Research on Intelligent Panoramic Sensing Technology in Low Voltage Area

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Abstract: This paper introduces the concept and characteristics of panoramic sensing technology, and points out the shortcomings of intelligent panoramic sensing technology in low-voltage area, which are mainly manifested in the lack of integrity, systematization, accuracy and comprehensiveness. In order to improve these shortcomings, panoramic sensing technology is designed and used, which mainly includes operation status information monitoring platform, intelligent analysis and application platform, interactive application and platform management. The result shows that the application of intelligent panoramic sensing technology can strengthen the line monitoring, promote the integration of operation and maintenance of transmission lines, reduce the labor intensity of staff, shorten the outage time, ensure the reliability of power supply, and improve the management efficiency and service level of power grid companies.

1. Introduction

The transmission line is generally a long route, passes through complex topographical and geological conditions, and it is affected by severe weather such as precipitation, ice and snow, which increases the operation risk. If effective preventive measures are not taken, safety accidents may also occur. Common problems include tower base displacement, tower tilt, disconnection of transmission lines, tower fall, etc. if these problems don't handle in time, it is easy to induce grid security accidents. Therefore, it is necessary to strengthen risk prevention and take measures to carry out transmission line safety management in the operation of low-voltage power grid. In this way, the safe operation of transmission lines can be ensured and risk events can be prevented. In fact, transmission lines play an important role in the operation of the whole power system, which is related to the quality of power supply. Therefore, it is an important work to strengthen the condition monitoring and operation maintenance. At present, panoramic sensing technology appears and is used more and more widely in low-voltage area, and its role is more and more prominent.

2. Concept and Characteristics of Panoramic Perception Technology

Panoramic sensing technology has its own remarkable characteristics, and its application has been paid more and more attention.

2.1 Concept of Panoramic Perception Technology

At present, the application of panoramic perception technology has become more and more popular, which can get the impression of objects through the senses. Its application is beneficial to strengthen the comprehensive monitoring and analysis of intelligent transmission lines. The panoramic perception of intelligent transmission line refers to the application of various effective monitoring means, communication system, information processing model, etc. to obtain basic data of transmission line and understand the safety status of line. For example, the probability of transmission line icing is analyzed by using meteorological data. Using video monitoring system, we can understand the potential danger sources of transmission lines, and then take preventive measures. At present, smart grid develops rapidly, and big data application creates convenience for panoramic perception.

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2.2 Characteristics of Panoramic Perception Technology

The remarkable characteristics of this technology are real-time perception, high operation efficiency, and fast understanding of the operation status of transmission lines. To provide technical support for taking optimization and improvement measures and preventing possible risks in time. Through the application of this technology, it can reduce the amount of labor, improve the coordination and cooperation of the staff, reduce the labor intensity of the inspection and inspection of the power grid, so its application has become more and more widely used.

3. The Shortage of Intelligent Panoramic Sensing Technology in Low Voltage Area

At present, in practical work, due to the complexity of data, it also brings challenges to the effective panoramic perception, and there are still deficiencies in the application of panoramic perception technology.

3.1 Lacking of Integrity and Systematisms

In the operation status of transmission line, the network and surrounding environment are dynamic, which easily leads to incomplete information obtained by maintenance personnel. Lacking of information integrity and systematization will affect the overall understanding of the basic situation of transmission lines, and ultimately restrict the improvement of work level.

3.2 Insufficient Accuracy

In order to improve the quality of transmission line maintenance, it is necessary to obtain accurate information. However, at present, there are various kinds of information with different natures and types, and the forms and contents of information are not completely consistent. Different sampling and quantization methods of sensors lead to the improvement of information accuracy. In addition, the network transmission signal is unstable, which is easy to cause intermittent information, it difficult for maintenance personnel to obtain accurate data information.

3.3 Information is not Comprehensive Enough

Although sensors play an important role in practical work, the sensing domain of sensors has some limitations, which make the information obtained incomplete. Thus, it is difficult to timely and accurately understand the actual situation of transmission lines, which affects line inspection and maintenance, and also restricts the improvement of work efficiency.

4. Improvement of Intelligent Panoramic Perception Technology in Low Voltage Area

In order to make up for the shortage of panoramic perception technology, it is necessary to take corresponding improvement measures.

4.1 Improvement Ideas

The complexity of information data structure and diverse sources make management and maintenance more difficult. In addition, a large amount of redundant information poses challenges to network transmission, storage and processing, and also increases the difficulty of processing information. For this reason, it is necessary to further study the effective methods of information perception, process and organize the uncertain data and information, and integrate the data to better serve the power supply network. In addition, the efficient methods of information perception should be studied, and data compression and data fusion methods should be used to process and perceive data information to provide reference for maintenance and maintenance of power supply network.

4.2 Specific Program

Panoramic perception technology is based on heterogeneous data from multiple sources. By integrating and integrating these data, it can provide reference for management decisions. Heterogeneous data comes from production management information system, transmission and

substation status monitoring system, wide area measurement system, power meteorological system, lightning positioning system, three-dimensional GIS system, etc. These systems will form a large amount of data information in the process of operation, which constitutes large data and provides sufficient data support and services for panoramic perception. However, due to the complexity of massive data structure, processing and collation are difficult, which increases the difficulty of panoramic perception. Therefore, it is necessary to study information fusion methods, data screening and filtering, and integrate them into the information needed for application services. In addition, effective methods of information fusion should be studied, such as data compression and data fusion, to achieve the goal of efficient information perception. On the basis of these perceptions, data information can be processed and utilized reasonably, which is helpful to propose a method of transmission line multi-source heterogeneous information integration.

5. Main Composition and Function of Intelligent Panoramic Perception Technology in Low Voltage Area

The main components and functions of the system are as follows.

5.1 Operational Status Information Monitoring Platform

The main function of this platform is to display transmission line information panoramically and complete visualization display of parameters such as inspection and on-line monitoring. At the same time, it can grasp the development trend of these parameters and display the status warning information. Status monitoring is a very important work, and it is also an important content in the maintenance of transmission lines. By strengthening the operation status monitoring, we can grasp the basic conditions of the transmission line, lay a foundation for line detection and maintenance, and ensure the safety and reliability of the transmission line.

5.2 Intelligent Analysis and Application Platform

In the process of operation, this platform mainly uses the panoramic perception information of transmission lines, comprehensive information of transmission line operation, status information of transmission equipment, external operation environment information, etc. On the basis of understanding these data information and data, it can scientifically and reasonably determine the basic operation situation of transmission lines and master the specific content. Then, the theory and technology of safety analysis for transmission line are used to identify the risk source so as to ensure the safe operation and adopt the method of safety warning. Then organizing the staff to carry out research, analysis and judgment to provide auxiliary decision-making for the safe operation and management and maintenance of transmission lines. It is helpful to prevent the occurrence of safety or quality accidents and ensure the safety, stability and reliability of transmission line.

5.3 Interactive Application and Platform Management

The development and application of this platform can not only manage and maintain the platform itself, but also exchange data and information with other business departments, which can provide inspiration for strengthening transmission line management and taking effective management measures. During the operation, data exchange with dispatching system is needed to understand status and real-time capacity and so on. Interacting with production management information system data to understand equipment production and equipment account, life cycle management, maintenance data, etc. Exchanging data with design departments to find defects and optimize transmission lines.

The intelligent monitoring and analysis platform can monitor comprehensive information such as line planning, design, construction, operation, power network dispatch, production management, and so on, so as to master the specific conditions of these links. Its prominent features are large amount of state information, wide distribution of data information, complex association, and influenced by many factors. At the same time, in order to effectively play its role, it also needs the key technology and theoretical support, and cannot be separated from the research and analysis of

interdisciplinary knowledge.

The key technology of this platform is the theory and method of intelligent status evaluation and diagnosis of transmission lines, and defect identification of transmission lines based on panoramic monitoring data. Digital signal processing, information fusion technology, artificial intelligence analysis technology and so on are used in intelligent evaluation and diagnosis. It is necessary to excavate the information contained in the transmission line, evaluate the components such as insulators, poles, towers, ground wires, carry out fault detection, defect diagnosis, reliability and life analysis. Defect recognition mainly uses intelligent image/video technology to study and analyze hidden dangers and parameter characteristics, classify the fault level, propose defect quantitative evaluation index, defect judgment method, and so on.

6. Conclusion

The application of panoramic perception technology can not only make up for the deficiency of platform management, but also help to strengthen the monitoring operation status, promote the integration of transmission line operation, maintenance and management, and improve the efficiency of operation, maintenance and repair. At the same time, with this technical support, the labor intensity of staff can be reduced and the shortage of staff can be alleviated. It is helpful to improve the coordination between different professionals, and then cooperate closely with each other to improve the efficiency of line maintenance. It is conducive to shorten the blackout time and ensure the stability and reliability of power supply. It can also reduce the idle cost of equipment, personnel and material, and promote the best performance of the operation of the power grid. It also has a positive role in improving the management efficiency, service level and economic benefits of power grid companies.

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