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Fire Remote Monitoring Based on Data Mining Technology

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Abstract:

In order to effectively remote monitor the forest fire, a forest fire remote monitoring system based on big data is constructed. Firstly, basic theory of forest fire remote monitoring system is designed, the hardware is confirmed, and the software is analyzed. The forest fire monitoring data is collected through proposed remote monitoring system, and the data dimensionality reduction processing procedure is established, and the improved data mining technology is designed. Case analysis show that the improved data mining technology can effectively and efficiently monitor the fire status of forest.

***Keywords**: Remote monitor, Data mining, forest fire, Data dimensionality reduction, Apriori technology.*

I. INTRODUCTION

Fire monitoring has begun to shift from analog video monitoring to digital video monitoring. The embedded remote digital video monitoring system has the characteristics of wide control area, almost unlimited seamless expansion ability, easy to form a very complex monitoring network, stable and reliable performance, and will become the development trend in the future. At present, forest fire remote monitoring is mainly to compress the video image collected by the camera and directly transmit it to the forest fire monitoring center by wired or wireless. Due to the relatively low probability of forest fire, the transmitted video images are pictures under safe conditions most of the time. Due to the sudden nature of forest fire, the staff of the monitoring center must monitor the video images transmitted from various monitoring points in the forest around the clock, otherwise, the discovery of the fire may be delayed and heavy losses may be caused [1].

Forest fire has the characteristics of large damage area, serious loss and difficult to control, which seriously threatens the existing forest resources. Therefore, the study of forest fire prevention countermeasures is the requirement of the new situation, which can effectively protect the forest. At present, the protective measures of forest fire mainly adopt the methods of manual inspection, video monitoring and satellite remote sensing. The cost of manual inspection is high, the observation range is small, and it is easy to be affected by weather conditions; The cost of video monitoring is high, the data is redundant, and the blind area of monitoring is easy to appear; Satellite remote sensing is costly and vulnerable to weather conditions. Compared with the above three forest fire protection measures, the

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system can timely obtain various environmental data in the forest, analyze the areas where fire may occur, timely alarm after finding the fire, prevent the accident, find the forest fire earlier, timely alarm and remedy in time, so as to better protect the forest resources [2].

In the development of the information age, information technology is widely used in various fields. Combined with the development needs of various fields, it promotes the development of information in various fields. In forest fire prevention, through the introduction of advanced technology and equipment, strengthen the prevention and control of forest fire prevention, and adopt the remote video monitoring system, which can monitor the overall situation of the forest in real time and record the detected relevant information and data in detail. Professionals can grasp the development status of forest resources by analyzing the relevant data. The system contains various business modules, which can record the whole process of "before, during and after the disaster" of forest fire, so as to achieve the goal of dynamic management of forest resources. Once there is a forest fire, the system will give an alarm at the first time to provide accurate fire location for firefighters and effectively reduce the damage to forest resources[3].

Design and implement a set of forest fire remote monitoring system, which has strong universality and certain intelligence. It can facilitate the transplantation between different forests, better help the administrator to carry out forest fire prevention management, and carry out forest fire data analysis and data mining research based on this platform. Forest fires occur from time to time. At present, most forest fire remote monitoring systems are customized and developed only for a certain forest, so they can not be easily transplanted to other forests, that is, the universality is not good, which will waste the system development time and cost. A set of forest fire remote monitoring general system is designed and developed, so that the system can be easily transplanted between different forests, and even the monitoring system can be transplanted between different forests only through the configuration of some parameters. In addition, the forest fire remote monitoring system has good intelligence. The intelligent control of the monitoring system is reflected in energy consumption control, forest fire condition judgment and so on. Based on the historical data of forest fire provided by the monitoring system, carry out data mining research to provide a strong basis for the improvement of forest fire remote monitoring system [4].

II.FOREST FIRE REMOTE MONITORING SYSTEM

(1) Basic theory of forest fire remote monitoring system

The application of remote video monitoring system in the field of forest fire prevention refers to a comprehensive intelligent forest fire prevention information system integrating video monitoring, intelligent early warning, intelligent scheduling and anti-theft alarm functions. Its main components include front-end forest fire prevention monitoring and early warning subsystem, wireless transmission subsystem, emergency command subsystem, tower infrastructure subsystem, etc. Among them, the front-end forest fire prevention monitoring and early warning subsystem uses the spectral HD PTZ camera to monitor the real-time fire in the forest area. In case of fire, it can immediately identify and locate through

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the front-end camera, and transmit the captured images and meteorological information to the command center. The wireless transmission subsystem transmits the relevant information collected by the front-end camera to the command center in real time to ensure that the fire information can be transmitted in the shortest time. The emergency command subsystem can coordinate fire fighting and disaster relief with various departments by implementing various emergency plans in case of fire in the forest area. As a centralized area of information, it can provide information and decision support for various disaster relief activities to ensure that the fire is effectively controlled. The tower infrastructure subsystem is the commanding point within the forest or forest farm, which is used to carry the forest fire monitoring equipment and transmission equipment in the remote video monitoring system. These subsystems together constitute the remote video monitoring system. The smooth operation of each subsystem is the normal working state of the system [5].

(2) Design of forest fire remote monitoring system

The function of the system is realized by ZigBee unit, monitoring controller and coordinator. ZigBee unit transmits relevant monitoring data to the coordinator through wireless local area network; The coordinator transmits the data of the wireless local area network to the monitoring controller through the serial port; The cloud receives the information sent by the monitoring controller through the 4G network. The overall architecture of the system is shown in Figure 1. The system includes hardware and software [6].

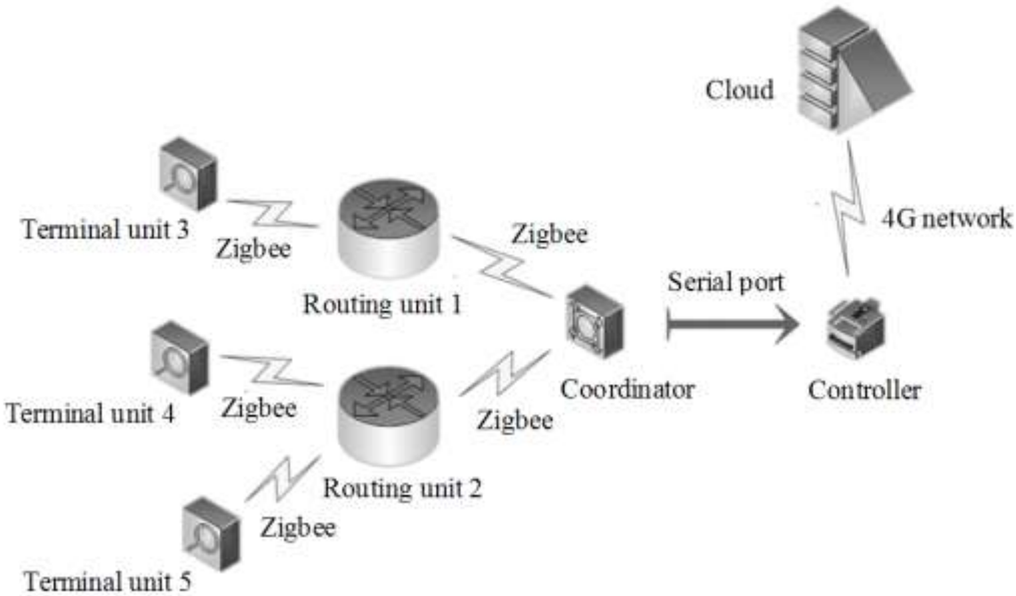

Fig 1: Whole framework of forest fire remote monitoring system

The structure diagram of ZigBee unit is shown in Figure 2. ZigBee unit is equipped with temperature and humidity, smoke, carbon monoxide and flame sensors to collect relevant information about the surrounding environment and transmit it to the monitoring controller through wireless local area network.

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The information transmitted by ZigBee unit includes the temperature and humidity of the surrounding environment, smoke, carbon monoxide, flame information and the unit number [7].

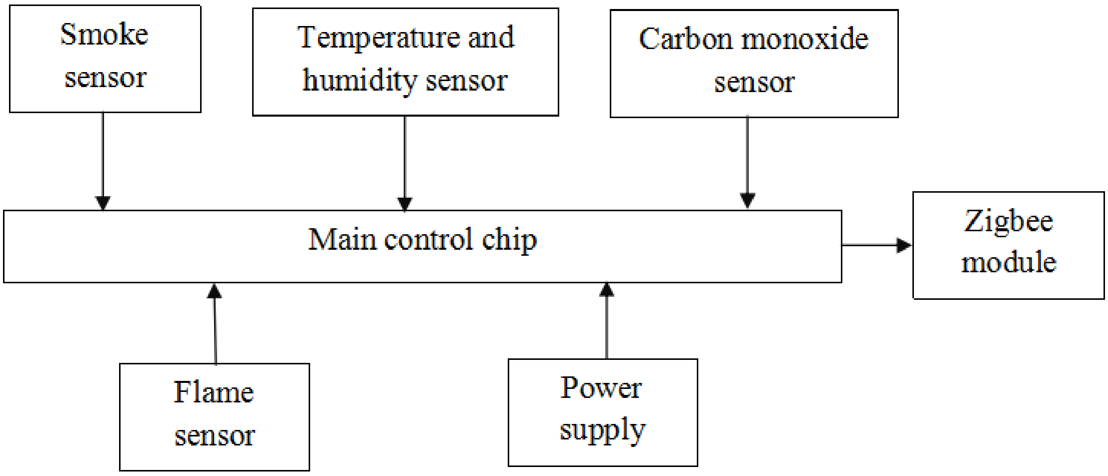

Fig 2: Hardware structure of forest fire remote monitoring system

ZigBee is a standard, which defines a series of communication protocols required for short-range and low transmission rate wireless communication. Long distance, low speed, low cost and low power consumption are its characteristics. It can realize the way of transmitting ZigBee unit to ZigBee unit, which can increase the communication range of ZigBee wireless local area network. In addition, the ZigBee wireless local area network has good flexibility. If the ZigBee unit is disconnected from the network, the ZigBee unit can be connected to the network again, without being unable to connect once disconnected. In the forest environment, the equipment is difficult to maintain, so it needs to work for a long time, the power consumption should be as low as possible, and the system should cover the forest as much as possible. Compared with the traditional Bluetooth communication and mesh communication, the number of ZigBee units can reach tens of thousands, and the communication power consumption of ZigBee is low, which is more suitable for the construction of forest fire prevention system [8].

(1) Processing chip

The system adopts CC2530 integrated chip to realize the function of reading and transmitting environmental information. The chip has the functions of interrupt, sleep and wake-up, which can effectively reduce the power consumption. Moreover, the price of the chip is low, and the ZigBee network can be established at a very low cost. In addition, the chip integrates the enhanced industrial standard 8051MCU, and has many powerful peripheral functions such as system programmable flash, 8KB ram, UART, SPI, DMA and so on; This makes it the best choice for establishing wireless local area network [9].

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(2)Temperature and humidity detection module

SHT20 module is characterized by wide range of temperature and humidity measurement, high precision, and IIC communication, strong anti-interference ability, and can work when submerged in water. In addition, the price of a product is only about 20 yuan, the cost is low, and its occupied space is small, which is convenient to carry on the processing chip, so the product meets the needs of working in the forest environment [10].

(3) Smoke detection module

MQ-2 is a special tool for detecting smoke gas, and other gases are difficult to interfere with it. Its detectable concentration range is 100 ~ 10000ppm. Once it detects a high concentration of smoke, the digital output port outputs a low level, otherwise it outputs a high level.

(4) carbon monoxide detection module

The internal material of MQ-7 is tin dioxide. It is a special tool for detecting carbon monoxide gas, which can detect a variety of mixed carbon monoxide gases. Once it detects a high concentration of carbon monoxide gas, the digital output port outputs a low level, otherwise it outputs a high level [11].

(5) flame detection module

Using infrared detection to judge whether there is a fire is the principle of flame sensor, and its detection angle can reach 60 °. Once it detects the flame, the module digital output port outputs low level, otherwise it outputs high level.

(6) power module

The system samples three 18650 lithium-ion batteries as the power supply. The battery has low leakage rate and large capacity, which is especially suitable for the forest environment without power supply. In addition, the input voltage is stabilized at 5V through LM2596 voltage stabilizing module to ensure that the system is in a stable power supply state [12].

The main control chip of the monitoring controller is STM32F103ZET6. The coordinator communicates with the monitoring controller through the serial port, and the monitoring controller uploads the environmental data to the cloud through the 4G module.

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(1) STM32F103ZET6

STM32 chip is designed for embedded applications with low power consumption, high performance and low cost, and the clock frequency is as high as 72MHZ; It has a variety of external devices including USB, IIC, SPI and so on, with powerful functions and fast chip operation speed. Moreover, it has strong interrupt function and interrupt priority division. The chip can work with a variety of sensors, communication modules and cameras, and has strong storage and driving ability [13].

(2) 4GDTU communication module ATK-M751

The module uses 4G network for communication and supports mobile/Unicom/Telecom access mode; Applicable to a variety of communication protocols; Support to connect multiple cloud servers; Support automatic timing collection of task, base station location, custom heartbeat packet and registration packet data; Support the configuration parameters of upper computer/at command/SMS/transparent command. It takes high speed, low delay and wireless data transmission as its core functions. It is suitable for transmission and has better use function, communication speed, bandwidth and stability. At command is the standard and rule for communication between STM32 main controller and 4G wireless module. STM32 main controller uses at command to control 4G wireless module to transmit data. 4gdtu module communicates with STM32F103 single chip microcomputer through TTL serial port, and sends the sensor information collected by ATM32F103 single chip microcomputer to the remote cloud server. Data upload requirements in forest environment. Compared with traditional GSM data transmission and 3G module.

The wireless communication technology in the sensor network is adopted to sense the real-time monitoring, sensing and collecting information of various forest fire environments in the above hardware, process the information by using the distributed information processing calculation in the sensor network, and transmit all the perceived information to the user terminal in a medium hop manner [14].

The distributed information processing procedure is listed as follows:

Step 1: system initialization is carried out.

Step 2: Judge whether there are nodes connected to the network, if it is yes return to step 3, otherwise return to step 1.

Step 3: the monitoring information is allocated.

Step 4: distributed processing is carried out.

Step 5: judge whether all data processing is finished, if it is yes, return to step 6, otherwise return to step 3.

Step 6: data perception is carried out.

Step 7: perceptual information transmission is carried out.

Step 8: technology is over.

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Due to the inevitable random interference in the transmission channel, there is an error in the data from the A / D transmission process, which becomes a random error. In order to overcome this error, digital filtering method is used to suppress the interference component in the effective signal and eliminate the random error in the signal. The digital filtering method is to remove the impulse interference in the sampling value through a certain calculation program, and then average the remaining sampling values, so as to eliminate or weaken the influence of interference noise. The technology is expressed as follows:

$$C = \frac{A - R}{X} \tag{1}$$

where: A is the maximum value among the sampling values, and R is the minimum value among the sampling values; X is pulse interference signal; C is all sampling values.

After the data processing is completed, the system receives various data sent by the sensor and monitors the operation of the ship cabin and equipment in real time. Respond to abnormal conditions in time and report the actual state of forest fire to the monitoring center to obtain corresponding instructions.

III. DATA MINING TECHNOLOGY

(1) Basic theory of data mining

The relationship between the data analyzed by data mining has confidence, and its confidence needs to be calculated to judge whether the relationship exists or not. Once it is within the scope of our reliability, the result can make a more accurate judgment for the relationship between things. It consists of the following steps:

Step 1: Data preparation: first, we need to understand the relevant background of data mining, analyze the needs of customers after getting familiar with it, and decide what kind of mining system to adopt. On the basis of user requirements, find out the data associated with data mining from the database, and make it clear that we will carry out data mining from these data.

Step 2: Data preprocessing: because the original data generally has some small problems, such as incomplete data, abnormal data, etc., we should actively remove the abnormal data, and we should use mathematical methods to make up for some missing data for incomplete data. In fact, transaction attributes are generally expressed as numerical values to facilitate data mining.

Step 3: Determine the goal of data mining: take user requirements as the goal, and specify the type of knowledge mining,

Step 4: Determine the data mining technology: After the data mining technology is determined, the reasonable data mining technology is determined. Specifically, for example, the transaction is expressed as data, and the mining model is selected according to the characteristics of the data.

Step 5: Data mining: analyze the relationship between data according to the adopted data mining technology.

Step 6: Pattern evaluation: correctly analyze the found data relevance. In the process of pattern evaluation, in order to make the final knowledge law more convincing, it is necessary to delete some

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redundant and worthless knowledge. Therefore, it may involve the above steps, which need to be extracted repeatedly.

(2) Data dimensionality reduction processing

The loss of data information will occur when the dimension of data is reduced. The degree of data loss is controlled by PCA technology. Define the data matrix as $k=(k_1,k_2,\cdots,k_n)$, where $k_j \in Q'$, the average value of k is calculated by [15]

$$\bar{k}=\frac{1}{n}\sum_{j=1}^{n}k_j \tag{2}$$

PCA technology mainly extracts the main characteristic components after k-means removal. Its main principle is to analyze the distribution pattern of data samples in high-dimensional space, and take the maximum variance of data samples in space as the discriminant vector to reduce the dimension of data. The objective function is as follows:

$$p=M^T k, s.t. M^T M=R \tag{3}$$

where M is the data conversion matrix, $M \in Q^{r\times r'}$, data matrix k is converted by the data conversion matrix $M \in Q^{r\times r'}$, and a new r' dimension space p is obtained, R denotes the unit matrix.

The optimal features are obtained through linear transformation, and the training data are reconstructed according to the features. The mean square error of the data before and after reconstruction is constrained to minimize the error. Make assumptions about linearly independent vectors that are defined by $\delta_1,\delta_2,\cdots,\delta_m$, the vector is n-dimensional linear independent vector, and the matrix based on it is expressed as $\mu=(\delta_1,\delta_2,\cdots,\delta_m)$, The n-dimensional random variable is expressed as σ, random variables can be expressed through the above matrix $\sigma=\mu m$.

The correlation matrix of σ is set to L that is expressed by [16]

$$L=\mu m(\mu m)^T=\mu\begin{bmatrix}\kappa_1 & & & \\ & \kappa_2 & & \\ & & \ddots & \\ & & & \kappa_n\end{bmatrix} \tag{4}$$

Generally, the known data information can be described by σ, from the above, L is known, when $\mu\mu^T=R$, then R is a single matrix, defined as

$$L\delta_j=\kappa_j\delta_j \tag{5}$$

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When KL performs dimension reduction transformation, the feature vector in front of m shall be selected, and the number of selected vectors is expressed as n', and other feature vectors of the remaining part shall be removed after selection, which is expressed by

$$\sigma = \sum_{j=1}^{n'} m\delta_j + \sum_{j=n'+1}^{n} m\delta_i \tag{6}$$

For the useful information retained after the residual vector is eliminated, the calculation formula of the mean square error before and after the feature vector is as follows:

$$v^2 = \left\|\sigma - \hat{\sigma}\right\|^2 = \sum_{j=n'+1}^{n} \kappa_j \tag{7}$$

The covariance matrix is calculated by

$$E = \sum_{j=1}^{n} (\kappa_j - \bar{\kappa})(\kappa_j - \bar{\kappa})^T \tag{8}$$

(3) Data mining method of association rules

Association rule mining can be divided into two steps: Step 1: given transaction database D and item set $I = \{i_1, i_2, \cdots, i_m\}$, find the set of all frequent item sets in D. Step 2: obtain the association rule $T1 \Rightarrow TT2$ from each frequent item set T in the set, and its confidence must be greater than or equal to min_conf.

Apriori technology is used in this research, which is a fast mining technology proposed by R. Agrawal et al. Apriori technology is the most important technology for mining frequent itemsets in association rules. Its technology idea is an iterative method of layer by layer search, which uses the known $k-1$-dimensional frequent itemsets to generate k-dimensional frequent itemsets.

The specific methods are as follows: first, find out the frequent 1-itemset and record it as L_1; Then use L_1 to mine L_2, that is, frequent 2-itemsets; Recurse repeatedly until frequent k-item sets cannot be generated. Of course, each mining system needs to scan the transaction database again. According to the nature of apriori, the process of seeking L_k $(k \geq 2)$ from L_{k-1} is mainly divided into the following two steps:

Step 1: connect. Connect L_{k-1} with itself to generate candidate k-item set L_k.

Step 2: prune. First, if the $k-1$ item subset of L_k is not in L_{k-1}, the candidate item set is infrequent and is deleted from L_k. Then L_k is generated in combination with the minimum support.

Although Apriori technology is the most commonly used and classic technology, it still has some shortcomings, such as repeatedly scanning the database. At the same time, the technology consumes a lot of time to read on I/O, which makes the efficiency of the technology very low. Therefore, we need to improve the Apriori technology to improve the mining efficiency of the technology.

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After analyzing the previous forest fire database, it is found that the forest environmental parameters can reflect the situation of forest fire to some extent. In order to monitor the forest fire information remotely and in real time, the whole forest fire remote monitoring system collects the forest environmental parameters every 30s, so the amount of data is very large. The traditional Apriori technology has to scan such a large database repeatedly, so we can use an improved Apriori technology to scan the transaction database only once, and simplify the process of generating frequent item sets, so as to improve the efficiency of the supervisor's analysis of the system data.

In this technology, each transaction is represented by an attribute value, and different transactions are different attribute values. When scanning the database, we first assign a value to each item, determine the support of the transaction by comparing whether the values of each item in the transaction set are consistent, and then calculate the number of transactions with consistent values of each item, that is, its support, So we can get the frequent item sets we need. When calculating its confidence, we add another forest environment item to each transaction. According to the situation of forest fire, this forest environment item is divided into three categories: severe fire, moderate fire and mild fire. When calculating the frequent itemset, we calculate the transaction volume containing these three types of forest fire at the same time, then through the definition, the confidence between the environment and each fire situation can be obtained, and the association rules between forest environment and forest fire situation can be deduced. In this way, we only need to scan the transaction database once to find the frequent item set we want, which is concise and very suitable for our forest fire remote monitoring system.

The technology procedure is listed as follows:

Step 1: Read the first record in the database, obtain the 2-item set composed of the record and forest fire items, and mark that their support count is 1 at this time;

Step 2: Read the second record of the database, and also obtain the 2-item set composed of the record and forest fire condition items. If it does not appear in the previous records and combinations, mark the support count of the record and combination as L. if it already appears, add 1 to their support count;

Step 3: The processing method is the same as that in step 2, process all records of the database in turn, and complete the statistics of the number of records and the corresponding support count of the combination;

Step 4: According to the set minimum support, complete their pruning, and calculate the corresponding confidence. Then, according to the minimum confidence, the reasonable and correct strong association rules are selected.

IV. CASE STUDY

In order to verify the effectiveness of proposed forest fire remote monitoring system, the forest in a county is selected to be research object, the area of forestry land is 2843km^2, and the forest coverage is 72.4%. This county is divided into three levels of fire risk areas. The first-class fire risk area is the key forest area around the county or the area with frequent fire risk, including 4 towns; Level II fire risk area refers to the area with dense personnel activities or frequent fire risk, including 7 towns; Class III fire risk

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area refers to the area with occasional or no fire risk, including 8 towns. The data mining technology is used to cope with data collected from forest fire remote monitoring system. The hardware parameters are listed as follows: the dominant frequency is 2.10GHz, the memory is 2GB, the operating system is Windows 10, the database uses SQL-2010.

The relationship between running time of technology and records is shown in figure 3. It can be seen from the figure 3 that the time consumed by the improved data mining technology is far less than that of the traditional data mining technology, and with the increase of the number of records, the advantages of the improved data mining technology become more and more obvious. This is because the improved data mining technology only needs to scan the database once when pruning, which greatly saves the scanning time and improves the operation efficiency of the technology.

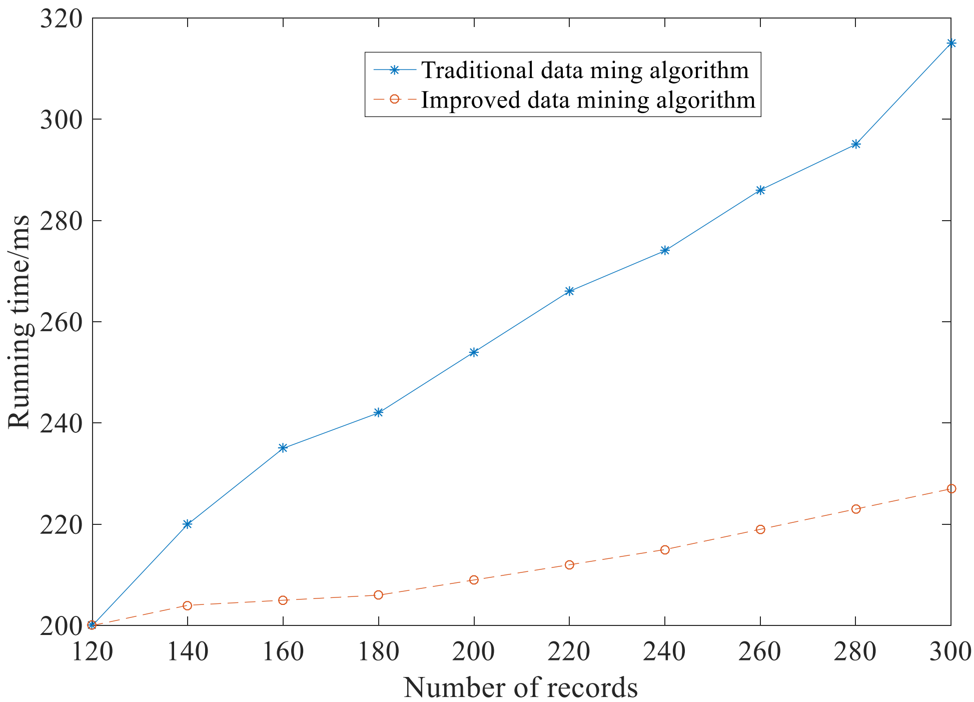

Fig 3: Relationship diagram between running time and number of records

The environmental data successfully received by the environmental monitoring terminal are listed in Table I and Table II respectively. The data of ZigBee unit number, temperature, humidity, carbon monoxide, flame, smoke and overall condition is shown in the display screen. Where “1” denotes the normal, “0” denotes the abnormal.

TABLE I. Normal test results of monitoring controller

Number	Temperature/K	Relative humidity/%	CO	Fire	Smoke	Overall
1	300	42	1	1	1	1
2	300	43	1	1	1	1
3	310	41	1	1	1	1
4	300	40	1	1	1	1
5	300	39	1	1	1	1
6	300	42	1	1	1	1

TABLE II. Abnormal test results of monitoring controller

Number	Temperature/K	Relative humidity/%	CO	Fire	Smoke	Overall
1	300	42	1	0	1	0
2	300	43	0	0	1	0
3	300	41	1	0	1	0
4	300	40	0	1	0	0
5	300	39	1	1	0	0
6	300	42	0	0	1	0

As seen from table 1, the data collected is normal, and the forest fire remote monitoring system is normal. As seen from table 2, the fire data of Zigbee unit 1 is abnormal, the CO and fire data of Zigbee unit 2 is abnormal, the fire data of Zigbee unit 3 is abnormal, the CO and smoke data of Zigbee unit 4 is abnormal, the smoke data of Zigbee unit 5 is abnormal, and CO and fire data of Zigbee unit 6 is abnormal.

V. CONCLUSION

The application of forest remote monitoring system based on data mining technology can well grasp the dynamics of forest security, which is conducive to the realization of all-weather fire detection. In fact, remote monitoring system is an advanced high-tech monitoring technology. Compared with the traditional

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forest fire monitoring system, it has great application advantages, can realize uninterrupted automatic patrol monitoring and improve the efficiency of forest fire prevention patrol. Time consumed by the improved data mining technology is far less than that of the traditional data mining technology, and the abnormal of forest environment parameters can be obtained correctly. Analysis results show that the data mining technology can effectively correctly and efficiently monitor the security of forest. In future, an novel data mining technology with better precision and efficiency should be developed.

REFERENCES

[1] David A.Wood (2021) Prediction and data mining of burned areas of forest fires: Optimized data matching and mining algorithm provides valuable insight, Artificial Intelligence in Agriculture (5): 24-42.
[2] Zhong Zheng, Yanghua Gao, Qingyuan Yang, Bin Zou, Yongjin Xu, Yanying Chen, Shiqi Yang, Yongqian Wang, Zengwu Wang (2020) Predicting forest fire risk based on mining rules with ant-miner algorithm in cloud-rich areas, Ecological Indicators118(11):106772.
[3] Saeedeh Eskandari, Hamid Reza Pourghasemi, John P. Tiefenbacher (2020) Relations of land cover, topography, and climate to fire occurrence in natural regions of Iran: Applying new data mining techniques for modeling and mapping fire danger, Forest Ecology and Management473(10):118338.
[4] Mark Annandale, John Meadows, Peter Erskine (2021) Indigenous forest livelihoods and bauxite mining: A case-study from northern Australia, Journal of Environmental Management 294(9): 113014.
[5] Meriame Mohajane, Romulus Costache, Firoozeh Karimi, Quoc Bao Pham, Ali Essahlaoui, Hoang Nguyen, Giovanni Laneve, Fatiha Oudija (2021) Application of remote sensing and machine learning algorithms for forest fire mapping in a Mediterranean area, Ecological Indicators129(10):107869.
[6] Noel Varela, Díaz-Martinez Jorge L., Adalberto Ospino, Nelson Alberto Lizardo Zelaya (2020) Wireless sensor network for forest fire detection, Procedia Computer Science 175(1):435-440.
[7] Anke C. Scheper, Pita A. Verweij, Marijke van Kuijk (2021) Post-fire forest restoration in the humid tropics: A synthesis of available strategies and knowledge gaps for effective restoration, Science of The Total Environment771(6):144647.
[8] Narayan Kayet, Khanindra Pathak, Abhisek Chakrabarty, C.P. Singh, V.M. Chowdary, Subodh Kumar, Satiprasad Sahoo (2019) Forest health assessment for geo-environmental planning and management in hilltop mining areas using Hyperion and Landsat data, Ecological Indicators106(11):105471.
[9] Francis K. Dwomoh, Michael C. Wimberly, Mark A. Cochrane, Izaya Numata (2019) Forest degradation promotes fire during drought in moist tropical forests of Ghana, Forest Ecology and Management440(5):158-168.
[10] Mathieu Decuyper, Roberto O. Chávez, Madelon Lohbeck, José A. Lastra, Nandika Tsendbazar, Julia Hackländer, Martin Herold, Tor-GVågen (2022) Continuous monitoring of forest change dynamics with satellite time series, Remote Sensing of Environment269(2):112829.
[11] Guofeng Ma, Qingjuan Du (2020) Optimization on the intellectual monitoring system for structures based on acoustic emission and data mining, Measurement163(10):107937.

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[12] Iqbal Owadally, Feng Zhou, Rasaq Otunba, Jessica Lin (2019) Douglas Wright, An agent-based system with temporal data mining for monitoring financial stability on insurance markets, Expert Systems with Applications123(6):270-282.
[13] Hendrik Wijaya, Pathmanathan Rajeev, Emad Gad, Ravi Vivekanantham (2022) Automatic fault detection system for mining conveyor using distributed acoustic sensor, Measurement187(1):110330.
[14] Andy Hira, James Busumtwi-Sam (2021) Improving mining community benefits through better monitoring and evaluation, Resources Policy 73(10):102138.
[15] Y. Wang, H. Ye, T. Zhang, H. Zhang (2019) A data mining method based on unsupervised learning and spatiotemporal analysis for sheath current monitoring, Neurocomputing352(8):54-63.
[16] Xing Su, Yixiang Huang, Lei Wang, Shaochen Tian, Yanping Luo (2021) Operating optimization of air-conditioning water system in a subway station using data mining and dynamic system models, Journal of Building Engineering44(12):103379.
[17] El Emam K, Koru AG (2008) A replicated survey of IT software project failures. IEEE Softw25(5):84–90
[18] Demir KA (2008) Measurement of software project management effectiveness. DoctoralDissertation, Naval Postgraduate School, Monterey, California, USA
[19] Philips D (2000) The software project manager’s handbook, principles that work at work.IEEE Computer Society, Los Alamitos
[20] El Emam K, Koru AG (2008) A replicated survey of IT software project failures. IEEE Softw25(5):84–90
[21] Humphrey WS (1996) Using a defined and measured personal software process. IEEE Softw13(3):77–88
[22] Humphrey WS (1997) Introduction to the personal software process. Addison-Wesley,Reading
[23] Hughes B, Cotterell M (2002) Software project management, 3rd edn. McGraw-Hill International(UK) Ltd, Berkshire
[24] Boehm BW(1991) Software risk management: principles and practices. IEEE Softw 8(1):32–41
[25] Jones C (1994) Assessment and control of software risks. Prentice-Hall, Englewood Cliffs
[26] Muller R (2003) Determinants for external communications of IT project managers. Int J ProjManag 21:345–354
[27] Jones C (2004) Software project management practices: failure versus success. Crosstalk – JDefSoftwEng 17(10):5–9
[28] Cicibas H, Unal O, Demir KA (2010) A comparison of project management software tools(PMST). In: Proceedings of the Software Engineering Research and Practice (SERP 2010), pp560–565, July 12–15, 2010, Las Vegas, Nevada, USA