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Intelligent Algorithms for Athlete Training in University Physical Education using Big Data Technology

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ABSTRACT

In the computer age, data is the most valuable resource. Based on big data analysis technology, we have constructed an intelligent physical training model for college students to better control their training pace. Simulation technology was also used to study and evaluate the operability of this technology, in the hopes of providing more effective training programs for college students. The research found that in the field of big data analysis, it is important to use intelligent training methods to control and adjust the competition time and intensity of college students. This method not only helps us to formulate and implement competition plans more swiftly but also aids in better understanding and handling a large amount of information, thereby improving the efficiency and quality of competitions. Hence, this method is worth our effort and promotion.

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1. Introduction

With big data technology, athletes can better grasp their conditions, thus adjusting their training methods more precisely to perform better in competitions. For instance, sprinters can utilize big data analysis to better master their technical level, while long-distance runners can more swiftly discover their shortcomings and promptly take improvement measures. Soccer players have profound understanding of their technical level and can accurately predict the opponent's offensive strategy and adjust their tactics promptly to achieve the best record. However, the application of big data also brings some potential risks [1]. Athletes may overly rely on the results of big data analysis, which could lead to a decline in interest in the competition and even loss of competitive enthusiasm. The excessive pursuit of perfection has drained the fun of the game, causing it to lose its original entertainment value. With the rapid development of science and technology, the emergence of big data has brought tremendous improvement to society, significantly enhancing functions like collection, dissemination, storage, and processing and promoting information innovation [2]. Today, we have enough re-

sources to delve into various complex issues, achieving quick and accurate categorization of a wide variety of things. With more and more research data available, we are paying more attention to its reliability and usability. This makes us focus more on exploring and analyzing the connections between things, thus improving the perspectives of sports audiences and experts. In this dynamic era of big data, sports experts and scholars must keep up with the trend, improve their scientific research concepts, and align themselves with this trend. A more comprehensive viewpoint should be adopted to look at the respondents rather than relying on traditional random sampling methods [3]. At the same time, data should be viewed more tolerantly rather than merely relying on structured data, as the latter may cause many unnecessary troubles. The traditional athlete training progress planning system still has many shortcomings, especially the system terminal is difficult to process and analyze big data timely and accurately, resulting in slow execution, thus hindering the progress of training planning. With the advent of the big data era, big data analysis technology has shown unique advantages in intelligent training progress planning based on advanced software systems for data collection and processing, including massive data coverage, high timeliness and practical value, strong precision and timeliness, and diversified output results. Therefore, this paper designs an intelligent model for athlete training progress based on big data analysis, which not only can realize the real-time transformation of data analysis from manual to computer and from experience to calculation but can also significantly improve the timeliness and reliability of data information processing, thus providing effective guidance for athlete training planning.

2. Literature Review

With the advancement of technology, more and more industries are leveraging big data to promote their development, thereby driving the development of sports in China, including: sports promotion, competitions, education, public services, sports industry, etc. As technology evolves, the application of big data analysis in the field of sports communication has become increasingly extensive. It not only promotes precision marketing, the development of new wireless value-added services, but also helps drive the integration of multimedia, providing a new direction for the future of sports network communication [4]. In addition, it provides a new way of expressing sports communication by analyzing and sorting data information to enhance the effectiveness and accuracy of information and provide users with a better reading experience [5].

With the advancement of technology, big data technology has been successfully applied to the dissemination of sports events, making this field more complex [6]. With the continuous increase of data volume, the sources and types have become more diverse, and processing and mining this information has become more difficult [7]. Ren D and others pointed out that we should use the strong support of cloud computing to establish a complete big data mining system from the bottom to the top, including the support platform, function layer, and service layer, to meet different types of application scenarios, such as infrastructure, platform, software, etc.; in addition, a model combining qualitative and non-qualitative should be established to reveal the complex relationships between big data, thus better understanding their causal relationships [8].

With the development of technology, big data has become a new driving force. It has not only changed the traditional method of formulating school sports policies, but also made the actual effect of sports courses more apparent, and also provided more comprehensive monitoring and management for the physical and mental health of students [9]. In addition, big data provides strong support for the development of the sports industry, providing companies with more information and resources, thereby promoting the development of the industry. According to the latest research results, using big data can carry out more comprehensive marketing. Thus better meeting customer needs, and can more effectively concentrate resources, thereby better achieving the aggregation of sports brands; in addition, it can better concentrate on experiential marketing to deepen the connection between users and brands.

Other research shows that the opportunities brought by the big data era to China's sports industry include big data mining and analysis to create more value for the sports industry; promote the collaborative innovative development of sports industry clusters, accelerate the technological process of the sports industry, etc.; in the field of sports scientific research, big

data provides a new field for sports scientific research, the research object is from random samples to total samples, the research data type is from precise structured data to chaotic, inclusive unstructured data, the research paradigm is to find new topics from a large number of correlations.

3. Construction of Athlete Training in Physical Education Based on an Intelligent Algorithm

3.1. Intelligent Model Design

The mesh program/server's overall architecture, combined with the MAHSUH server, can effectively enhance the collaborative effect between each module. In addition, the program can respond to user needs promptly, collect athlete training requirements through data feedback, the server can quickly compile statistics and make corresponding responses, and ultimately store the collected data in the large database on the server side, thereby achieving intelligent training progress monitoring. Figure 1 shows a model framework for intelligent training, which is used to help athletes improve efficiency.

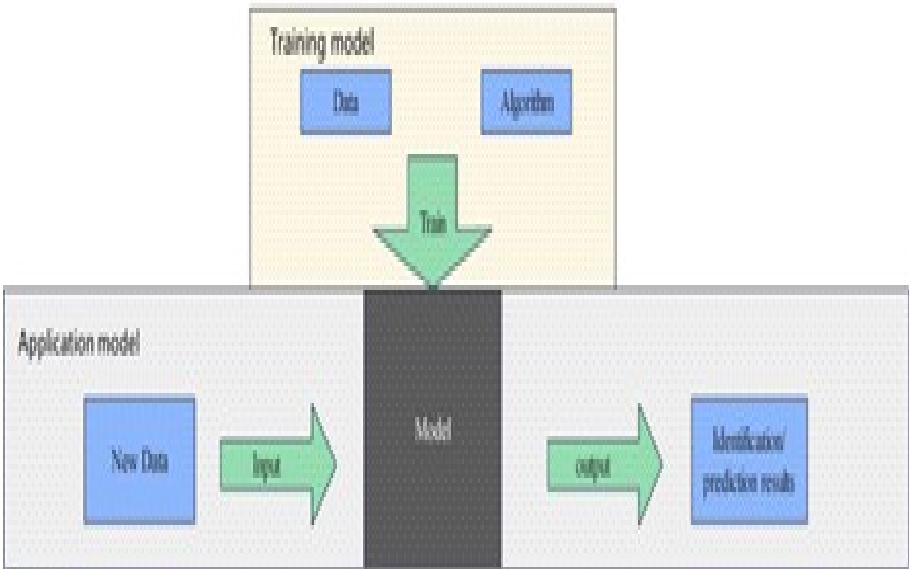

Figure 1. Intelligent Model of Athlete Training Progress

3.2. Okumura-Hata Intelligent Model

In the field of big data analysis, the Okumura-Hata intelligent mode is widely used. It has a strong anti-interference ability, which can effectively improve the accuracy and stability of the model. In addition, it can also build a complete pattern according to the collected information, thus better interpreting and exploring the essence of data analysis. Based on the Okumura coordinate graph and normal distribution of curve functions, the Okumura-Hata intelligent mode can effectively categorize data and infer its characteristics based on the normal distribution of statistics. Moreover, this model can also help us better understand the statistical motion trend by analyzing the extreme data values, thereby more effectively enhancing the accuracy and credibility of the data.

$$\frac{Q(k)}{N(k)M(k)} = s_c \left[\frac{Q(k)}{N(k)M(k)} \right]^a \quad (1)$$

Q(k) represents the maximum error of the data, N(k) represents the reference elevation, M(k)

represents the working frequency band, K(k) represents the change in the mathematical model after loss index calibration, δ represents the propagation distance, and v represents the quantitative constant. The specific feedback data (H[a]) of the Okumura-Hata intelligent simulation is as follows:

$$\frac{\partial^2 N_2}{\partial i^2} = \frac{\left(k - k_m - N_2\right) W_0(i)}{w_0(i)} > 0 \qquad (3)$$

By changing a'N, we can improve the model's balance and computational efficiency. In addition, we can use ai to improve computational efficiency and better control computational complexity. However, when we improve the computation method, we find that the robustness of the module will be weakened with the improvement, leading to computational delay. Therefore, we suggest using intelligent control to improve the computation method and improve computational efficiency by optimizing the computational process. In this sentence, Ep is a pre-set highest critical value, [h1, h, hp] are converging data sets from the highest point to the lowest point, all of which have sound optimization effects, [Xi, X, X,] are a set of disappearing data. We use formulas (2) and (3) to improve and optimize our intelligent model, making our training plan more accurate and efficient. In the early stages of the system, content-based recommendation is very suitable. This algorithm is completely based on the user's past behavior and initial choices, and the content provided is very similar to the user's past behavior, so it has high interpretability. In addition, this algorithm does not depend on the behavior of other users. Collaborative filtering algorithm does not depend on historical data, and mainly constructs a user behaviour matrix to achieve a dynamic analysis processing process. Knowledge-based recommendation algorithms mainly rely on knowledge graph technology, where the core idea is to construct the ontology and associated rules in the field to create a corresponding knowledge base and make recommendations according to the weight ratio of the data in the knowledge base. The knowledge base integrates the rich semantic information formed by various data sources, and provides recommendation services based on the information needed by the user inferred. Using algorithms such as TF-IDF and Word2Vec, we can conduct detailed analysis of keywords and build a series of models based on their characteristics. We can also use Top-N tags to calculate the weight of each piece of information and build a series of models. In addition, we can use cosine similarity to evaluate different models and get more accurate recommendation results.

4. Experimental Design and Analysis

4.1. Experimental Design

A key aspect of the auxiliary training system for college sports education athletes in this experiment is identifying the movement postures of the human body's key points. Based on the experimental foundation, we use big data to integrate and capture the movement data of athletes' skeletal key points after processing. According to this key point data, we can define the posture of college sports athletes. By extracting features of key point angles and speeds, we compare standardized data and training data, finding that both data types have errors regarding angles, coordinate points, and postures. Timely adjustment and correction for motion rectification are employed to achieve efficient training goals. Using two Kinects, we can collect data on the human body's key points. Each key point has unique coordinate values in different frames, so we can recognize athletes' limb movements and postures by comparing the differences in these coordinate values. By adjusting the three-dimensional coordinates of the human body, different training action postures can be achieved, causing changes in the three-dimensional coordinates of joints such as shoulders, elbows, wrists, hands, knees, etc., thus achieving more effective interactive effects.

4.2. Analysis of Experimental Results

We can achieve better results by using basketball athletes as research subjects and mimicking their training conditions to basketball game scenarios. We will use the SO test software to check the reliability and manipulability of this model and measure its accuracy and reliability through the YUH and pol parameters. This will help us better understand the development trend of this sport and better control its direction of development. Figure 2 shows the detailed results of the experiment.

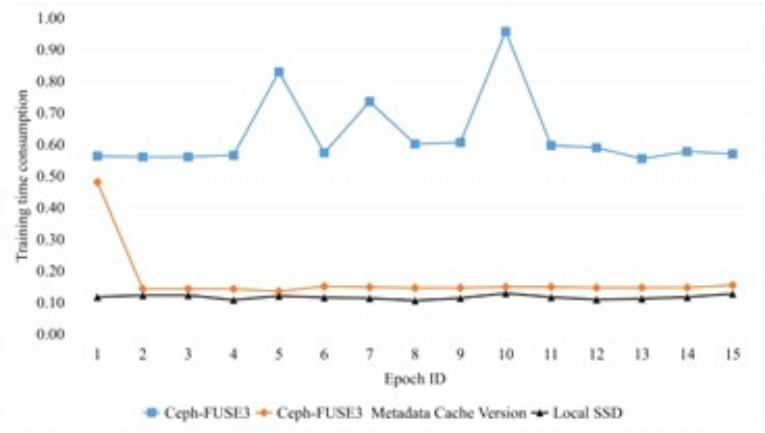

Figure 2. SO detection experimental results

Figure 2 shows a comparison between the key position inspection results of intelligent training actions for left and right university sports coaches. Professional and trainer automatic movement data for eight corresponding key positions from start to end are collected, and the average value of joint point coordinates for several consecutive frames is recorded as one frame when the standard personnel and trainer complete this action. From the start to end period, 60 corresponding frames are selected as the judgment data for the joint point motion trajectory; by comparing the time limit and coordinate point differences, the difference in motion trajectory changes at the corresponding coordinate points can be obtained. Based on the data, it can be seen that the POL parameters of the intelligent development model for sports talent cultivation progress are relatively stable, always above 1.0. This level of intelligence can reach a high level of consistency, and the YUH index shows a smooth growth trend, indicating that the model has high feedback. The data strength characteristics are shown in Figure 3 when developing the model intelligently.

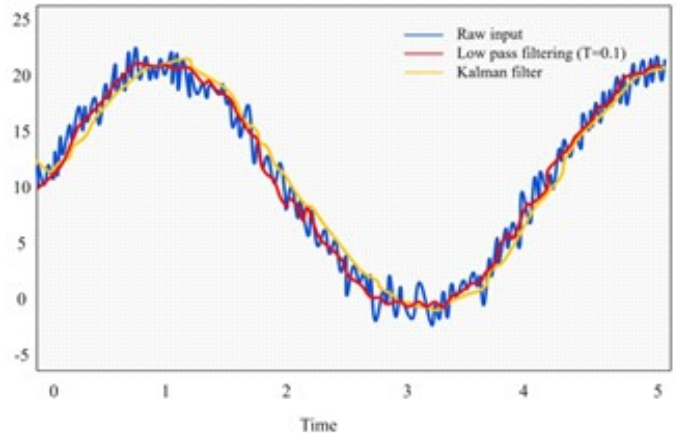

Figure 3. Data Intensity

As shown in Figure 3, the data intensity in the intelligent formulation mode of basketball player development progress from the perspective of big data analysis is high, which can truly reflect the basic level of the data. If there is more data, it indicates that the accuracy of the development results of this mode is better. Figure 3 shows that the athlete's skeletal point data after filter estimation is closer to the real value, and the corresponding error after filter estimation is less than the observed error. The filtering effect obtained is obvious, so the filter fusion use of Kalman filter estimation under computer big data technology is feasible.

5. Conclusions

After in-depth research, we have found that in today's competitive arenas, the training needs of many athletes have shifted from traditional manual methods to more efficient self-service methods. Not only does this method save labor production costs, but it also simplifies the process. To better respond to these changes, we propose a new method of using big data to optimize training progress, thereby improving efficiency and quality. Our research also proves that this method is suitable for coping with increasingly complex competitive scenarios. By adopting advanced technologies, we can make the system more intelligent, with excellent smoothness and accuracy. Therefore, we strongly recommend its popularization.

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