Application of Artificial Intelligence Technology in Basketball Games

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Abstract: With the vigorous development of computer technology, artificial intelligence technology has also been greatly improved, and its application in sports competitions has become more and more widespread. The basketball game is a fierce rivalry under the team. In addition to testing the physical fitness of athletes, the ability to independently coordinate and plan athletes needs to be tested. Artificial intelligence has great application value in basketball games. Applying artificial intelligence technology to field decision-making in basketball games, real-time display of basketball game field data in real time, assisting coaches in field analysis and decision-making, can provide targeted training goals for daily training, and has strong application value. In this paper, an artificial intelligence assisting system for basketball game field decision-making is constructed to explore the application of artificial intelligence technology in basketball games. This paper tests the system proposed in this article through simulation experiments. The test results show that in the module test, the module error rate is 0.5%, the reliability is high, the module functions can be basically realized, the system responds quickly, and the security is high. The results of this paper will provide a good paradigm role for the application of artificial intelligence in sports competitions.

Keywords: Artificial Intelligence Technology, Basketball Game, Field Decision-Making, Artificial Intelligence Assisted System

1. Introduction

Artificial intelligence is a branch of computer science. It is a new technical science that researches and develops theories, methods, technologies and application systems for simulating, extending and expanding human intelligence. One of its main goals is to enable machines to perform complex tasks that normally require human intelligence to complete. In recent years, its rapid development has been widely used in military, economic, and management fields.
With the rapid development of computer technology, artificial intelligence technology has also been greatly improved, and its application in sports competitions has become more and more widespread. It not only allows audiences to enjoy the exciting moments of sports events with satisfaction, but also evaluates sports events objectively and fairly, reducing referee disputes between referees and athletes. This is also the eager expectations of coaches, athletes and referees for artificial intelligence technology, and also points the direction for sports researchers.

Research on decision-making under the background of basketball has always been a hot issue in the field of sports cognition. For those open, on-court collective sports events, the level of sports decision-making directly affects the athlete's ability to compete and skills and tactics. This requires athletes to have the ability to capture goals and process them in real time. In addition to tightly locking basketball goals, they also need to plan their course through their own decisions in order to complete efficient and high-quality goals. The method of artificial intelligence decision-making is to introduce the idea of knowledge representation and processing in artificial intelligence into decision-making theory, apply management science, computer science, and related disciplines theories and methods, analyze and compare, and provide managers with the right decisions Intelligent help. The application of artificial intelligence decision-making in basketball games is of great significance for real-time display of basketball game field data and helping basketball players to make field decisions.

The research purpose of this article is to explore the application of artificial intelligence in basketball games. This article explores the application of artificial intelligence in basketball games by designing artificial intelligence-based artificial intelligence assistance systems for basketball game field decision-making. This article first analyzes the current application of artificial intelligence in sports games, and analyzes the advantages of artificial intelligence in sports. In addition, this article elaborates the implementation method and feasibility of artificial intelligence-based artificial intelligence assistance system for basketball game field decision-making, and verifies the feasibility of the system through experiments.

2. Method

2.1 Application Status of Artificial Intelligence in Sports Games

(1) Applied to badminton boundary digital detection system and piezoelectric sensing technology

The main feature of the digital out-of-bounds detection system in ball games is composed of optical three-dimensional motion real-time tracking and capture equipment, data information processing system, digital display and sound warning and light-emitting warning equipment [1-2]. When badminton is playing on the playing field, its spatial position graphic information is captured by the optical three-dimensional motion real-time tracking and capture device in real time and uninterrupted, and the three-dimensional coordinates (X, Y, Z) and Graphic information [3]. When the ball is out of bounds at a certain point, the ball's three-dimensional coordinates and graphic information are processed by the data information processing system and compared and judged. The digital display, audible warning, and luminous warning devices instantly issue out-of-bounds alarms, and display the coordinates of the ball outside the bounds. The application of this out-of-bounds ball detection system makes it easier for the referee and audience to instantly and accurately determine whether a ball is out of bounds, including whether the ball is out of bounds when serving.
(2) Hawkeye system applied to tennis

The official name of the so-called "Eagle Eye Technology" is "Instant Playback System". Its technical principle is not complicated, but it is very precise [4-5]. This system consists of 8 or 10 high-speed cameras, four computers and a large screen. First, with the powerful computing power of the computer, the three-dimensional space in the playing field is divided into several units of measurement in millimeters. Second, the high-speed camera is used to capture the basic data of the tennis flight trajectory from different angles at the same time. These data generate a three-dimensional image; finally, the image uses real-time imaging technology to clearly show the sports course and landing point of the tennis ball from a large screen [6]. The significance of "Eagle Eye" lies in that it overcomes the shortcomings and areas of human eye observation ability and helps the referee to make accurate and fair judgment results. At present, there are still some restrictions on the application of "Eagle Eye Technology" on the tennis court. Each athlete only has two opportunities to use the Eagle Eye Challenge challenge per game. If the challenge is successful, it still enjoys two opportunities. If the challenge fails, it means Lost a chance.

(3) Electronic generator applied to football

In the football game, the side flag in the hands of the lineman has an electronic generator, which can inform the referee to find out the lineman's penalty in time [7-8]. "Football electronic referee" refers to electronic instant judgment systems such as goals and offsides in football. It consists of two major system components: hardware and software. The hardware system consists of a football positioning transmitter, a court corner directional transmitter, a camera, a radar speedometer, a player positioning transmitter, and a referee vibration receiver on the field. The software system is developed for the hardware described above. According to FIFA's definition of offside position combined with the court plane model, the judgment rules are obtained. By extracting the characteristic line of the stadium, the coordinates of the stadium plane are reconstructed, and the players and football are detected, and the automatic determination of offside in the video of the football game is completed [9]. This method can better monitor the offside situation in football matches, and achieve the purpose of assisting penalty, reducing referee workload and mistakes.

(4) Digital detection system for volleyball and football

It consists of optical motion real-time tracking and capturing equipment, data information processing system, digital display and sound emitting warning device [10-11]. During the game, when the game ball moves in the calibrated court space, the capture device will capture the graphic information of the ball and the three-dimensional coordinate information of the center of the ball to the information processing system. After calculation and graphic processing, it is determined whether the ball is out of bounds. Judge. Because of the rules of volleyball and football, the whole ball is judged as an out-of-bounds ball. At this time, the position relationship between the center of the ball and the sideline when the ball landed should be compared. When the ball landed, the tracking device can capture and process the center coordinates X, Y, Z) for mathematical comparison. At this time, Z is a certain minimum value. Comparing X and Y at this time with the standard value of the out-of-bounds range, you can decide whether the alarm is output [12].

2.2 System Implementation
(1) Conception of the system

There are a large number of professional data in basketball sports teaching and scientific research, such as daily training data, game data, teaching data, and experience data of colleagues at home and abroad. Using computer technology, these data are effectively classified and organized to form a data warehouse, and an artificial intelligence assisted system for basketball game field decision-making is constructed[13-14]. The artificial intelligence auxiliary system for basketball game scene decision-making is divided into three levels: database layer, processing layer and display layer. The database layer is the basic support platform and provides data support for the processing layer; the processing layer is the core executive agency responsible for the logical processing of basketball tactics; the display layer is a visual display of the processed data into decisions. The data layer library mainly completes the collection of basketball tactics data and builds a basketball tactics data warehouse. The artificial intelligence assistance system for basketball game field decision-making completes the collection and storage of basic data, training data, court data, and image file data by collecting basketball tactical data, including the characteristics database of basketball players, the characteristics database of coaches, and tactical cases Library. The processing layer is responsible for the processing of various basketball data. Obtain potentially useful information and knowledge through data mining, use mathematical knowledge to build your own experience into a professional model library, and combine artificial intelligence to optimize the model. In addition, you can use online analysis and processing to query and analyze data in a multidimensional manner. At the basketball game site, you can use the correlation analysis method to make reasonable arrangements for the players’ playing conditions. If the two players A and B often cooperate, the success rate of the two players on the court at the same time is 70%, and when the A player is off the field, at the same time, the success rate of cooperating with B for another person may decrease, and it will also affect B's physical fitness, reducing the success rate of A and B in the next stage, and thus affecting the team's performance. However, if B's physical fitness is sufficient, and the success rate of the players who join the team with B is not low, and the success rate with other players is higher than A, then such a substitution is reasonable. Data mining can effectively analyze connections like this, and use data model modeling to complete extremely complex pattern extraction and trend analysis through self-learning by artificial intelligence. After inputting field data parameters at the game site, the artificial intelligence auxiliary system for basketball field decision-making can analyze and compare these data, calculate the probability of various situations, and select the best substitution list, the best tactical combination and other data. The most complex and critical part of the processing layer is the establishment of a model library (knowledge base). The establishment of the model needs to be based on the experience of coach-level experts on the one hand, and on the other hand to model the association relationships obtained through data mining and other methods. Models include static models and dynamic models. The static model is mainly the individual ability model of the players, the overall ability model of the players on the field, etc.; the dynamic model requires the field parameters as input conditions, and then the model of the field operation. For example, the formation model of the two sides can analyze the position of each player on the field and the comparison of the opponent's position to analyze the attack and defense of the current formation, and by real-time input of the field data of both players, analyze which position of the team needs to be strengthened. Which position of the opponent is the weakest, etc. The use of artificial intelligence algorithms for self-learning and self-improvement of models. On the one hand, various models can be optimized and adjusted through self-learning capabilities; on the other hand, key parameters are modified based on
feedback data in practical applications to make the model More in line with the actual situation, in addition, the coach's experience can be adjusted as an effective input parameter.

(2) Feasibility analysis

The artificial intelligence assistance system for basketball game field decision-making is based on data. It is precisely because of the accumulation of a large amount of data and information in daily training and actual combat, which has laid a solid foundation for the system, coupled with the coach's rich knowledge and on-the-spot commanding experience. Provides reliable support for adjusting and optimizing the system. The data mining, online analysis, and virtual technologies involved in this system are relatively mature technologies, and they are widely used in military, economic, and management fields, and have been successful. The application of artificial intelligence in various industries is also becoming more and more extensive, and robot football simulation games have become quite mature. Of course, artificial intelligence needs to be built on the basis of data and models. Models can be built on the basis of various relationships and rules analyzed by data mining, or they can be built on the basis of basketball professional knowledge and the experience of coaches and experts. Through the model, valuable information can be obtained from a large amount of data, and the information is displayed in an intuitive form, so that the data can be effective, and the model can be dynamically increased and decreased and continuously enriched and improved through practical applications. In addition, tactical deduction, virtual arena, and virtual exhibition halls have gradually matured.

3. Experiment

(1) System performance test

In order to verify the performance of the artificial intelligence-based artificial intelligence assistance system for the field decision-making of the artificial intelligence-based basketball game in this paper, perform a performance test on the system. The test combines the basketball professional knowledge and the experience of coaches and experts to test the performance of all aspects of the system. Results were recorded for analysis.

(2) Experimental design

The accuracy of the data has a great impact on field decision-making. In order to verify the application of the artificial intelligence-based artificial intelligence assistance system for basketball decision-making in this article to a basketball game, a test experiment is designed. In order to verify the reliability of the test results, in the actual basketball game, the system proposed in this paper is chosen to make decisions on the field of the basketball game, and the results are collated and analyzed.

4. Discuss

4.1 Performance Analysis of Artificial Intelligence Assisted System Based on Artificial Intelligence for Basketball Game Scene Decision

The performance analysis and recorded data of the artificial intelligence-assisted artificial intelligence-assisted system for basketball decision-making at the scene of the artificial intelligence
proposed in this article are shown in Table 1.

| Module testing | Confirmation test | Performance testing |
|-----------------|-------------------|---------------------|
| Module error rate | 0.5% | Whether the performance requirements meet the requirements | Yes | System reaction time | 0.03s |
| Module function realization rate | 97% | Whether the function meets the requirements | Yes | safety | 96% |

As can be seen from Table 1, the results of the performance test are divided. In the module test, the module error rate is 0.5%, the reliability is high, the module functions can be basically realized, and the system meets the performance and functional requirements. The system response time is 0.03s and the safety is as high as 96%.

4.2 Analysis of Experimental Results

The artificial intelligence-assisted artificial intelligence-assisted decision-making department of the basketball game based on artificial intelligence proposed in this article is tested and compared with the actual data. The comparison result between the system collected data and the actual data is shown in Figure 1.

![Figure 1. Comparison results of data collected by the system and real data](image)

It can be seen from Figure 1 that the data collected by the system is roughly the same as the actual data. Except for slightly better errors in ball control time and number of shots, the accuracy of other items is as high as 100%. In general, the system for data collection The accuracy is quite high, and the accuracy of the data collection is high to ensure that athletes and coaches can make on-site decisions based on the data. This proves that after using this system, on-site decisions in basketball games can be performed well.
5. Conclusion

With the continuous efforts of sports researchers and sports enthusiasts, the application of artificial intelligence technology in sports is becoming more and more widespread. At present, artificial intelligence referee technology is far from mature. Sports artificial intelligence technology is still far behind the development of computer science. There are a series of software and hardware matching problems that need to be explored by the majority of sports workers. In order to explore the application of artificial intelligence in basketball games, this paper designs an artificial intelligence-assisted artificial intelligence-assisted system for field decision-making in basketball games, and verifies the reliability of the system through experiments. The research results of this paper have a good reference value for the future application of artificial intelligence to various sports games.

References

[1] A. Selvarajah, M. Bennamoun, D. Playford. Application of Artificial Intelligence in Coronary Computed Tomography Angiography [J]. Current Cardiovascular Imaging Reports, 2018, 11(6):12.

[2] Peter Hobson, Brian C Lovell, Gennaro Percannella. Benchmarking human epithelial type 2 interphase cells classification methods on a very large dataset[J]. Artificial Intelligence in Medicine, 2015, 65(3):239-250.

[3] Yuanxiong Long, Buoyan Liu, Shusong Mao. Review and prospect of the standardization of acupuncture and moxibustion in China[J]. Zhongguo zhen jiu = Chinese acupuncture & moxibustion, 2016, 36(12):1337-1340.

[4] Diego Perez, Spyridon Samothrakis, Julian Togelius. The 2014 General Video Game Playing Competition[J]. IEEE Transactions on Computational Intelligence & Ai in Games, 2015, 8(3):1-1.

[5] Toshiaki Hirasawa, Kazuharu Aoyama, Tetsuya Tanimoto. Application of artificial intelligence using a convolutional neural network for detecting gastric cancer in endoscopic images[J]. Gastric Cancer Official Journal of the International Gastric Cancer Association & the Japanese Gastric Cancer Association, 2018, 21(Suppl 1):1-8.

[6] Xiaoyan Sui. The Application Research of Secondary Attack Tactics in Freestyle Wrestling Sports[J]. Revista De La Facultad De Ingenieria, 2017, 14(1):74-78.

[7] Hamid Rahamanifard, Tatyana Plaksina. Application of artificial intelligence techniques in the petroleum industry: a review[J]. Artificial Intelligence Review, 2018(5):1-24.

[8] Young Joo Yang, Chang Seok Bang. Application of artificial intelligence in gastroenterology[J]. World Journal of Gastroenterology, 2019, 25(14):1666-1683.

[9] Wang, Tinghua, Zhao, Dongyan, Tian, Shengfeng. An overview of kernel alignment and its applications[J]. Artificial Intelligence Review, 43(2):179-192.

[10] Wang, Limin, Qiu, Xiaoping, Zhang, Lin. Turbulence originating from the
compromise-in-competition between viscosity and inertia[J]. Chemical Engineering Journal, 2016, 300(SEP):83-97.

[11] Ye, Jay J. Artificial Intelligence for Pathologists Is Not Near--It Is Here[J]. Archives of Pathology & Laboratory Medicine, 2015, 139(7):929-935.

[12] Demis Hassabis, Dharshan Kumaran, Christopher Summerfield. Neuroscience-Inspired Artificial Intelligence[J]. Neuron, 2017, 95(2):245-258.

[13] Luc De Raedt, Kristian Kersting, Sriraam Natarajan. Statistical Relational Artificial Intelligence: Logic, Probability, and Computation[J]. Synthesis Lectures on Artificial Intelligence & Machine Learning, 2016, 10(2):1-189.

[14] Herbert Jaeger. Artificial intelligence: Deep neural reasoning[J]. Nature, 2016, 538(7626):467.