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PROSPECTS OF USING ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN SPORTS GYMNASTICS

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Abstract

This article examines the theoretical and practical aspects of applying Artificial Intelligence (AI) technologies in artistic gymnastics. It explores the digitalization of the training process, biomechanical analysis, video analytics, machine learning algorithms, and the prospects for using intelligent sensor systems to enhance athletic performance. In addition, based on international scientific research, the study analyzes the significance of AI technologies in improving athletes' preparation, refining technical skills, optimizing training processes, and preventing sports-related injuries.

Keywords: Artistic gymnastics, artificial intelligence (AI), biomechanics, computer vision, machine learning, video analytics, sports technologies, digitalization.

Introduction

The rapid development of digital technologies and artificial intelligence has brought new opportunities to the sports industry. Especially in sports that require high accuracy and complex coordination, such as artistic gymnastics, SI tools are becoming an important tool for analyzing athletes' movements, identifying technical errors, and developing individual training programs. In artistic gymnastics, the quality of each element's execution directly affects the result. Therefore, enriching the coach's observations with modern algorithms and digital analysis is an urgent scientific and practical issue.

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The purpose of the study. To scientifically analyze the prospects for the use of artificial intelligence technologies in gymnastics and develop recommendations for increasing the effectiveness of training.

Research objectives

- ✓ study the theoretical foundations of SI technologies in gymnastics;
- ✓ analysis of international experience;
- ✓ assessment of the possibilities of video analytics and biomechanical monitoring;
- ✓ determination of their role in injury prevention;
- ✓ justification of promising development directions.

Research methods

The methods of scientific literature analysis, comparative analysis, systematic approach, generalization, observation, and theoretical modeling were used. Adabiyotlar sharhi

In recent years, the number of published studies on SI in sports has increased dramatically. International scientific works have developed methods for automatically assessing the technical movements of athletes using deep learning, computer vision, neural networks and smart sensors. Biomechanics studies show that SI can be used to calculate joint angles, body center displacement and movement trajectories with high accuracy. Machine learning models are described as effective too Application of artificial intelligence in gymnastics

1. Automatic analysis of technical elements Using computer vision algorithms, jumps, rotations and landings are analyzed frame by frame. As a result, the coach can identify errors that are difficult to notice with the human eye.

2. Video analytics High-resolution cameras and SI algorithms create a model of the athlete's skeleton and evaluate the amplitude, speed and balance of movement.

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3. Biomechanical monitoring As a result of mathematical modeling of movements, optimal technique is developed, overload is identified and efficiency is increased.

4. Creation of individual training programs SI systems help develop a personal training plan based on the athlete's age, training, previous results and recovery indicators.

5. Injury prevention By analyzing sensors and historical data, risks associated with overload or incorrect technique can be identified early.

Statistics The pace of use of artificial intelligence in the sports technology market is increasing year by year. According to analysts, this area is expected to maintain double-digit annual growth rates in the coming years. SI systems are especially widely used in video analytics, biomechanics, sports medicine, and individualized training. Is for predicting athlete performance and determining individual loads.

International experience in developed sports centers, SI technologies are used for the following purposes:

- automatic evaluation of complex gymnastic elements;
- analysis of competition videos;
- planning individual loads;
- monitoring the recovery process;
- early identification of talented athletes.

Practical recommendations

1. Introduction of video analytics systems in sports schools.
2. Expanding the use of smart sensors in training.
3. Training coaches in the use of SI technologies.
4. Establishment of biomechanical laboratories.
5. Creation of sports analytics platforms based on a national database.

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Discussion

Artificial intelligence does not replace the work of a coach, but rather supports it with accurate data. With the help of technology, the possibilities of objective assessment, individual approach and scientifically based planning expand. At the same time, the training of specialists and the development of technical infrastructure are of great importance.

Conclusion

In conclusion, the use of artificial intelligence technologies in gymnastics is one of the most promising areas of modern sports science. These technologies allow for the scientific organization of the training process, in-depth analysis of the technical and functional training of athletes, and support coaching activities with objective data. In particular, the use of computer vision, video analytics, biomechanical modeling, and machine learning algorithms is of great importance in accurately assessing the quality of performance of complex gymnastic elements, timely detection of technical errors, and their elimination. Also, artificial intelligence-based analysis systems serve to optimize training loads, control the recovery process, and reduce the risk of overexertion and injury, taking into account the individual characteristics of athletes. Real-time data obtained through smart sensors and digital monitoring tools allows coaches to make quick decisions and help protect the health of athletes. The results of the study show that the gradual introduction of artificial intelligence technologies into the gymnastics system will not only increase the effectiveness of training, but also create broad opportunities for improving the results of athletes in competitions, identifying talented young people and developing their potential. In addition, by analyzing the large amount of collected data, it will be possible to develop long-term training strategies and make scientifically based management decisions. In the future, it is expected that the integration of artificial intelligence in gymnastics with virtual reality, augmented reality, digital twin technologies

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and wearable smart devices will bring the quality of training to an even higher level. At the same time, for the effective use of these technologies, it is important to increase the digital competencies of coaches and specialists, develop modern technical infrastructure and strengthen cooperation between national sports organizations and scientific institutions.

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