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Discussion on The Construction of Substation Security Video Surveillance System

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Abstract: The construction of security video surveillance system is the key to ensure the normal operation of substation. In order to ensure that this system can play its intended role, this paper will first analyze the defects existing in the application process of video surveillance system of existing power enterprises. And then based on this, the core technologies to be applied in the new substation security video surveillance system are introduced. The third section and the fourth section respectively discuss the design and construction methods of the hardware system and software system in the system.

1. Introduction

With the continuous development of our society, people have put forward higher requirements for the stability and reliability of power supply. Under such a background, power companies must be able to avoid substation through the design and construction of video surveillance systems. Factors or other external factors are affected and power cannot be delivered to the user normally. In response to such demands, existing video surveillance systems still have problems such as excessive monitoring software, different device selection, and fewer monitoring points. If these problems are not effectively restricted, the application of this system is not only difficult to play the expected. Monitoring and early warning functions, excessive maintenance costs will also lead to an increase in the overall operating costs of the power system. In order to avoid the impact of such conditions on the economic efficiency of power companies and the safety of power systems, it is necessary to study the corresponding construction methods of new security video surveillance systems. This article will discuss in detail in the following sections.

2. Problems in The Actual Application Process of Existing Video Surveillance Systems in Power Companies

2.1 More Monitoring Software

Since the existing software monitoring system in the power enterprise is built over a long period of time, the monitoring functions are gradually improved through the installation of different software. Under such a background, the functions and operation methods of different softwares are differences in management methods and other aspects will directly lead to increasing system management difficulty. At the same time, as the number of monitoring software continues to increase, the complexity of software operations will continue to increase, eventually making it difficult for the system to meet functional requirements.

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2.2 Different Hardware Devices are Selected

The reason for this situation is the same as the above. Although the update speed of the system hardware is relatively slower than that of the software, since the device selection was not clearly stated the power enterprise video surveillance system was built early. The increasing number of video surveillance hardware devices, the quality of hardware devices, and different operating standards will inevitably affect the overall operation of the video surveillance system [1]. On the other hand, equipment selection problems will also affect the overall maintenance costs of the system, resulting in power companies need to spend more manpower and resources to ensure the normal operation of the system.

2.3 Less Monitoring Points

The video surveillance system must be able to supervise the key equipment and key positions in the substation at the same time, in order to better supervise the operation of the substation,. However, due to the insufficient monitoring points set in the existing system, the system cannot obtain the corresponding information in time. In the event of an emergency, the problem of a small number of monitoring points will directly lead to the failure of relevant staff to detect and deal with these problems in a timely manner, which will eventually lead to an increase in the scope of the related safety problems or emergencies. On the other hand, for the unattended supervision system commonly used in power companies at present, the rationality of the number of monitoring points is particularly important. Therefore, in the design process of substation security video surveillance system, relevant personnel must be able to pay attention to this problem. [2].

3. Core Technology Introduction

3.1 Video Data Compression

By definition, video compression mainly refers to the process of removing redundant information in video and retaining useful information. The application of this technology in substation security video surveillance system is mainly due to the inter-pixel between image and video files. Highly relevant, there is a large amount of redundant information, in order to ensure the efficiency of this type of data and information in the transmission process, it is necessary to compress images and video [3].

In the actual application process, according to the different types of redundant information, the corresponding compression methods also have certain differences. Under normal circumstances, the time domain redundancy information can be deleted by motion compensation, motion representation, motion estimation and the like. The spatial redundancy information can be removed by transform coding, quantitative coding, entropy coding, etc. for the purpose of removing such redundant information.

3.2 Streaming Media Technology

Streaming media technology mainly refers to the completion of the transmission of various multimedia files in the form of data streams. For the substation security video surveillance system discussed in this paper, this technology has a fast startup speed and can be played without having to completely download the source files. Advantages can greatly improve the efficiency of multimedia file transfer [4].

In the actual application process, the streaming media system mainly consists of three parts: a compression coding module, a server and a client. The compression coding module is mainly used to convert multimedia files into a format that can be transmitted and played through streaming media, while the server is mainly Provide support to the system software and hardware and streaming media services, the client directly interacts with the user to complete the playback of audio and video files.

3.3 Target Recognition Technology

Under the background of the continuous development of intelligent technology, in addition to the

functions of video surveillance and video transmission, the substation security video surveillance system should be able to complete the detection and analysis of various moving targets in the substation through target recognition and other technologies. On this basis, the identification and tracking of these targets is achieved [5]. With the help of this technology, the overall automation level and intelligent level of the security video surveillance system will be effectively improved.

In the actual application process, the operation mode of this technology can be divided into the following steps:①Motion detection. It is analyzed whether the video stream has changed by observing the video image sequence. If a change occurs, it is considered that the target is detected, and otherwise, no moving target appears. ② Target tracking. On the basis of detecting the target, the system should be able to collect data such as shape, color, position, etc., and then combine the content with the image frame sequence to compare, and the feature matching is considered to track the target. ③ Target classification. During the operation of the security video surveillance system, some targets do not pose a threat to the safe operation of the system. Some of the targets are risk factors and need to be further processed on the basis of effective monitoring. In order to assist the system to autonomously complete the target recognition process, the system should include classification methods for the target. The classification methods commonly used at this stage can be classified into two types based on shape information and classification based on motion characteristics.

3.4 Storage Technology

In addition to real-time monitoring and alarming, the substation security video surveillance system should be able to support management personnel to access all kinds of audio, video and pictures at any time, so as to better analyze the causes of various emergencies or security incidents. And combine these contents to take precautions. Under normal circumstances, the substation mainly uses the collected data to be transmitted to the central server for storage to ensure that the data in the system can be effectively stored and processed. Oracle database has very high security and can process large amounts of data, so it can well meet the data storage and transmission requirements of substation security video surveillance system.

3.5 Algorithm Design

Combined with the above, the main operation process of the substation security video surveillance system is as follows:

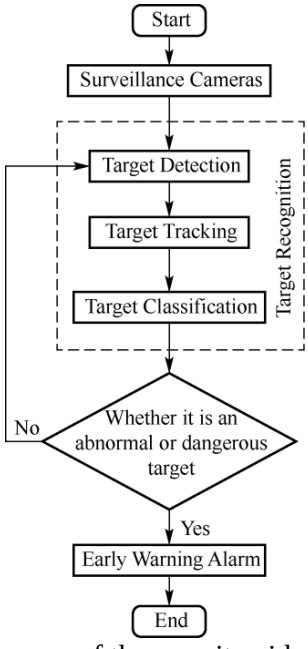


Figure 1 Operation process of the security video surveillance system

According to the content of this flow chart, the implementation of the system core algorithm should include the following steps: First, the image preprocessing work is completed by steps of image graying, image smoothing, etc., based on the background update algorithm and background difference, human Techniques such as face detection are used to detect whether the object is a human face, and finally corresponding processing is performed according to the target recognition result.

4. Hardware System Design

4.1 Front-end Data Acquisition Equipment

For the substation security video surveillance system, the monitoring of the internal and surrounding conditions of the substation is still the core function of this system. Therefore, the camera is also the most important hardware device in this system. In the process of selecting the camera, the sharpness of the image acquired by the camera directly determines whether the system can perform the functions of target detection and recognition according to the content. Therefore, the camera should be able to automatically convert from the color image mode to the low illumination state. Black and white mode to ensure image clarity can meet the requirements. The cameras commonly used at this stage mainly include gun type and ball type, and both have the above functions, and the designer only needs to select the manufacturer. On the basis of ensuring that the camera can meet the system requirements functionally, the designer should further consider the selection of the camera position, and conduct a detailed inspection of the surrounding conditions of the substation and the distribution of various internal production equipment, in order to ensure that the camera can be effectively obtained.

4.2 Server

The server is the core component of the system. In order to ensure that the substation security video surveillance system can meet the requirements in function, the main control center should configure the following types of servers: ①Management server. As the name implies, this server mainly manages all kinds of devices in the system, and can ensure the coordination and effective operation among various devices in the video monitoring system through configuration management, security management, and fault management. In addition to this, this system should support the alarm function. ② Streaming media server. The operation mode of the streaming media server has been introduced above, and in order to ensure that the server can better complete the audio and video transmission work, the management server should be responsible for completing the management and control thereof, and the server can also receive from the server. Session requests from other servers. ③ Storage server. The new substation security video surveillance system should be able to collect real-time information collection, emergency alarms, remote information access and other functions. Therefore, the system will generate a large amount of data during the operation process, and the storage server mainly realizes the storage and management of these data.

4.3 Storage Device

In the actual system construction process, since the video surveillance system needs frequent reading and writing, the data should be managed by the storage area network IP-SAN. This storage network not only has the characteristics of openness and high reliability of the IP network, but also has the economical and high scalability features of the SAN. It can realize the storage of data and provide remote data backup and disaster recovery. Function to provide security for system data.

4.4 Fire Alarm

The appearance of a fire will have a serious impact on the operation of the substation. If it cannot be quickly controlled, there is a high probability that a large-scale safety accident will cause casualties. In order to avoid such a situation, the video surveillance system must be able to interact with the fire protection system. When a fire situation occurs, the video surveillance system should be able to quickly use the camera to determine the fire location after receiving this information, and observe and

track the fire situation. The auxiliary fire department will coordinate the on-site fire equipment and rescue personnel, and finally achieve efficient treatment of fire conditions, try to minimize the negative impact of this situation.

5. Software System Design

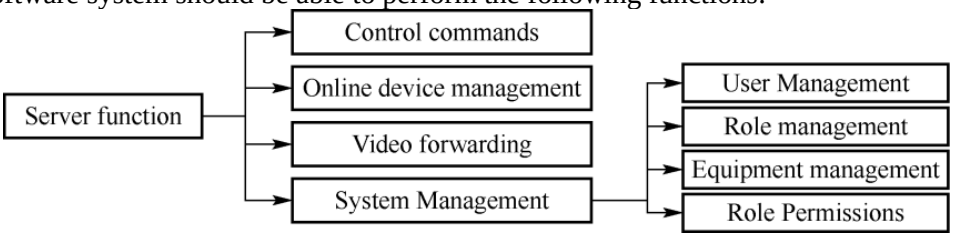
5.1 Client Software Design

Combined with the above content, the substation security video surveillance system has multiple functions, and for the practical application of this system, the client software must be designed to be human-machine friendly, with clear interface arrangement to assist related The operator quickly grasps the operation methods of various devices in the system and can remotely control the system. In combination with such requirements, the client's main operation interface should first display the running status of all front-end devices. When the user clicks on a certain device screen, the interface should display the screen monitored by the device and display the camera. The keys controlled by the focal length and angle are assisted by the operator to adjust manually. In addition, the client's main interface should also have video screenshots, video recording, projection and other functions to ensure that the user's various needs can be effectively met during the actual application process.

On the basis of the above-mentioned common functions, when an emergency such as a fire occurs, the client should be able to issue an alarm to the monitoring personnel in the form of a prompt box, and complete the alarm grading work according to the monitored situation, and assist the relevant staff to receive the alarm, then they can handle it quickly after the alarm.

5.2 Server Software Design

The server software system should be able to perform the following functions:



Combined with the above block diagram, the relevant designers should complete the construction of the server software system based on four aspects: control commands, online management of devices, video forwarding, and system management. Taking system management as an example, the user management module should be able to implement functions such as creating new users, modifying existing user information, and deleting users. The device management module should be able to maintain and manage substation monitoring points, and the role permission module should be able to according to different job positions, different permissions are designed, and then the sub-authorization is used to avoid the human operation error affecting the normal operation of the video surveillance system.

5.3 Other Module Design

In this design process, relevant personnel should be able to achieve efficient linkage between the video surveillance system and other systems through different system configurations. Taking the linkage between the fire alarm system and the video surveillance system as an example, the processing flow after receiving the fire alarm information can be set in advance in the system, thereby improving the overall automation level of the system on the original basis, and to put off the fire more effectively for an emergency.

6. Conclusion

In summary, based on the analysis of the existing defects in the video surveillance system, this paper first introduces the core technology to be applied in the construction process of the new substation

security video surveillance system, and then from the software, The hardware has made an in-depth discussion on the specific construction methods of the system. In the subsequent development process, power companies should further attach importance to the construction of video surveillance systems, and flexibly apply various types of intelligent technologies and automation technologies to ensure that the operation of power systems can meet user needs in terms of security and stability.

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