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Research on Autopilot Technology in Aviation in the Era of Big Data

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Abstract: With the rapid progress and wide application of big data technology, its position in the autopilot technology in the aviation field is increasingly prominent, playing an irreplaceable role. This paper is devoted to a comprehensive analysis of the current development, challenges and future development direction of autopilot technology in the aviation field. We will provide more solid and in-depth theoretical support and practical guidance for improving aviation safety performance and enhancing flight efficiency. Aviation autopilot technology can make full use of massive data resources, accurately grasp the flight state, optimize the flight path, and further improve flight efficiency and aviation safety. This paper expounds its specific application status in aviation field in detail, and looks forward to its possible development trend in the future.

Keywords: Big data technology; Aviation field; Autopilot technology; Flight efficiency; Aviation safety

Introduction

With the coming of the era of big data, the development of autopilot technology in the aviation field has ushered in an unprecedented historical opportunity. The vigorous development of big data technology provides massive data resources for aviation autopilot, and provides strong technical support for data processing, analysis and mining. Aviation autopilot technology can control flight state more accurately and optimize the flight trajectory, thus improving flight efficiency and ensuring aviation safety. This paper will deeply analyze its application status in aviation field and explore its future development trend.

1. The application status of big data in aviation autopilot technology

1.1 Data acquisition and storage

In the field of aviation autopilot, data acquisition and storage can be described as the cornerstone of big data applications. The aircraft can capture dribs and drabs of data in the flight process. These data tell the details of each flight. After a series of elaborate processing procedures, it can be transformed into accurate flight information required by the autopilot system.

Efficient data storage and management are indispensable. Using distributed storage technology, massive flight data can be stored in order to ensure its integrity and reliability. This storage method ensures data safety, and makes data query and retrieval more convenient.

1.2 Data processing and analysis

Big data processing and analysis technology plays a vital role. Cleaning, integrating and deep mining the collected data is like extracting gold from a gold mine and extracting valuable information from it. This information is the basis of decision-making and the wisdom of flying.

For example, we can predict changing trend of aircraft performance, find possible safety hazards in time, and take targeted measures to prevent them. It not only improves the use efficiency of aircraft, but also ensures flight safety. In addition, data analysis can help us optimize flight trajectory, reduce flight cost, improve flight efficiency and inject new vitality into the development of aviation industry.

1.3 Intelligent decision-making and control

Autopilot technology based on big data has achieved a leap in intelligent decision-making and control. Autopilot system can deeply learn and train flight data, and gradually has the ability of independent decision-making and control.

Autopilot system can make correct judgments and responses quickly according to actual flight conditions. Whether it is sudden weather changes or complex flight tasks, it can deal with it. At the same time, intelligent decision-making and control technology has greatly improved the degree of flight automation, reduced the risk of flight accidents, and escorted aviation safety.

1.4 Safety monitoring and early warning system

Safety monitoring and early warning system is undoubtedly another important application of big data technology. This system relies on

powerful data processing ability to analyze and monitor the flight data in depth in real time. Specifically, safety monitoring and early warning system can receive all kinds of flight data from aircraft in time, including flight status, equipment status, environmental parameters and so on. The system quickly processes and analyzes these data, and identifies possible security risks or abnormal situations. Once system detects an abnormal situation, it will immediately trigger an early warning mechanism and send early warning information to pilots or ground control centers.

2. The challenges faced by aviation autopilot technology in the era of big data

2.1 Data security and privacy protection

Data security and privacy protection are undoubtedly one of the key challenges faced by autopilot technology. Once these data are leaked or illegally used, it will not only lead to serious results, but also pose a threat to national security and public interests. Therefore, in the whole data life cycle of autopilot technology, from data collection, storage, processing to application, extremely strict security measures must be taken to ensure the integrity and confidentiality.

Data security is not only a technical issue, but also a multi-dimensional issue. Autopilot technology in the aviation field needs to establish a complete data security system to ensure legal use of data and prevent any form of illegal acquisition and abuse. Personal information in aviation field involves passengers' travel records, identity information and so on. Therefore, we must strictly abide by the principle of privacy protection to ensure that personal information is not abused or leaked.

2.2 Data quality and reliability

The quality of big data has a decisive influence on the performance of autopilot system. Application of autopilot technology is directly related to flight safety, so the data quality and reliability are extremely high. However, the data quality may decrease, thus affecting the accuracy and reliability of the autopilot system.

It is necessary to start with data collection, processing and application. First, it is necessary to ensure the reliability and consistency of data sources and avoid data quality degradation due to data source problems. Secondly, it is necessary to use advanced algorithms and technologies to clean, filter and integrate the data to eliminate noise and outliers in the data. Finally, it need to be strictly verified and tested to ensure the accuracy and reliability of the data.

2.3 Technical update and personnel training

Aviation autopilot technology is constantly being updated. New technologies and methods are constantly emerging. However, the talent pool of autopilot technology in aviation field is relatively insufficient, and there is a lack of professionals with knowledge and practical experience.

Therefore, strengthening personnel training and technical training has become an urgent problem to be solved. It is necessary to strengthen the training and education of existing employees and improve their technical level and professionalism. In addition, it is necessary to strengthen cooperation between Industry-university-research, promote technological innovation and transformation of achievements, and provide strong talent guarantee and technical support for the development of aviation autopilot technology. At the same time, government and enterprises should increase investment and support for aviation autopilot technology.

3. The development trend of aviation autopilot technology in the era of big data

3.1 Multi-source data fusion and application

On the road to the future aviation autopilot technology, the fusion and data is becoming more and more important. The core of this technology lies in the deep fusion of multivariate data from different sensors and different sources. We can imagine the flight environment perception map will be accurately integrated. It's not only provide navigation and positioning information accurate to millionths for the autopilot system, but also provide unparalleled support for flight decision-making.

3.2 The improvement of intelligence and autonomy.

The degree of intelligence and autonomy of aviation autopilot technology is also increasing. By introducing more advanced and efficient algorithms and models, the automatic driving system is gradually showing its powerful perception. It's not only reflected in the accurate perception of the flight environment, but also in the independent planning and execution of flight mission.

Autopilot system can continuously optimize its flight strategy and control mode through in-depth learning and analysis of a large number of flight data. This enables the system to respond quickly in the face of complex and changeable flight environment to ensure the safety and stability of flight. At the same time, autopilot system will also have stronger self-repair and fault handling capabilities.

It's gradually getting rid of the dependence on human intervention and achieving a higher degree of autonomous flight. This means that autopilot system will be able to independently complete tasks such as taking-off, cruise and landing, and making decisions and dealing with problems independently. This degree of autonomy will reduce the workload of pilots, and provide possibility for the application of complex scenes.

3.3 Cross-border integration and innovative development

Aviation autopilot technology is welcoming the golden age of cross-border integration and innovation. It will bring us powerful data processing and analysis capabilities. Using cloud computing, big data and other technologies, we can collect, transmit and process flight data in real time, and provide more accurate and comprehensive data support for the autopilot system. The Internet industry's rich experience and technology accumulation in the fields of artificial intelligence and machine learning will provide strong support.

Also, cooperation with the manufacturing industry will promote the upgrading of the hardware equipment of the autopilot system. We can improve the performance and reliability of the autopilot system and ensure its stable operation in various extreme environments. In addition, the advantages of manufacturing industry will also provide a strong guarantee for mass production of autonomous driving systems. This will push aviation autopilot technology to a new height.

3.4 In-depth strengthening and continuous guarantee of security

The in-depth strengthening and continuous guarantee of safety is always crucial. Autopilot system is facing more and more security challenges. First, we need to strengthen the safety design and verification of the autopilot system. It is ensured that all kinds of potential safety risks are fully considered in the design and development of the autopilot system. Secondly, we need to establish a perfect safety monitoring and emergency response mechanism. At the same time, we need to formulate effective emergency plans and response processes. Finally, we need to strengthen cooperation and exchanges with other related fields.

4. Conclusion

The era of big data has brought vast space and unlimited possibilities for the development of autopilot technology in the aviation field. We can continuously improve aviation safety, improve flight efficiency and contribute to the sustainable development of aviation. Also, we need to pay attention to the challenges and problems, strengthen data security and privacy protection, improve data quality and reliability, strengthen personnel training and technical training. In the future, it will play an important role and open a new chapter for human aviation.

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