Evaluation Model of Soccer Training Technology Based on Artificial Intelligence

Yongzhi Yang\textsuperscript{1,*}
\textsuperscript{1}Hainan College of Economics and Business, Haikou Hainan, 571127

*Corresponding author e-mail: yyzh2893@163.com

Abstract. Modern football competition has the characteristics of fierce confrontation, long duration, intensity of the game and large amount of exercise, and has high technical and tactical requirements. Therefore, the scientific and technical ability evaluation system plays a decisive role in football. One of the key factors for the real development of Chinese football is how to train and select young football talents scientifically. In order to train football talents better, this paper combines with artificial intelligence technology to study the evaluation model of football training technology. According to the characteristics and laws of football, this paper analyzes the index composition of football competitive ability. Combined with the traditional clustering data model, a support vector machine classification algorithm is proposed to construct the evaluation model of football training technology. Finally, this paper takes a professional team and a semi-professional team as an example and adds soccer evaluation model into their daily training. The results show that the evaluation efficiency is 24.12% higher than that of traditional artificial team, which proves the feasibility of this model.

Keywords: Artificial Intelligence, Vector Machine Algorithm, Cluster Analysis, Football Training

1. Introduction

Physical training is one of the hot issues in competitive sports. Special physical training is also an important way to improve the competitive performance of football players. Throughout the development history of competitive sports in China, football has been in a weak sport in China for many years, and its competitive level and development situation has not been satisfactory\textsuperscript{[1-2]}. This is mainly due to the insufficient cognition and understanding of special physical training, and is also one of the important factors directly affecting the training effect and athletes' competitive performance\textsuperscript{[3-4]}. 

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David L Carey collected data on loads and injuries of 53 players from an Australian professional football club over two seasons. Acute: chronic workload ratios were calculated for each athlete on a daily basis and noncontact injury probabilities were modeled using quadratic relationships. Six workload variables, eight acute time Windows and seven chronic time Windows were considered. The damage likelihood fitting results were compared among all parameter combinations. Entezari Zahra is exploring the effects of situational disturbance on observational learning. Therefore, verbal and visual cues related to artificial intelligence technology error correction are organized into blocking and random methods. Twenty-four participants, aged 19±1.4 years, were randomly divided into the occlusion group, the random group and the control group. Use 3-Dmotion analysis system for performance collection and use Cortex software for analysis. The main objective of Jovan Garda evi was to determine the impact of a quantitative change level on the speed of a 15-year-old soccer player, with a six-week preparation period for football training. The training programme comprises 44 training units. The study was based on a sample of 120 cadet football players. In order to estimate the movement speed, three test methods were adopted: stepping on a wall, sprinting to a 20-meter high starting point and sprinting to a 60-meter high starting point.

Aiming at the soccer training technology evaluation model, this paper combines the artificial intelligence algorithm and USES vector machine algorithm to carry out the modeling fast task assignment method, so as to improve the evaluation task execution efficiency caused by the rapid changes of soccer players' positions. The simulation results show that the accuracy and efficiency of the evaluation are greatly improved, which is conducive to the analysis of the problems existing in the process of soccer.

2. Artificial intelligence algorithm and football sport

2.1. Football Training Evaluation

It is the core method to evaluate the running ability of players in football matches. From the early manual symbol method, competition video analysis, radio telemetry and GPRS technology, has been developed to the current use of computer video technology analysis method, so computer video technology analysis method is the mainstream of this field of research. From the existing research results, it is too much classification of running speed, which is not conducive to the transformation of research results. The basic feature of running in football match is the position of players on the field. For example, there is a huge difference between the running of forward players and that of players in the middle and back field. However, from the current research results, there is a lack of specific research and evaluation on the running of players in different positions.

2.2. Football Training Technology Evaluation Model

As long as different kernel functions are defined in SVM algorithm, various existing learning methods such as polynomial approximation, radial basis kernel function method and Bayesian classifier can be realized. It is assumed that the sample data amount in football training sample set S is L:

\[ S = \{(x_i, y_i), i = 1, 2, \ldots, l\}, x_i \in R^n \] (1)
\[ \nabla^2 G(x, y) = \left( \frac{x^2 + y^2 - \sigma^2}{\sigma^4} \right) e^{-\frac{(x^2+y^2)}{2\sigma^2}} \]  

Where \( x \) represents the input data vector containing n-dimensional data characteristics. In the context of data flow, the traditional classification model is often unable to fully meet the requirements of practical application. Therefore, a new learning method emerges at the historic moment, namely incremental learning. The main purpose of incremental SVM algorithm is to solve two kinds of problems: one is that the computer memory is not large enough or there are too many data to be trained; the other is that all data cannot be obtained at one time and must be continuously trained online. Only in this way can the prediction accuracy of classifier be improved. The dynamic template data vector of the visual system of soccer movement recognition is attached to the second case, so the incremental SVM algorithm can be used for template recognition.

3. Design of the experiment

3.1. Experimental Background

In football, technical ability is the first priority, which is the most important in the training of young football players. Carrying on systematic technical ability test and establishing a set of scientific evaluation criteria play an important role in improving football level. Any effective action must have some kind of feedback process to provide information to see if the intended goal is being achieved. The correct feedback information can be obtained by testing the technical ability of football players, so as to objectively and truly reflect their football level, find out the characteristics and deficiencies of technical ability, and provide basis for improving football technical training.

3.2. Experimental Design

In this paper, vector machine algorithm is used to build the simulation model of soccer training evaluation, and then SPSS1310 and MAT-LAB710 software are used to realize the test, statistics and calculation of data. Then the fuzzy comprehensive evaluation is used to create the factor set and evaluation set of players' competitive ability, the subjective and objective combination weighting method is used to determine the index weight set of players' competitive ability at different positions, and the fuzzy evaluation of players' competitive ability is realized through matrix construction and calculation. Then, the evaluation model of a semi-professional team and an amateur team (20 players for each team) is adopted to realize the evaluation, so as to analyze the operability and practicability of the evaluation model. The experimental results are shown in Table 1.

| Table 1. Experimental results |
|-------------------------------|
| Indicators | Marking | Steals | The ability to choose a seat | Focus | Header |
| u1 | u2 | u3 | u4 | u5 |
The importance of group 1 4.66 4.11 4.78 4.02 4.13
The weights of group 1 0.02 0.01 0.02 0.05 0.08
The importance of group 2 4.21 4.12 4.58 4.32 4.24
The weights of group 2 0.06 0.02 0.03 0.02 0.01

4. Soccer training Evaluation model under artificial intelligence technology

4.1. Analysis of the Evaluation Model of Soccer Training Technology Based on Artificial Intelligence

As shown in Figure 1, the experimental study of this project selects players from two teams as the evaluation objects, one of which is a semi-professional team with certain professional characteristics, and the other is a well-organized amateur football team. Five coaches or five professionals familiar with the players were invited to evaluate the competitive ability indicators of each 20 players. Through fuzzy calculation, the evaluation and scores of players in different positions were obtained, and the fuzzy evaluation results were obtained. In addition, the coaching staff should give the experience evaluation of each player's competitive ability and position characteristics based on the information of players' training and matches. By comparing the evaluation of the two groups, it is found that the fuzzy evaluation of players' athletic ability is in good agreement with the experience evaluation, among which the semi-professional team has a high degree of agreement or above 90.00%(including a high degree of 65.00% and a high degree of 25.00%), and the amateur team has a high degree of agreement or above 75.00%(including a high degree of 35.00% and a high degree of 40.00%). The reason why the fuzzy evaluation effect of amateur teams is worse than that of semi-professional teams may be caused by such factors as the large gap of competitive level between amateur teams and the great randomness of position arrangement.
According to the experimental results, from the current research and practical application, there are mainly problems in the following aspects. First, there are too many dividing standards, and the practical applicability is not strong. For example, the coach may pay more attention to the athletes' high-intensity running and the total running distance in the competition, and pay less attention to the middle and low-intensity running. Second, this standard is a unified standard for athletes of different positions, ignoring the differences of players' positions on the field. For example, there is a huge difference in the running characteristics between forward players and forward players. If the players in different positions are evaluated according to a unified standard, a large error may be caused. Therefore, the primary purpose of this study is still to combine with artificial intelligence algorithm to improve the ability to screen the running ability evaluation indexes of athletes at different positions. According to the basic theory of general training, the athletic ability of athletes refers to the ability of athletes to participate in the competition, including physical ability, skill, tactical ability, sports intelligence and mental ability, which are comprehensively manifested in the process of special competition. This definition applies to the description of the athletic ability of a football player. According to this definition, the athletic ability of football players can be roughly divided into five parts: physical quality, technical ability, tactical ability, sports intelligence and mental ability. Some scholars also put forward different opinions. Starting from the characteristics of football specialties, they divided the competitive ability of football players into three sub-systems: football action, football consciousness and football intention. But overall, just to specific indicators to do a new classification, there is no essential difference.

As shown in Figure 2, the individual training of several sample football players was observed. For example, the athletic ability of a player P is evaluated. Capability evaluation for marking that accounted for 40%, of good accounted for 30%, accounted for 20%, 10%, 0%, poor, remember to: \[ x_1 = (0.13, 0.12, 0.14, 0.11) \], similarly, tackling ability \[ x_2 = (0.11, 0.11, 0.13, 0.13, 0.12) \], choose a \[ x_3 = \]
ability (0.15, 0.13, 0.12). From the point of view of the position characteristics of fullbacks, their running characteristics are similar to those of forward players to a certain extent, mainly high intensity running and low intensity running. However, with the prevalence of total offense and overall style of play, some fullbacks have a very large range of movement, so the total running distance in the game has a tendency to further improve. From the above analysis, it can be seen that sprint and total running distance are the core indexes to evaluate the running ability of athletes at different positions. The reason lies in the form of football and the field. From the point of view of sports form, football belongs to the same field of confrontation sports. The transition between attack and defense is very fast, and the confrontation is fierce. In addition, compared with the general collective ball games, the football match field is relatively large and the match time is relatively long. Therefore, the scope of players' activities becomes an important content to evaluate their running ability, and the total distance of their running is the core index to evaluate their range of activities.

![Figure 2. Sample analysis of football players' training](image)

4.2. Suggestions on Artificial Intelligence-based Soccer Training Technology Evaluation Model

Only the subjective weighting method is used in this study, which results in limited objectivity of weight allocation. In the next step, we can collect the sample data of players' competitive ability, combine the subjective and objective weights with the effective objective weighting method, so as to rationalize the weight distribution and improve the effectiveness of the evaluation method. The multi-angle and multi-level evaluation model has more influence indexes on the competitive ability of football players. As far as the model itself is concerned, the second-level or multilevel evaluation model can be established for evaluation. If the first and second level index analytic hierarchy process is used, the player's tactics, technique, physical ability, intelligence and mental ability can be evaluated. The evaluation of comprehensive competitive ability is realized with the first level index as the reference object. Draw the pentagonal projection graph of comprehensive competitive ability by tactics, technology, physical ability, intelligence and mind.

Through expert evaluation, the author determined 31 indicators of football players' competitive
ability. Taking the position of central defender as an example, the paper analyzes the distribution of different positions on the football players' athletic ability index weight. Can provide reference for player training and selection. The fuzzy evaluation method is used to establish the evaluation model of soccer players' athletic ability, which can realize the qualitative and quantitative evaluation of soccer players' athletic ability at different positions. The graphical representation of players' athletic ability visually describes soccer players' athletic ability levels at six different positions through a hexagonal graph. The projection area of the inner hexagon reflects the versatility of the player. It can provide scientific theoretical basis for the arrangement of players' position on the field.

Due to the small sample size, limited representativeness and subjectivity of the evaluation, the effect of fuzzy evaluation on the competitive ability of football players needs to be further verified in practice. But undeniably, it can provide an important auxiliary role for the evaluation of players' athletic ability, and can realize the quantitative evaluation of players' athletic ability based on experience. The fuzzy evaluation method has certain reference value, but it cannot replace the role of experienced football coaches and professionals. The fuzzy evaluation method is an effective supplement to the qualitative and quantitative evaluation of experience and can provide some reference for football professionals to evaluate players.

5. Conclusions

With the development of society, artificial intelligence technology is gradually put into various fields. Based on artificial intelligence technology, this paper studies the evaluation model of soccer training technology. This paper mainly USES vector machine algorithm, fuzzy evaluation and other methods to establish a soccer training technology evaluation model and standard. In the simulation experiment, the time-weighted classification strategy achieves the highest accuracy in the face of dynamic template establishment. The results show that the evaluation model is efficient and can provide basis and reference for football training and match.

References

[1] Lininger M R, Wayment H A, Craig D I, et al. Improving Concussion-Reporting Behavior in National Collegiate Athletic Association Division I Football Players: Evidence for the Applicability of the Socioecological Model for Athletic Trainers[J]. Journal of Athletic Training. 2019, 54(1):21-29.

[2] Jovan Gardasevic, Dusko Bjelica, Ivan Vasiljevic. The Strength of Kicking the Ball after Preparation Period with U15 Football Players[J]. Sport Mont Journal, 2017, 15(2):39-42.

[3] Zhao Wei, Cai Yunliang, Li Zhigang, et al. Injury prediction and vulnerability assessment using strain and susceptibility measures of the deep white matter[J]. Biomech Model Mechanobiol, 2017, 16(1115/1):1709-1727.

[4] Walker E J, Mcainch A J, Sweetching A, et al. Inertial sensors to estimate the energy expenditure of team-sport athletes[J]. Journal of ence & Medicine in Sport, 2016, 19(2):177-181.
[5] Carey D L , Blanch P , Ong K L , et al. Training loads and injury risk in Australian football—differing acute: chronic workload ratios influence match injury risk[J]. Br J Sports Med, 2017, 51(16):1215-1220.

[6] Zahra E , Alireza F , Behrooz A . Effect of Contextual Interference in Video Feedback on Kinematic Characteristic Acquisition of Football Pass[J]. European Journal of Experimental Biology, 2017, 07(02).

[7] Jovan Gardašević, Duško Bjelica, Ivan Vasiljević. Six-Week Preparation Period and its Effects on Transformation Movement Speed with Football Players Under 16[J]. Sport Mont Journal, 2016, 14(1):13-16.

[8] Mirabile, Mcdonald P. The Determinants of Attendance at Neutral Site College Football Games[J]. Managerial & Decision Economics, 2015, 36(3):191-204.

[9] Jeavons, Andrew. What Is Artificial Intelligence?[J]. Research World, 2017, 2017(65):75-75.

[10] Moravík, Matej, Schmid M, Burch N, et al. DeepStack: Expert-level artificial intelligence in heads-up no-limit poker[J]. ence, 2017, 356(6337):508.