

Research on the Application of Information Technology in Basketball

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Abstract

With the development and application of information technology, people's lifestyles have undergone tremendous changes, and basketball has naturally gradually become associated with modern technologies such as artificial intelligence, big data, and virtual reality. Therefore, this article discusses the practical application of the two technologies of big data and artificial intelligence in information technology in basketball games and basketball training, in order to clarify how information technology can be used in basketball.

Keywords

Basketball, Big data, Artificial Intelligence.

1. Introduction

Information technology refers to the methods and equipment used to obtain, process, store, transform, display and transmit text, value, image and sound information under the support of computer and communication technology, including methods and equipment for providing equipment and providing information services. Collectively. As a new generation of information technology, artificial intelligence and big data have been applied to major industries, and basketball is no exception. Through the application of these technologies, more convenient and more scientific analysis and methods have been brought to the training and competition of basketball, ensuring the quality of training and improving sports performance.

2. Application of Information Technology in Basketball

2.1 The application of big data in basketball games

IBM proposes that big data has five characteristics: Volume, Velocity, Variety, Value, Veracity. This article mainly discusses the big data involved in basketball. Big data of basketball refers to the huge amount of data involved in basketball matches that cannot be captured by the human brain or even mainstream software tools in a reasonable time. In order to obtain, manage, process, and organize, new processing models need to be used to make data more detailed, comprehensive and systematic information assets. At present, basketball big data is mainly used for game analysis and game judgment.

2.1.1 Application of big data in basketball game analysis

As one of the best professional sports leagues in the world, the National Basketball Association (NBA) brings together the best basketball players in the world and stores extremely detailed statistical records, thanks to its advanced data collection and analysis technology. At present, the NBA mainly uses the Sportvu system to collect data. The Sportvu system was first used in military fields such as missile tracking technology. Its working principle is to capture the player's spatial coordinates at a rate of 25 frames per second. Point plus timestamp and player ID. A game can collect 72,000 data

points, and the collected raw data accumulates to form a huge database. After these data are captured on the server side, the data can be processed. sportvu can not only record the basic data of the player's team, but also track the basketball skills-related actions performed by all players on the court, such as shooting, passing, touching the ball, screening and running distance. More importantly, these data can help players and teams make better decisions. For players, Sportvu provides a lot of unstructured data. For example, in shooting data, Sportvu can analyze the shooting rate of players under different defensive pressures. Using these data, players can make better shots in the game. Choose and practice in the usual training for shooting methods with lower shooting percentages. For the team, sportvu can track the rhythm and characteristics of the entire team. For example, compare the running data of the main players of the two teams (Spurs and Heat) that successfully entered the finals in the 2013-2014 season (Table 1). In five games, the Spurs' entire team has run more distance than the Heat. The team runs 4 miles longer. The Spurs run 0.77 miles longer per capita than the Heat. It is not difficult to conclude that the Spurs are a team that pays more attention to movement and teamwork. This can also explain why. The Spurs can win the championship that year.

Table1. Running data of some players in the 2013-2014 finals

Player	Team	Gp	Dist. Feet	Dist. Miles
Tony Parker	SPURS	5	14146.2	2.68
Boris Diaw	SPURS	5	13099.4	2.48
LeBron James	HEAT	5	13086.2	2.48
Kawhi Leonard	SPURS	5	12808.8	2.43
Chris Bosh	HEAT	5	12492.4	2.37
Dwyane Wade	HEAT	5	12037.2	2.28
Ray Allen	HEAT	5	11834.6	2.24
Tim Duncan	SPURS	5	11423.6	2.16
Manu Ginobili	SPURS	5	10249.6	1.94
Rashard Lewis	HEAT	5	8745.6	1.66
Mario Chalmers	HEAT	5	8578.6	1.62
Danny Green	SPURS	5	8459.6	1.6
Norris Cole	HEAT	5	6584	1.25

At the same time, the data of the Sportvu system is developed for the public, so for fans, this system also greatly increases the fun of watching football. Fans can use SportVU to find various data about their favorite players to improve their understanding of the player. Enhance the experience of watching the ball. However, due to the high cost of the sportvu system, its use worldwide is only limited to the NBA.

2.1.2 The application of big data in the referee system

In a basketball game, in addition to the performance of players and opponents, the referee's penalties also have a certain impact on the results of the game. Especially at a critical moment of the game, a referee's penalty will even determine the final trend of the game. Although professional basketball matches are equipped with three referees, due to the short time of occurrence and the limitations of the human body, wrong judgments and missed judgments will inevitably occur. In order to further ensure the fairness of the game, professional leagues in various countries are exploring how to use modern technology. To improve the accuracy of the penalty. In 2014, the NBA League set up a big data reply center in New Jersey that connects all games. Referees can turn to the reply center when they encounter situations that are difficult to judge by the naked eye. The referee directly communicates with the officials of the center. Players and coaches on both sides must not interfere with the referee. Such a provision not only shortens the judgment time, but also improves the accuracy of the judgment and further ensures the smoothness and fairness of the game. According to data, more than two thousand judgments were intervened by the reply center, and the average time to determine

a penalty was only 29 seconds, and the average time for each game to be delayed due to video playback was only 101 seconds. During the playoffs, their overall accuracy rate of whistleblowing can reach 87.2%. In 2017, the Chinese Professional Basketball League (CBA) also opened a replay center. However, due to the lack of seats and lines, and the lack of relevant regulations for watching replays, this replay center cannot directly pronounce judgments like the NBA. Assist the on-site referee to make a judgment.

2.2 Application of artificial intelligence in basketball

Artificial intelligence is a branch of computer science. It attempts to understand the essence of intelligence and produce a new intelligent machine that can respond in a similar way to human intelligence. Research in this field includes robotics, language recognition, image recognition, Natural language processing and expert systems, etc. Artificial intelligence is also widely used in the basketball field, such as basketball video editing, shooting robots, basketball assisted training, etc.

2.2.1 The application of artificial intelligence in basketball video editing

Basketball sports footage is very complex, athletes are moving at high speeds, the screen is crowded with people, blocking each other, multiple cameras, and frequent lens movement. There are many interfering factors, which bring great challenges to the editing of videos, and also greatly affect the efficiency of editing. In high-level professional basketball leagues, each team is equipped with a dedicated video analyst. The size of the NBA video analyst team can reach 10-15, and the positions are subdivided, and each team performs its own duties. In the CBA, Video analysts are still in the embryonic stage. Although each team is equipped with a video analyst, the team is very small, almost only 1-2 people. This requires them not only to organize and collect materials, but also according to the team coach According to different requirements, the game videos are classified and transferred to the coaching staff for analysis and use. Therefore, CBA's video analysts have been overworked for a long time. But today, with the continuous development of artificial intelligence, there is a better solution to this problem. In 2018, Tencent Sports cooperated with IBM to apply the IBM "AI Vision" technology developed by IBM China Research Institute to basketball video clips. IBM "AI Vision" uses "multi-modal vision understanding technology" to "pixel-level tracking and recognition" of video images, including player face recognition, human action recognition (dunk, shooting, air relay, layup, flying rescue Ball, celebration), human facial expression recognition (roar, sad, happy, funny), object recognition (court, basketball, basket, jersey number); and analyze the correlation behind the judgment, the relationship between human actions and the movement of objects With the logic of AI, massive amounts of data can be categorized in a short time through AI's high-speed calculations, which greatly saves editors' time to find material. In addition, "IBM AI Vision" can complete the video recognition and cutting work in real time during the live broadcast of the game, and within 20 seconds after the game, it can be combined into a film according to people's inspiration and requirements. And through "human-machine collaboration", the creators formulate the entire storyline and art framework, select the soundtrack, and the AI editor can perform specific operations within the set framework, and the final film can fully return the original author's intentions. Through the learning function of artificial intelligence, it can not only save a lot of labor costs for team video analysis, so that video analysts can edit better quality videos in a shorter time, but also provide fans with more accurate video recommendations. Fans can more easily find various video highlights of their favorite stars.

2.2.2 Application of artificial intelligence in basketball training

The development of basketball is inseparable from the development of personal skills, and the diversity of skills also determines the diversity of tactics. For example, Stephen Curry's precise three-pointer led to the advent of the small-ball era (Small-ball) and ushered in it. The upsurge of three-point tactics. However, whether it is a professional player or a basketball enthusiast, the training of personal skills has always been a relatively boring content, not only because of the repetition and monotony of the training content, but also the problem of untimely training feedback, which leads to the training of professional players or basketball enthusiasts. Afterwards, he is not clear about the

effect of his practice, which affects the improvement of basketball skills. For this reason, many auxiliary training tools have appeared on the market. For example, a mobile AI technology company called NEX Team has launched an application called HomeCourt, which combines artificial intelligence (AI) and augmented reality (AR) technologies. In combination, when practicing shooting skills, only a smart phone and a tripod are required. Players can record on any field. The software will record the player's shooting action, shooting angle, shooting arc, shooting speed, and shooting percentage. Wait for recording, and every shot of yours can be played back in slow motion. Players can use these data to adjust their shots in time to continuously improve their shooting percentage. In addition, the software also supports the creation of personal files and team files. After the files are created, they can be compared with users of the same level who use the software, and they can also perform various fun challenging tasks, and even challenge NBA professional players. This increases in order to improve the player's interest in practice, he improves his basketball skills by challenging and completing tasks. At present, the software has applied this practice-comparison-challenge mode to dribbling, passing, physical fitness and so on. In addition to providing technical and physical training assistance, artificial intelligence technology can also play an important role in monitoring the physical condition of athletes. For example, during training for Golden State Warriors players, they will wear Catapult Sports monitors to track acceleration, redirection, heart rate and other indicators, and use Omega wave devices to monitor tension. In addition, the team also tried the Athos EMG practice suit and many other different smart devices. Based on long-term monitoring, the team can integrate and comprehensively analyze the obtained data indicators to reasonably arrange the players' playing time. For the team, these data are the basis for arranging whether the players will play and the time of the game. For the players, these data can help them know their physical state in real time and adjust the training state according to their physical conditions. This also allowed the Golden State Warriors to win three championships from 2014 to 2018, and their injury rate is also the lowest in the NBA. Therefore, we have reason to believe that through artificial intelligence data analysis, using the analysis results to guide training and competitions can have a positive impact on the development of the team.

3. Conclusion

The application of information technology has a positive effect on basketball. In terms of basketball analysis, big data technology can not only obtain a large amount of accurate data and analysis results in the game, help players and teams make corresponding adjustments during or after the game, but also provide a further guarantee for the fairness of the basketball game, Which further enhances the fans' watching experience. In basketball training, the combination of AI and AR can enhance the fun of basketball training and help players better improve their basketball skills. The combination of AI and wearable devices can analyze the player's real-time physical state, and adjust the player's playing time and training intensity based on the analysis results, so as to protect the player's health and prolong the sports life. Therefore, the basketball industry should actively introduce information technology to continuously promote the competitive level of basketball players and sports teams, and at the same time attract more social resources to participate in the basketball industry, so as to promote the continuous development of basketball.

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