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Application of Artificial Intelligence Technology in Sports Competition

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Abstract: **This paper summarizes the applications of artificial intelligence technology - machine vision, infrared technology, electronic sensing technology and computer control technology in sports referee in recent years, with the purpose of providing theoretical reference for future application of artificial intelligence technology in sports referee field.**

Keywords: Artificial intelligence; Physical education; Game; Competition

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1. Introduction

Artificial Intelligence (AI) is a frontier subject, which is developed on the basis of many disciplines such as computer science, cybernetics, information theory, system science and philosophy. It can simulate, extension, expansion of human intelligence disciplines. Its research has extended the function of the human brain, deepened and expanded the intelligent labor of mankind, and made the development of science and technology revolution unprecedented. With the vigorous development of computer technology, artificial intelligence technology has also been greatly improved, and its application in sports competitions more and more widely. It can not only meet the audience to enjoy the wonderful moments of sporting events, but also objective and fair evaluation of sports, reduce the referee and the referee disputes between athletes. This is also the coaches, athletes and referees on the ardent expectations of artificial intelligence technology, but also for the sports scientific research workers pointed out the direction.

2. The Application of Artificial Intelligence in Sports

2.1. Applied to the table tennis border digital detection system and piezoelectric sensing technology

The purpose of the article is to explore the new diagnosis method of skills and tactics of table tennis matches and to try the application of artificial intelligence for diagnosis and analysis of table tennis matches. It also discusses the method. of evaluation and predicting based on the outcome of diagnosis of table tennis matches.

The artificial intelligence methods study how to simulate human's intelligence and behaviors by means of computer technology. The decision-tree method can build the tree according to goal data set, obtain decision rules and provide support of table tennis matches. The rough set method can get the minimum set of goal set and optimization attribute combinations. Depending on its' efficient nonlinear fitting abilities, the artificial neural network method can find the implied functions. For their advantages, it is very important to study the application of diagnosis evaluation and predicting of table tennis matches systematically (Figure 1).

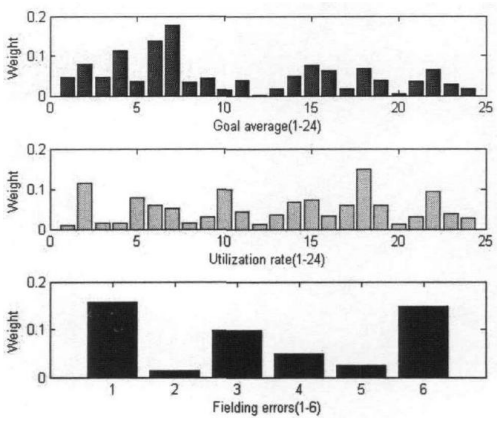

Figure 1. Artificial intelligence technology diagnosis.

The study of skills and tactics indicator system of table tennis matches for diagnosis and evaluation. Based on the analysis and summary of related literature, we found that the study on diagnosis of table tennis' skills and tactics developed in two different directions: abstract and concrete. The article manages to build new skills and tactics indicator system to bound five elements of table tennis together. Firstly, it builds skills system combining skills and placement of table tennis, which includes serve, forehand loop drive (fast attack), backhand loop drive (fast attack), flick, Chop, Chopping short, Push(block). Secondly, it builds tactics system by combing tactics and time series of competition, which includes three phases such as serving phase, receiving phase, countering phase and four tactics such as attack (Figure 2), control, defense and balance.

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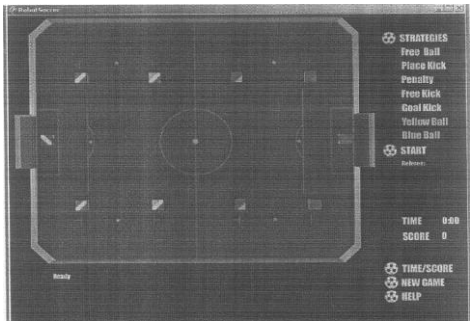

Figure 2. Development Platform.

The contrast of skills-tactics diagnosis of table tennis matches based on artificial intelligence, which includes the application of decision tree and rough set based on the winnowing results of decision tree and reduction results of rough set. The results indicated that ANN and DT method are stable, the reduction results of rough set are different among several tests. ANN method is able to fit goal set precisely if the goal error is selected justly, DT method is good and rough set method is poor. The results of DT and rough set method are tend to attributes with large value; but ANN method is tend to find the function relationship between skills attributes and winning percentage according to its better transfer function.

The improvement of method of skills and tactics diagnosis of table tennis matches based on artificial neural network, firstly, the way of improvement of delta is changed, secondly, the matches are divided into three kinds of circumstances such as the best, good and poor performance.

The study of skills-tactics evaluation and predicting of table tennis matches based on artificial intelligence, which discusses the importance, approach, principle and processing procedures of evaluation, that is divided into two circumstances such as evaluation between players and some player. The results showed that the evaluation method has a strong approach and better results and can reflect the difference reasonably among matches. The paper tries to predict the results of table tennis matches based on the results of diagnosis and discuses the meaning, classification and procedures of predicting. It studies the combination of the decision tree and the artificial neural networks to predict the outcome of table tennis matches: Practices have shown that the algorithm is applicable. The new methods used data from 70 matches to develop predictive models of excellent ping-pong players and 32 matches for test. Combination prediction, which takes on average 3.1094s, takes only 18.61% of ANN would take. The accuracy is 0:9285; is close to ANN.

It studies the characteristics of skills of excellent table tennis players based on the improved ANN diagnosis method. The results showed that: The forehand loop (fast attack) is a major pointing method of all excellent table tennis players. The skills of serving are also important pointing method, especially, at middle half placement. The characteristics of skills between Chinese male table tennis players and foreign are similar; there are some differences in the importance of forehand loop drive. For foreign male players, the importance of forehand loop drive is different from Chinese layers such as the hitting placement; the series of their goal average of forehand loop drive is backhand middle forehand; Chinese players are backhand forehand middle. For Chinese female players, the most important skills are forehand loop drive and backhand loop drive. The placement of forehand and backhand are primary pointing method; however, those are backhand and middle for foreign female players.

It also studies the characteristics of tactics excellent table tennis players. The results showed that: The most important tactics of male table tennis players are serving-attack and reserving-control. The most important tactics of female table tennis players are serving-attack and countering-balance. Compared to the foreign male players, the tactics of serving-control and reserving-control of Chinese male players are better. The tactics of defense are important to foreign players. The tactics around attack are most widely used for Chinese female players. The uses of receiving countering tactics play a decisive role in foreign female players' matches.

The improved diagnosis method is used to excellent table tennis players at the first time such as CHNMA, CHNMB, CHNMC, CHNMD, CHNME, CHNFA, CHNFB, CHNFC, CHNFD, CHNFE, FORMA (GER), FORMF (GER), FORMB (BLR), FORMC (KOR), FORMD (KOR), FORME (TPE), FORFA (SIN), FORFB (SIN), FORFC (SIN), FORFF (SIN), FORFD (JPN), FORFE (KOR). The diagnosis conclusion is used for competitor analysis o} the 29th Olympic Games and the 50th World Table Tennis Championship, which has been proposed and broadly accepted by Chinese coaches and players.

2.2. Robot Soccer Match Intelligent Technology

Robot Soccer game is a high-tech oppositional activity that develops rapidly in recent years, and is the combination of the physical culture and high-tech. It is a milestone after the "Deep 131ue" which won the international chess master. In the soccer robot system} several robots cooperate with each other and complete the aim of shooting in the real-time, noisy, oppositional and complex environment. At present, many researchers apply the real-time technologies, such as AN(Artificial Neural Network), EA (Evolutionary Algorithms), MAS(Mufti-Agent system), ES(Expert system), decision-making path-planning and fuzzy logic to the normal plat of Robot Soccer and make some progress. However the development of Robot Soccer is underway, some theories is not so perfect and some arithmetic should be improved.

Firstly, the paper introduces the background and actuality of the exploitation tells the whole system based on the vision has four component: the decision-making subsystem, the vision subsystem, the wireless communication subsystem and the robot vehicle subsystem. Then t the function, structure

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controlling model and using method of the robot vehicle subsystem are introduced .The structure and familiar problems of the wireless communication subsystem are analyzed. The working flow and oration method of vision subsystem is expatiated. And some design methods of the decision-making subsystem are introduced.

Secondly, as the important component of the soccer robot system, the decision-making subsystem, the design method of it is discussed. From bottom to top, the paper gives the denotation means of the entity. The design method of the action, the role of the robot and the order are all robots behave, and describe the design.

2.3. Application of artificial intelligence technology in game development

With the rapid upgrading of hardware and the rapid development of computer graphics, Game development is undergoing tremendous changes. Three-dimensional (3D) graphics rendering and visual effects have been developed to an extreme, and the focus of Game development is gradually shifting from the traditional "graphics" to "Artificial Intelligence (AI)"."Game AI" is a new concept and it mainly refers to the study on how the existing AI technology can be better applied to game development, making games show humans' intelligent behavior, thinking, activity, or emotion. Game AI is a powerful technology which can extend the life of the game that has aroused widespread concern in the field of technology and academia (Figure 3).

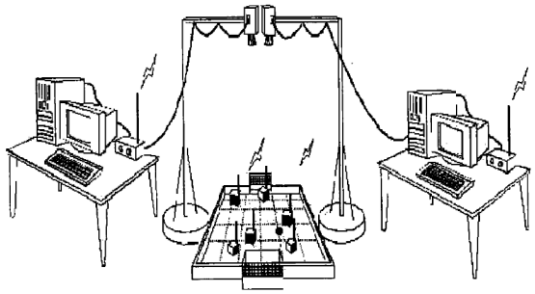

Figure 3. Artificial robot.

Firstly, we summarize the concept, characteristics and development process of Game AI, introduce some common development, and, combined with the development of computer science, make a moderate prospect of the trends of the Game AI (Figure 4).

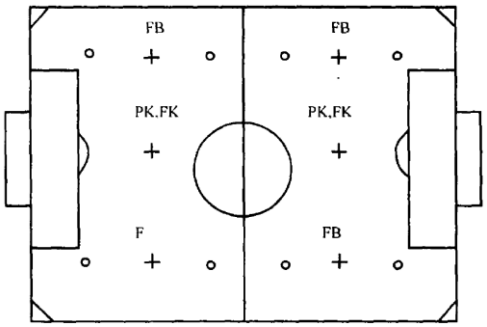

Figure 4. Schematic diagram of the venue.

Secondly, we compare some algorithms commonly used in grid map searching, focusing on the deficiency of A*algorithm combined with the game development. By weighted heuristic function to break the searching equilibrium, thus stopping the inefficient extension of many equilibrium points, the efficiency and Intelligent of the algorithm have been improved (Figure 5).

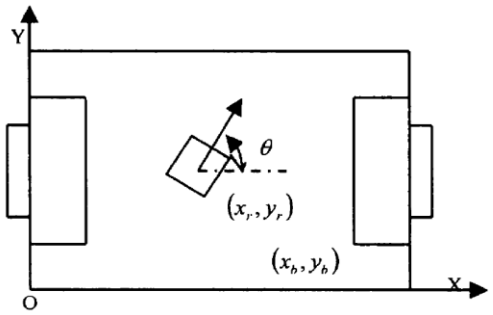

Figure 5. An entity representation in a coordinate system.

Finally, we propose a model of game development based on ANN&FSM which has the ability of learning and adapting, and implement a common "Decision Engine" by using "Back Propagation Neural Networks". Meanwhile, the design and development of a 11-person Robot Soccer Simulation Game with JAVA has been achieved by adopting the above model accompanied with related technology of JAVA game development, which has produced ideal experimental results.

3. Advantages of Artificial Intelligence in Sports

The rapid development of computer technology, the rapid increase in computing speed and the rapid advance of camera technology, are for the potassium in the field of sports a wide range of applications to provide a strong technical support. The speed of calculation is improved, so that the reaction speed of real-time referee system can meet the needs of the audience (Figure 6). Camera technology advances, but also to solve a number of exciting sports moments of controversy.

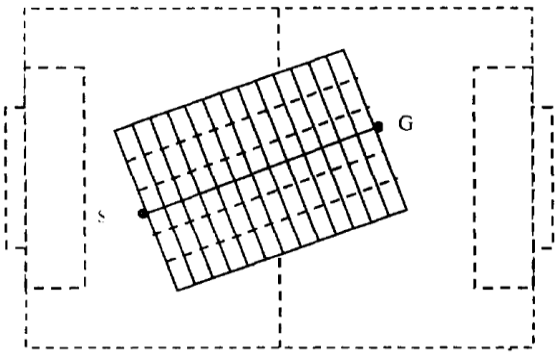

Figure 6. Genetic Algorithm to Avoid Obstacles.

In recent years, China's high-level physical education has made great progress, cultivates a large number of the prime of life, and has a strong scientific

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research ability of master's and doctoral students. For them, to master artificial potassium technology is not out of reach. Young sports science and technology workers of the continuous development and growth of practical and practical for the development of sports potassium to provide the necessary personnel support (Table 1).

With the development of the economy, people's leisure time increased the requirements of watching sports competitions are getting higher and higher. Not only the athletes have a higher technology expectations, the level of the referee has also been more understanding and expectations. It is hoped that the determination of referees' judgments through artificial potassium technology will be fair and the more exciting games will be displayed on the bigger screen. This will provide a broad market prospect for the development of artificial intelligence technology.

Table 1 Winning probability discrete interval

Probability winning	Discrete value	Qualitative evaluation
[0.5294,1]	5	Best
[0.4737,0.5294]	4	Better
[0.4286,0.4737]	3	Good
[0.36,0.4286]	2	worse
[0,0.36]	1	worst

4. Conclusion

Based on the majority of sports research workers and sports enthusiasts continue to make artificial potassium technology in the field of sports more and more widely. But if all the games are using artificial potassium technology, the verdict is fair, it may affect the sports of the United States, it is precisely because of the referee's "mistakes", only to make sports more talk, become people Gossip discussion hot spots. At present, artificial potassium can judge from the mature technology there is a long distance, artificial potassium technology can lag far behind in the development of computer science, there is a series of software and hardware matching problems, the majority of sports workers need to explore.

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