are transformed into binary numbers and used as the attribute values of the samples, and the generated multiple samples are used as training sets, and the same training and test sets for training and testing. Finally, a computer and an intelligent analysis system are programmed to analyze the data content in sports teaching.

4 RESULT ANALYSIS AND DISCUSSION

4.1 Validation Experimental Design of Computer-Aided Design System for Physical Education

In this study, online publicly available physical education materials were used as the database for the empirical experiment, and more than 10 million documents were collected. Three relevant characteristic parameters related to the relationship index between physical education and training process were selected, namely physical education time, training time, and number of physical education items, and then analyzed in collaboration with the sensor network through image sensing and artificial intelligence analysis strategies, which led to the real-time monitoring of The action status of the physical education video and the resulting data are transferred to the final database of the computer-aided analysis system to obtain the conclusions of the evaluation, whose preliminary experimental results are shown in Figure 6.

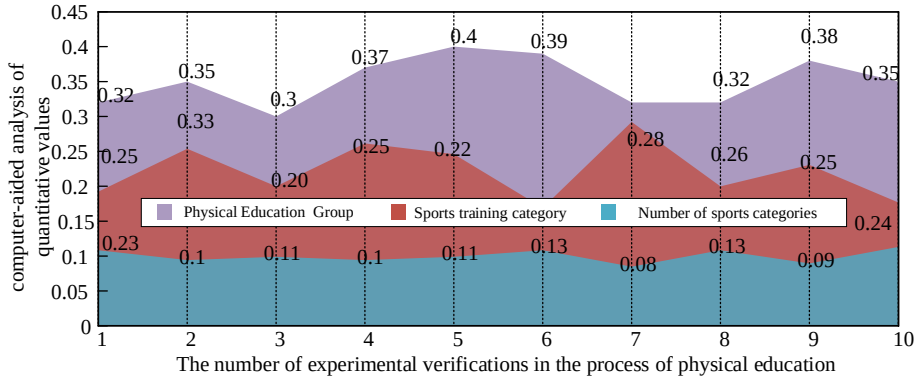

Figure 6: Preliminary experiment results of computer aided design system for physical education.

4.2 Experimental Results and Data Analysis

The results of the analysis of the 3 types of data in the experiment based on the multidimensional self-classification artificial intelligence algorithm, and the results are shown in Figure 7.

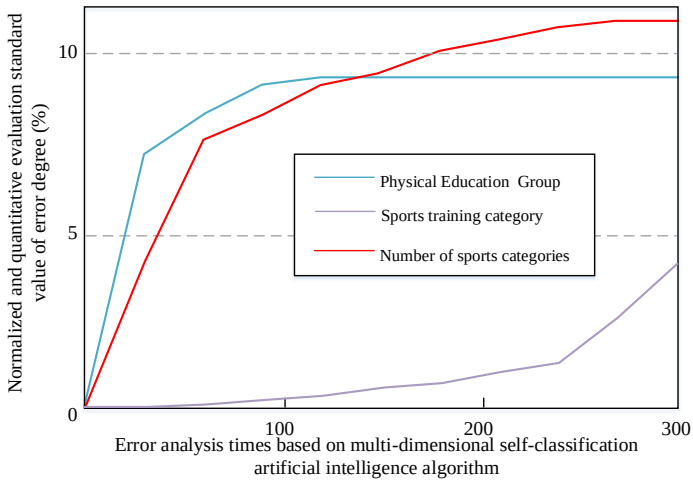

Figure 7: Quantitative evaluation and analysis results.

As seen in Figure 6 and Figure 7, the rules of variation of the quantitative assessment values corresponding are similar, all due to the fact that although there are significant of the three types of experimental data themselves, the analysis of this sports training model allows the standardization of the data information generated by the various sports processes, so that the error values tend to level off with the increase in the number of repetitions.

5 CONCLUSION

In the current physical education classes, the application of network technology is increasingly widespread, so it is especially necessary to use big data for high-dimensional matching and intelligent analysis to intellectualize physical education. Therefore, based on the artificial intelligence technology of multidimensional self-classification, a new classification and modeling model for physical education and sport teaching is proposed by using the idea of integrating multidimensional self-classification with adaptive intelligent training. Firstly, this paper applies the high-dimensional matching technology based on big data and the intelligent method of multidimensional self-classification to the process analysis of sports teaching, and proposes a model using the intelligent method of multidimensional self-classification and then the video and image recognition of sports teaching according to the different characteristics and different needs of sports. Experiments show that, the intelligent sports teaching recognition technology using the combination of multidimensional self-classification artificial intelligence technology and sensor technology has good detection effect, high data validity and low cost, which can improve the working efficiency of sports teaching. However, since this system only parses information from data materials in physical education and does not take into account the daily training differences in physical education, more in-depth research can be conducted.

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