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Research on Monitoring technology of construction machinery based on Big data

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Abstract. In the rapid development of information era, the pace of economic construction in all fields of our country is becoming faster and faster, including the field of engineering machinery put forward modern remote monitoring system with big data technology as the core, not only has a broad development space, but also provides a variety of research directions for the development of new era technology equipment. On the basis of understanding the concept of big data technology, according to the development phenomenon and unique advantages of construction machinery monitoring technology under the background of big data, this paper deeply discusses the development trend of construction machinery monitoring technology with big data as the core, in order to provide effective basis for the technical development of construction machinery field in the new era.

Keywords: Big data, construction machinery; Monitoring technology; Real-time sharing; Cost control.

1. Introduction

Engineering machinery as an important resource of the development of economic construction in our country, in the face of the sustainable development of social economy and science and technology in the infrastructure of modern engineering development and industrial construction, remote monitoring technology gradually permeate into the application of engineering machinery manufacturing, not only can improve the application level of construction machinery technology, but also can create good conditions for the development of construction machinery. After entering the era of big data, the original remote monitoring technology has been applied more widely, and the mechanized remote monitoring system has been developed. From the long-term development perspective, although the remote monitoring system put forward in the field of construction machinery has made an excellent achievement, the development and change of the market is very significant. Therefore, under the background of big data, Chinese scientific research scholars should continue to combine the concept of big data technology to comprehensively explore the construction machinery monitoring and control technology system. The development of big data provides more opportunities for the development of information technology. The remote monitoring technology is developed based on the traditional monitoring technology. It not only integrates the wireless information transmission technology of computer network technology, but also supervises, manages and schedules the use of mechanical equipment on the basis of remote monitoring, so as to solve the maintenance and repair problems of mechanical equipment in a short time.[1-3]

From the perspective of practical application, the research on construction machinery monitoring technology combined with big data application has the following advantages: First, it can share and transmit data information in real time. The remote monitoring technology system will upload the collected mechanical equipment information to the monitoring center, and provide information guarantee and effective reference for the subsequent system operation while comprehensively monitoring the mechanical equipment. Due to the complex operation procedures of construction machinery system, it is difficult to supervise and store data information. Moreover, since operation data can lay a foundation for improving performance, it is essential to use effective monitoring technology. The remote monitoring technology can better meet this demand. Secondly, it can

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improve the level of equipment after-sales service guidance. The remote monitoring technology can share all kinds of data information in real time and feed all the data information back to the computer monitoring center in the monitoring system. The mechanical equipment staff can pass the equipment problems found in actual operation to the monitoring platform of suppliers and marketers. The technical staff can diagnose and analyze all kinds of problems by combining the acquired data information and then determine the main causes of the problems. Eliminate the area without failure in time to facilitate the staff to develop effective solutions as soon as possible; Finally, it can improve the quality and efficiency of construction machinery in the cost environment. The remote monitoring technology can clearly feedback the main problems and related information of mechanical equipment on the platform, reducing the time and cost of equipment maintenance and analysis. In the process of analyzing the data, the staff can discover the main causes of the problems and then formulate effective solutions. At the same time, remote monitoring technology can also shorten the maintenance time of equipment during the construction period, accelerate the construction progress to a certain extent, so as to improve the construction quality and construction efficiency of construction machinery.[4-6]

In this paper, on the basis of understanding the development trend of the era of big data, combined with relevant technical theories to discuss the main content of construction machinery monitoring technology, and from the perspective of long-term development, focus on the development direction of construction machinery monitoring technology based on big data, put forward effective construction management measures, scientific solution to the traditional construction machinery monitoring work existing problems.[7-9]

2. Methods

2.1 System Purpose

The remote monitoring system of construction machinery with big data as the core is researched and designed. It mainly uses computer, wireless communication, satellite positioning and other technical theories to monitor and control the running state, location and construction progress of construction machinery equipment under construction, and then communicates with drivers remotely to truly realize remote guidance and control. In order to improve the management level of construction machinery and construction organization ability. From the perspective of practical development, the purpose of the overall system technology is to improve the after-sales service level of the sales enterprise, strengthen the control ability of leasing or installment machinery, establish the mechanical dynamic plan, truly realize the development goal of mechanization management, accurately record the site construction parameters, and lay the foundation for the project quality supervision or the implementation of quality accident responsibility.[10-12]

2.2 System Functions

The remote monitoring system of construction machinery based on big data technology consists of three parts. The specific structure design is shown in Figure 1 below:

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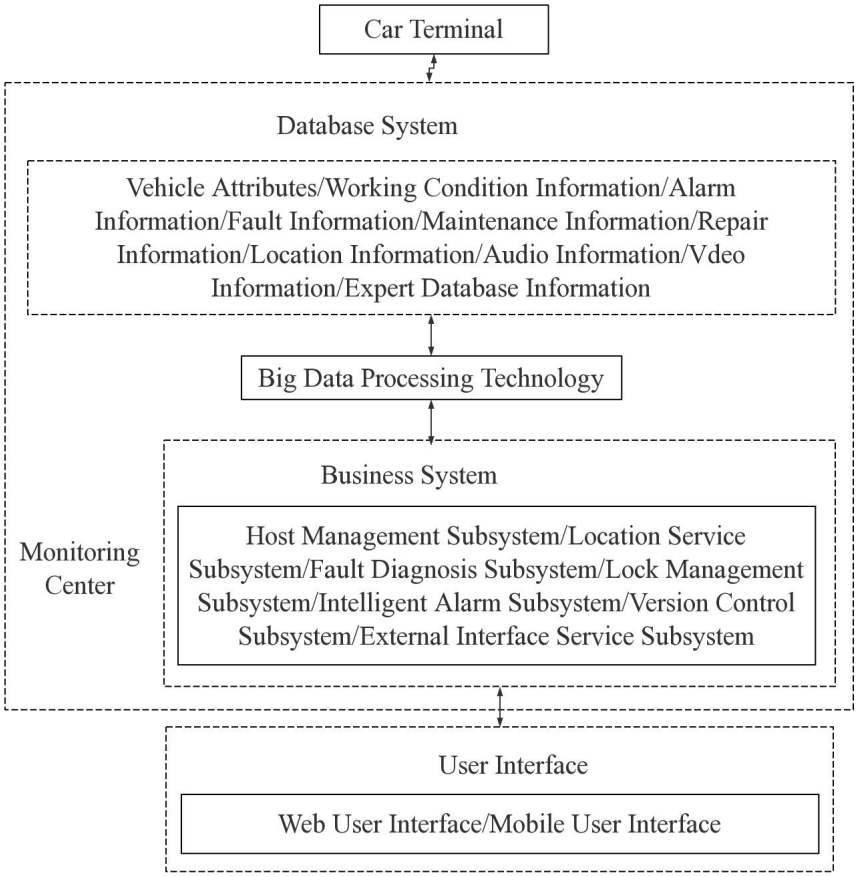

Figure 1 System structure diagram

First, the on-board terminal. The system design includes on-board computer, detection circuit, wireless communication, GPS module, sensor module, etc. The specific structure is shown in Figure 2 below:[13-15]

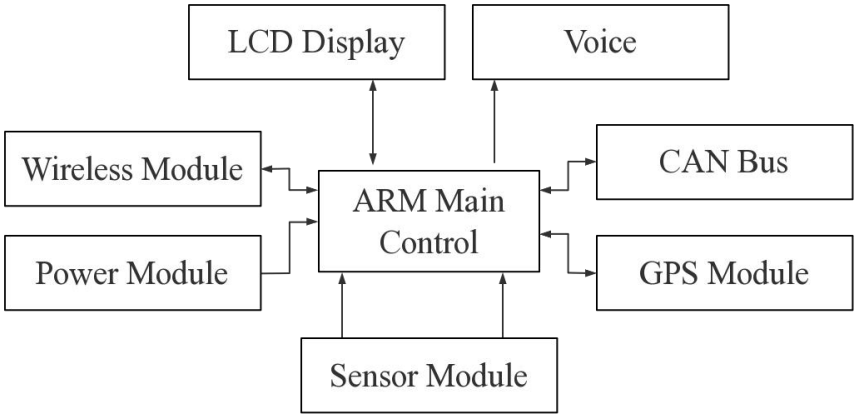

Figure 2 Structure diagram of vehicle terminal

Based on the analysis in Figure 2, it CAN be seen that the operation principle of the system is to use the sensor module to obtain the required information, and then transmit it to the ARM master controller module through the CAN bus. On the basis of effective information processing, the temporary mobile AD hoc network structure is constructed through effective classification, in which the ARM master controller mainly carries out data analysis, data fusion and other processing operations. From the perspective of on-board computer operation, as the core content of system operation, direct connection status monitoring, GPS satellite positioning, wireless data

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communication system, etc., will make corresponding responses based on the analysis of communication data. The circuit system includes sensors installed in different areas, which will directly transfer the collected mechanical data to the on-board computer through the line. The final content involves the running state parameters of all the equipment, which intuitively shows the working state of the construction machinery.

Second, the monitoring center. This part is the management center of the overall system operation, which will send instructions to the on-board computer according to the working requirements, obtain the data information returned by the on-board computer, and correctly process the application for remote monitoring. The corresponding software system architecture is shown in Figure 3 below:

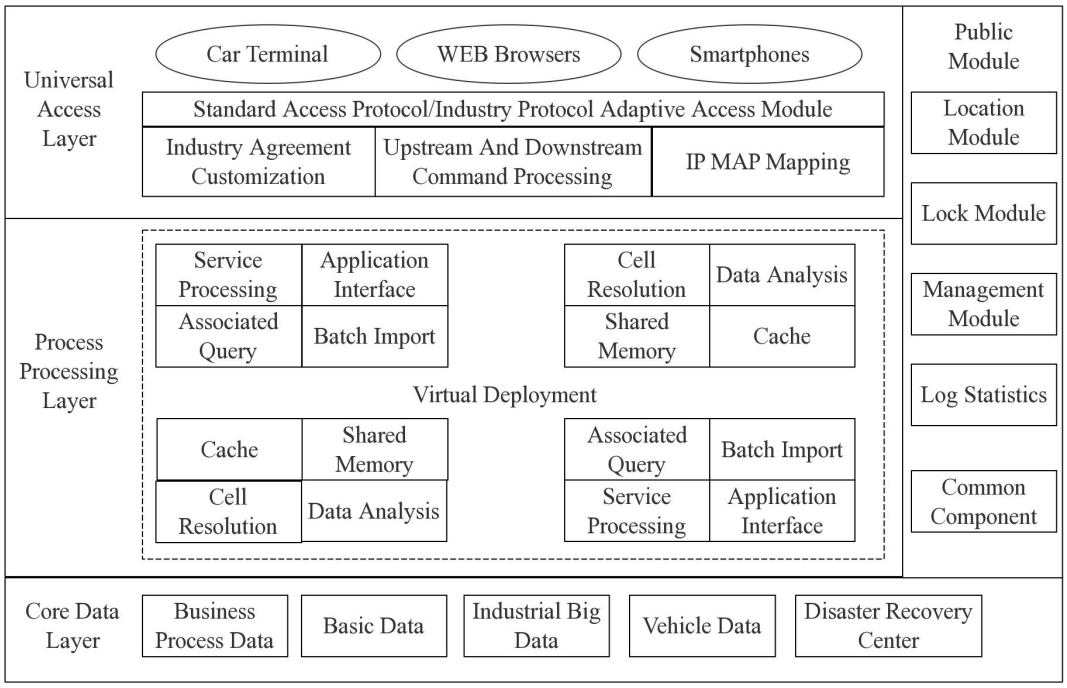

Figure 3 Architecture diagram of system software

From the perspective of practical application, the monitoring center is composed of GSM/GPRS industrial mobile phone module, monitoring computer and system software. The GSM/GPRS module can be connected with the computer, which belongs to the communication equipment of the system operation. The software is mainly responsible for obtaining the data information provided by the GSM/GPRS module. Obtain the command of the main program of the monitoring center, and finally transmit information directly through the communication module. No matter what stage of the data information, need to be directly displayed in the communication interface, mainly to help staff intuitively show the communication process.

As the core software of the monitoring center system, after acquiring the daily log and active information of the on-board terminal, the main program should conduct a secondary analysis of the working parameters combined with the internal algorithm, and then obtain the relevant data information of the mechanical work, accurately evaluate the operator's proficiency, and finally determine the mechanical maintenance or repair area according to the overall performance analysis results.

Finally, the user interface. This part of the design is mainly divided into two parts, one refers to the mobile phone interface, the other refers to the Internet interface. The former can facilitate mobile phone users to access the system faster, and directly feed back relevant information to them, providing mobile phone users with more convenient and effective functional services; The latter can provide more complete monitoring information, including current information and historical information. Integrated with GIS system, it is convenient for system users to have a more intuitive

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understanding of the location and working state of construction machinery. The GIS system structure is shown in Figure 4 below:

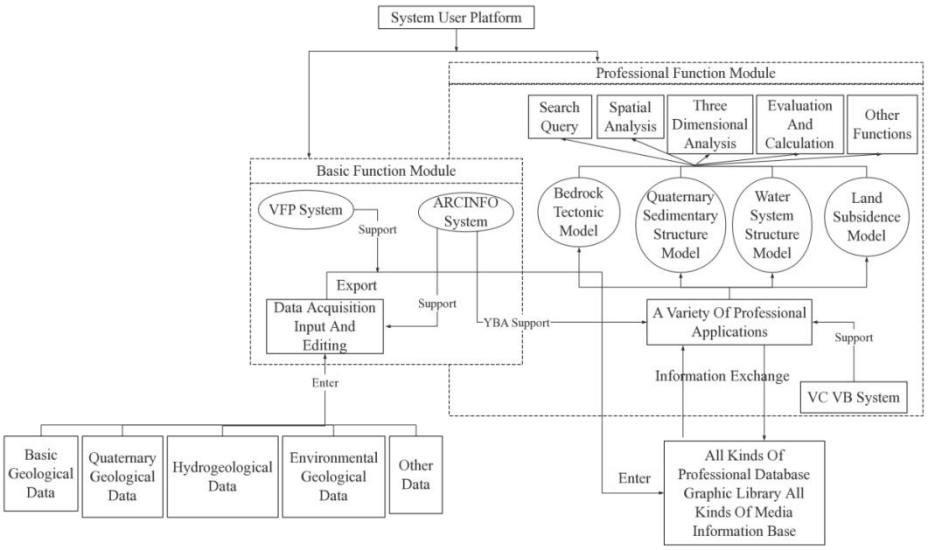

Figure 4 Structure diagram of GIS system

Based on the analysis of the above figure, it can be seen that GIS system structure can be applied to the monitoring work of construction machinery. On the one hand, it can be combined with basic functional modules to facilitate the collection and transmission of data information and provide technical support for various professional applications. On the other hand, it can combine professional functional modules to orderly complete the monitoring and management of construction machinery equipment, such as retrieval query, spatial analysis, three-dimensional analysis, evaluation and calculation.

3. Result analysis

In the context of the era of big data, the innovation and development of information technology is getting faster and faster. It has not only been widely used in social production and human life, but also made excellent achievements in practice and exploration. The more mature theory and technology provide basic guarantee for the construction and operation of computer network system, change the traditional production activities and engineering construction mode, can comprehensively supervise the application quality of construction machinery, and provide broad development space for the development of remote monitoring technology of construction machinery equipment. From the long-term development perspective, the construction machinery monitoring technology with big data as the core as shown in Figure 5 below will develop in the following directions in the future:

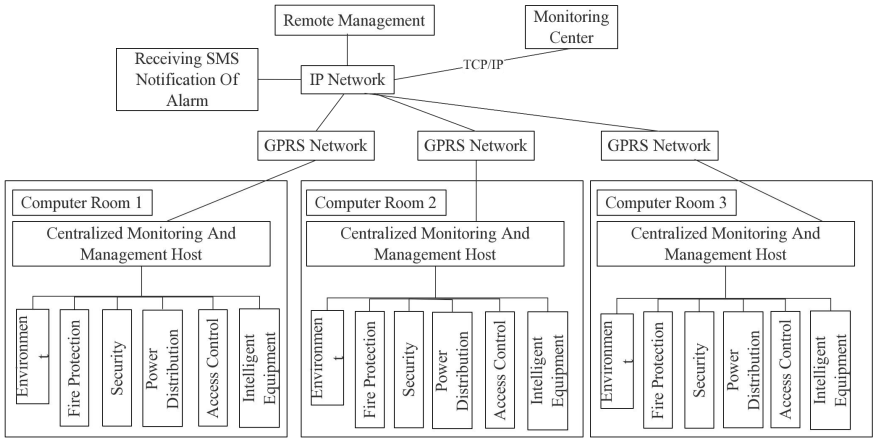

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FIG. 5 Construction machinery monitoring technology structure based on big data

First, the structural development of the hardware is monitored remotely. Nowadays, the remote monitoring technology in the field of construction machinery is mainly based on positioning technology, general packet wireless technology and computer. The information processing platform with relatively perfect application function is built, which can truly realize the digital development goal of positioning technology, and general packet wireless technology can realize the network development goal.

Secondly, intelligent design ideas. In order to realize the intelligent development goal of remote monitoring technology, the field of construction machinery should first fully connect different types of vehicle monitoring system and remote monitoring system, and then orderly connect the internal control system of internal mechanical equipment, and comprehensively complete the construction machinery management system on the basis of integrating and analyzing information data. At the same time, the intelligent remote monitoring system is an important link to collect and process information. The intelligent service system can transmit information in real time and process parameter information of each stage scientifically. Therefore, relevant units and departments should regulate machinery and equipment according to the actual situation and monitor the core content of application equipment in real time, so as to provide effective basis for the follow-up system supervision.

Third, remote monitoring and testing of mechanical equipment. The application of all kinds of mechanical equipment in the construction and management of construction machinery, because it will be affected by the external operating environment, so it is very easy to appear safety failure in the working state. The intelligent remote monitoring system not only has the advanced and effective fault diagnosis system, but also can effectively control the construction machinery equipment. In the event of safety failure, it will warn part of the staff in time, find the main cause of failure according to the standard parameters of the equipment, and then increase the application time of the equipment.

Finally, remote alarm control function. In order to ensure that construction machinery and equipment can work normally, it is generally necessary to design standardized operation parameters in the main control center of the mechanical equipment monitoring system. If there is a problem with construction machinery and equipment, or the parameters exceed the set operation standards, the system will automatically alarm and upload the relevant information data directly to the monitoring center. Technical personnel can according to their own work experience, Come up with effective solutions as soon as possible.

Conclusion

To sum up, in the rapid development of social economy and science and technology, big data and information technology provide a large number of opportunities and challenges for technological innovation in the industrial field, among which the construction machinery monitoring technology with big data as the core is the most significant, which not only changes the supervision concept of traditional construction machinery and equipment, but also excavates a large amount of data information. Therefore, Chinese scholars will continue to explore relevant technical theories in the future, in order to play a greater role in production and construction activities.

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