Review: Application of Electronic Computer and Automatic Control System in Forest Fire

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Abstract :
Forest fire is one of the forest resources disasters in China, and it is also one of the natural disasters that cause serious losses to forest resources in China. Forest fire prevention has always been the focus of forest protection in China. How to prevent forest fire has become an important task of forest resource management. The use of electronic computer and automatic control system in the current forest fire prevention increasingly highlights its importance. This paper analyzes the application of remote sensing technology in forest fire prevention and forest resource management.

Key words :*Forest fire ; Electronic monitoring ; Remote sensing ; Automatic control ; Fire protection*

I. INTRODUCTION

The development of forest industry has been adhering to the concept and ideas of circular economy of sustainable development. The regeneration of forest resources after cutting is a very slow process. Relevant departments should develop and use forest resources scientifically, and strengthen the protection of resources, especially the task of forest fire prevention and disaster reduction[1]. Once a forest fire occurs, it will cause extremely serious damage to forest resources and even cause a large number of casualties. In the event of forest fire, the application of electronic computer and automatic control system can help firefighters improve the efficiency of disaster relief. At the same time, electronic computer and automatic control system can effectively monitor the fire, make the first time alarm for fire accidents, and carry out early fire work at the first time after the alarm to ensure the safety of people 's lives.

II.APPLICATION OF VIDEO SURVEILLANCE TECHNOLOGY IN FOREST FIRES

In the 1990s, China began to use the forest fire video monitoring technology system. However, due to the poor video technology at that time, the video fire monitoring picture quality was low, the monitoring range was small, and the positioning function of the fire location was lacking. So far, many forestry fire monitoring departments in forestry areas are committed to the establishment of remote fire monitoring system, and establish real-time fire control system using wireless transmission technology and monitoring technology. At present, the most advanced fire video monitoring technology system has very high technical standards, including the identification and monitoring of fire within 30 min, and the fire identification time for some products should be controlled within 20 min. The underreporting rate of forest fires should not exceed 1 ‰, and the average number of misfires per 10000 hectare can be controlled within three times. The positioning accuracy is within 100 m[2,3]. It can be said that the current forest fire

video monitoring technology can grasp the fire situation in real time when a fire occurs, which is conducive to the formulation of fire prevention plan and provides help for the rapid solution of fire.

Ⅲ. FOREST FIRE WARNING SYSTEMS

Forest fire alarm early warning system is the forest fire information collection and feedback system. Forest fire warning system is mainly used in the detection system through the temperature and wireless network module. Signal transmission is used to receive temperature in the form of data and the wireless network is transmitted to each subnet of the base station node. Each subnet node is composed of multiple sensors, through the form of network connection, to achieve the purpose of communication[4,5]. Firstly, when the system is initialized, the GPS node first initializes its position information, and then joins the network system to form a complete wireless sensor network system, and is in the monitoring state. When a child node collects fire warning data, it will transmit data through multi-hop video base station node. When a node sends a fire warning signal to the remote control center through the network, this process greatly saves the cost and improves the efficiency, making it possible to lay sensors on the forest where the warning facility is zero. It can also transmit the specific location and temperature of the fire to the corresponding base station nodes through multiple paths[6]. The base station node then sends fire messages to the remote control center through the base station network, and the control center performs data analysis after receiving the information to determine the location of the fire.

When a fire occurs in a forest region, the video monitoring system will start to transmit the unknown information of the fire, and the time information of the fire is quickly transmitted to the fire information processing system. After the fire information processing system obtains the data information of the fire situation, the sorted fire information will be transmitted to the database[7]. The database will also automatically reflect the historical fire records according to the data to see whether there are fire records and fire information in the fire area. Therefore, through more data analysis and application, disaster relief commanders can more comprehensively understand the situation of the fire area for comprehensive consideration, so as to make more reasonable fire treatment methods. In addition, the fire information processing system can also produce the corresponding fire distribution map according to the data, including the historical fire records, so as to provide more help to the disaster relief personnel and also provide important technical support for forest firefighters.

Forest fire video monitoring system also has intelligent fire recognition function, the first time to detect the forest fire signal, transmitted to the fire alarm center. The forest fire prevention video monitoring system is working for 24 hours. When the fire smoke and fire situation occur in the forest, the image processing system of the monitoring system will automatically identify the fire smoke and fire image. After the system automatically determines the fire situation, the alarm system will be automatically launched, and the fire alarm signal and video monitoring information will be transmitted to the regional fire control center[8]. Therefore, the application of fire monitoring system can enable the fire control center to find fire in the first time, so as to quickly respond to fire and reduce the fire loss to the minimum.

Ⅳ. APPLICATION OF REMOTE SENSING TECHNOLOGY IN FOREST FIRE EARLY WARNING SYSTEM

At present, China 's forest fire prevention video surveillance system is also connected with the satellite information system to facilitate the determination of major fire solutions[9]. The video surveillance system and the national satellite hotspot system are interrelated. When the fire occurs in the forest area, the fire video surveillance system integrates the rights and functions into the national satellite hotspot system to obtain the corresponding hotspot data, so as to use more hotspot data for fire prevention and control, which greatly improves the efficiency of fire treatment.

Forest fire prediction is affected by the accuracy of weather forecast. With the rapid development of Internet technology, forest resource management in forest areas is increasingly inseparable from the application of forest fire prediction. The forest fire prevention in many forest regions is mainly based on the neural network method to analyze the relationship between forest fire spread and environmental factors[10]. The fire data of forest fire site are collected by GPS, and the area of the fire site is implemented. The spatial analysis is mainly based on GIS, and it is used to extract the environmental factors of the fire site. The VLBP neural network is simulated in Matlab to list the forest fire risk prediction equation, and then the risk model is established according to the forest fire risk model and the forest fire risk spread model. The model calculation method is the strong prediction ability of the neural network method on the nonlinear mathematical relationship. It is not a priori statistical model, so it is widely applicable.

Forest fire monitoring is the process of transmitting and analyzing the possibility of forest fire information by using relevant methods. Monitoring is to enable people to deeply realize the importance of scientific and technological development and people ' s understanding of forest fires to forest fire fighting[11,12]. For example, in forest fire monitoring, aerial spraying fire extinguishing, patrolling, and detection of airborne landing fire extinguishing are often applied to aircraft ; forest fire management system and fire extinguishing system use more Internet technologies, and are also widely used in forest fire modeling management.

Ⅴ. PROBLEMS AND SOLUTIONS IN FOREST FIRE VIDEO SURVEILLANCE SYSTEM

The application of forest fire video monitoring system plays an important role in the prevention and control of forest fire in China. However, due to its working environment is in the forest with abnormal changes in natural conditions, it is inevitable to encounter some problems, and the relevant technical means have not reached absolute maturity will also bring trouble to the application of forest fire video monitoring technology, including the following aspects : Firstly, forest fire monitoring system is a set of high-tech systems, and its installation cost is relatively high. In addition, the monitoring system is installed in the vast forest, which is difficult to install and has a wide range of installation. The cost of technology, manpower and equipment is also very huge[13-15]. Therefore, it is difficult to realize the full area of forest

fire prevention and control from the aspects of installation difficulty and cost management. Secondly, the harsh natural environment in the forest region also brings problems to the work of the video monitoring system. Different from other video monitoring products, the fire prevention video monitoring system works outdoors, and the natural weather in the forest changes rapidly, which is likely to cause different degrees of interference to the monitoring equipment signal, thereby affecting the accuracy of the forest fire identification system. Third, the selection of forest resources monitoring points is not reasonable. At present, because it is unable to achieve full area of fire monitoring, it can only be targeted to some areas for pilot monitoring. In the process of selecting pilot monitoring, it is often judged according to the personal experience of forestry protection staff. It is difficult to say that the protection of forest fire video monitoring is reasonable.

Ⅵ THE SOLUTION STRATEGY OF VIDEO SURVEILLANCE SYSTEM APPLICATION PROBLEMS

Forest fire video surveillance technology is the leading technology in fire prevention and control technology in China, and the problem of video surveillance technology is the vulnerability of fire prevention and control in China 's forest sector, which is likely to cause direct economic losses in the process of vulnerability. Therefore, in order to better protect China ' s forest resources, it is necessary to effectively solve the problem of video surveillance, and the effective strategies include the following aspects. Firstly, in order to solve some areas with poor geographical conditions, wide forest resources and high investment cost in the construction of video surveillance system, the laying of cable lines and the construction of watchtower can be minimized, so as to save the construction cost. More wireless transmission connection is used for signal transmission, which increases the transmission speed and saves the cost of human resources.

Secondly, in view of the impact of harsh natural conditions in the forest area on the transmission signal of the monitoring system, the selection of video driving control area points should be strictly investigated. On the one hand, the scientific and reasonable monitoring position is selected to protect the video transmission signal to improve the transmission quality of the fire situation. On the other hand, when the full-area monitoring cannot be completed, the selection of reasonable position can effectively monitor the forest fire and avoid the waste of resources. When selecting the regional points of forest fire monitoring, the mathematical modeling method, computer space technology and fire historical data should be used to reasonably select the monitoring points, so as to ensure the representativeness of the monitoring points and improve the efficiency of forest fire monitoring.

Finally, in view of the technical problems existing in the forest fire video monitoring technology, the national forestry department and related technical departments should pay high attention to develop scientific and technological strength, and apply more high-tech to forest fire monitoring technology to improve the overall efficiency of forest fire monitoring technology.

Ⅶ. CONCLUSION

At present, the application of remote sensing technology is becoming more and more popular in forest fire prevention monitoring and management, and it has always played an important role in the whole process of forest fire prevention. Remote sensing technology is used to monitor the fire video in the process of forest fire fighting, and the law of forest fire spread is analyzed effectively. The commander can reach the forest fire fighting site in time with the correct fire fighting instructions, and control the forest fire with scientific forest fire fighting tactics. In the fire investigation, forest fire rescuers can judge the ignition point and fire area according to the images transmitted by remote sensing satellites, and evaluate them accordingly, so the role of remote sensing technology cannot be ignored.

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