To Explore the Application of Artificial Intelligence Technology through the Inspection of Special Equipment

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Abstract: China is currently developing the fifth-generation mobile communication technology, namely 5G technology. Although it is an upgrade of 2G, 3G, and 4G technologies, there are significant differences. 5G technology is developing rapidly in the field of intelligence, which is different from the data generated in the 2G era. , The birth data of the 3G era and the development data of the 4G era. In a 5G environment, data runs faster and has more capacity. The technology is used in special equipment inspection and testing to ensure the safety of inspection and inspection work, and to obtain higher precision data. All tasks are automated and intelligently processed. In special equipment inspection and testing, including big data technology and cloud Computing technology can be reasonably applied, and can also play a certain role in promoting the development of special equipment technology. This paper focuses on the application of artificial intelligence technology in special equipment inspection and testing.

Introduction

The process of scientific and technological development is accelerating, especially the speed of information technology updating is very fast, mainly to meet the needs of the application field to improve technical performance and make up for the deficiencies in the application field. Special equipment inspection and testing is a special task, special equipment itself has a high risk factor, and has high technical requirements for inspection and testing. At present, advanced technology is used in the production, use, supervision and management of special equipment, and the professional technology shows a diversified development trend [1]. Research on the inspection and testing of special equipment, the content involved mainly includes type testing of special equipment, quality supervision and inspection of special equipment, installation quality supervision and inspection of special equipment, etc. To ensure the safe use of special equipment, periodic inspections are necessary. When inspecting and testing special equipment, a large amount of data information will be generated. If the analysis and processing of data information still use manual methods, not only the workload is large, but also the quality of work is difficult to guarantee. In the 5G era, the use of artificial intelligence technology has enabled inspection and testing to be carried out with high efficiency and high quality, which has played a certain role in promoting the development of inspection and testing technology [2].

1. The application of artificial intelligence technology in special equipment inspection is an inevitable

In 2020, China's 5G technology will develop vigorously. The difference of this technology is that it is no longer limited to upgrades at the technical level, but has achieved leapfrog development. The 5G network architecture has been completely updated. Compared with the 4G network rate, it is 100 times higher. The average information transmission rate per second can be tens of Gb. Information transmission is calculated in milliseconds to achieve transmission delay. 100 million [3]. In order to efficiently complete the tasks and ensure the quality of inspection and testing in special equipment inspection and testing, it is necessary to make full use of 5G technology, give full play to the supporting role of intelligent technology, and apply intelligent technology to process

various data information in inspection and testing.

For a long time, special equipment inspection agencies have produced a large amount of data and information in the process of regular inspection of equipment, which are kept within the inspection agency. Due to the inconsistency of the format of the test data every year, the structure and definition are different, and these data must be referred to during the analysis of the safety status of special equipment. If manual methods are used, it is difficult to obtain accurate analysis results for a large number of special equipment. For example, in the process of analyzing special equipment of the same type, to determine the type of hidden danger, it is necessary to analyze the problems in equipment management and accurately locate the weak links. If you analyze the test data over the years, you also need to use the information volume method, productivity factor method, AHP, etc. to analyze and evaluate the application of special equipment. When extracting various indicators, apply big data technology and cloud computing technology to the processing of historical detection data, put forward valuable data information for processing, do time series statistical analysis work, and quantify the safety performance of special equipment. The analysis results are stored in the cloud, and the data information can be called anytime and anywhere according to the needs, without being limited by time and space. As a result, the inspection and detection efficiency of special equipment is improved, and the accuracy of the inspection and test results is guaranteed [4].

2. Application of artificial intelligence technology in special equipment inspection

2.1 Application of Internet of Things technology for special equipment inspection and testing

In the 5G era, special equipment has developed rapidly under the support of various new technologies, and has achieved intelligent development in the inspection and testing of equipment. At present, many units and departments conduct research on the intelligent inspection and detection of special equipment to achieve comprehensive digital management of equipment. In specific applications, after digitally processing the information of each device, it will play the role of computer network technology and communication technology for information transmission and processing, and gradually improve the management of digital devices according to actual needs, implement automated operations, and intelligentize data deal with. In the inspection and testing of special equipment, the intelligent system is fully utilized for inspection and testing operations, collecting information and processing data information, doing a good job in intelligent management of special equipment, implementing digital technology maintenance, and eliminating manual operations [5].

With the extensive application of 5G technology, a large number of sensors are used on special equipment, which promotes the establishment of correlation between special equipment and inspection and testing equipment through sensors, and the establishment of networked connections of various physical equipment, and the operation of wireless networks can make equipment The realization of the correlation between them can thus collect the data information generated in the operation of the device in real time and realize information sharing [6]. This is the role played by the Internet of Things technology. The application of the Internet of Things in the inspection and testing work of special equipment makes the inspection and testing work intelligent. With the development of special equipment into intelligent equipment, the inspection work of special equipment is also intelligently operated. A large amount of data can be processed in real time after being generated. The data is quickly shared on the network under the data information, and the data information can be transmitted in real time. As the amount of data continues to increase, the requirements for inspection and detection technology are getting higher and higher, and the super computing power of cloud computing technology needs to be used, which can be stored anytime and anywhere during the information transmission process [7]. 5G's data transmission rate is an important advantage. It can be used in the inspection and testing of special equipment to accelerate the calculation speed and obtain more accurate calculation results. At present, full network coverage has been achieved. In such an environment, the platform provided by the 5G technology is characterized by a connection and a transmission rate of less than 1 millisecond. Application of such

technology can ensure the safe operation of special equipment, and strengthen the inspection and detection technology.

2.2 Application of augmented reality technology for special equipment inspection and testing

The application of augmented reality technology in the inspection and detection of special equipment is to fuse virtuality and reality together, and play the role of multimedia technology and 3D modeling technology. It can achieve real-time tracking in inspection and detection, realize intelligent interaction, and apply sensor technology jobs. In the inspection and testing of special equipment, various data information generated by the computer, such as text information, image information and three-dimensional models, etc., including audio information and video information, can be indexed and transmitted to virtual simulation software for simulation operations to obtain Virtual information. The fusion of virtual information and real information can play a complementary role, so that the real inspection and detection technology can be "enhanced" [8].

The inspection and detection environment for special equipment is very complicated. It is difficult to obtain good results if it is simply operated manually, and there are certain risks. Using augmented reality technology to inspect and test special equipment, even if the inspection and testing environment is very complex, fully utilize augmented reality technology, the staff can experience high-resolution, continuous view, and large field of view simulation by watching the natural 3D display Graphic, and in the free interaction according to the working situation, the virtual information is integrated into the real inspection site, and the seamless combination of the two is realized, so that the staff can understand the specific situation of the field inspection and detection more deeply.

2.3 Application of computer vision technology for special equipment inspection and testing

Computer vision is used in the inspection and testing of special equipment. In the inspection and detection, the digital processing technology is used for the image, and the role of digital signal processing technology is used. The optical theory, physics theory, applied mathematics theory, etc. are used in combination to intelligently identify and detect geometric images artificial intelligence. This technology incorporates the knowledge of robotics, physics and chemistry, medicine, astronomy and geography, etc. for comprehensive research [9].

The application of this technology in the inspection and detection of special equipment can automatically construct scenes using the data after image processing of the collected information. In addition, the technology can also understand human vision, and human operations use machines instead. The application of computer vision technology can carry out non-destructive testing of special equipment and make judgments about the defects in welding. In specific applications, it is the machine that visually understands different types of welding defects, enters the images of the defects, enters the object structure and environmental constraint knowledge into it, and interacts to clearly establish the description and understanding. In this way, the inspection and detection can extract the scene information in one image and complete some calculations. In the inspection and inspection, the understanding of different stages needs to introduce relevant inspection knowledge into it, the understanding and processing work is completed, the human vision is simulated to identify welding defects, and tracking processing, measurement operations, and processing graphics can be made to make the image It is more suitable for human eye observation. Using the network to remotely transmit the tested instrument, you can get a conclusion. Remote workers use this information as a basis to make a final judgment [10].

Conclusion

Through the above research, it is clear that the 5G era has now entered, and various information technologies play an important role in the application field, such as the Internet of Things technology, computer vision technology, etc. not only have perception, but also have supervision and control capabilities. The information can be collected, play the role of the sensor and the role of the controller, for the information to effectively collect information, transfer information and control

information. In the current special equipment, mobile communication technology and intelligent analysis technology are gradually integrated. In the process of testing special equipment, it can automatically collect data information in various links to provide reference data for the detection. New technologies are constantly emerging, especially the application of artificial intelligence technology, which has improved inspection and testing efficiency, greatly reduced labor and material costs, and correspondingly reduced resource consumption, thereby improving the efficiency of special equipment inspection and testing.

References

[1] Chen Benyao, Ruan Licheng, Zhu Shaojun, et al. Intelligent processing and application of a large number of special equipment inspection data [J]. City Weekly, 2018 (28): 75-77.

[2] Luo Jiwei. Development of intelligent unmanned crane equipment and related issues [J]. China Science and Technology, 2018 (05): 82, 84.

[3] Sun Xujun;. Research on the safety of special equipment inspection and testing [C] // April 2018 Academic Conference on Construction Technology and Management. 2018.

[4] Wang Jiabin. Application of Quality Management System in Special Equipment Inspection and Testing [J]. China Equipment Engineering, 2018 (02): 58-59.

[5] Wang Jinzhao, Bi Chenshuai. Discussion on the application of UAV airborne detection technology in special equipment inspection and detection [J]. Science and Technology, 2019, 375 (07): 77-79.

[6] Liu Jun. Development of intelligent unmanned crane equipment and related issues [J]. China Chemical Industry Trade, 2018, 10 (03): 217-217.

[7] Zeng Yiting. Application of risk-based inspection technology in special equipment inspection [J]. China Equipment Engineering, 2018 (03): 109-110.

[8] Jin Kai, Wang Kegang. Analysis of special equipment inspection and detection technology-application of unmanned aerial vehicle [J]. China Chemical Industry Trade, 2018, 10 (27): 120-120.

[9] Zeng Yiting. Talking about the Application of Nondestructive Testing Technology in Special Equipment Inspection [J]. China Equipment Engineering, 2018 (02): 59-60.

[10] Li Nengqiang. Explore the application of TOFD testing in special equipment inspection and testing [J]. Boutique, 2019 (03): 203-203.