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Research on Road Geological Hazard Risk Assessment Model Based on Computational Deep Learning Algorithm Integrated With GIS

Journal of Electrical Systems

***Abstract:* -** This paper studies the geological disaster emergency command and management system based on geographic information system. This system is for the province, city, county land resources and other aspects of the comprehensive application, the realization of real-time information display, meteorological early warning, group measurement and mass prevention, monitoring and early warning, major disaster management, prevention plan, quick report processing, emergency investigation, emergency disposal, emergency consultation and other functions. Through the GSM network, the monitoring data is sent to the monitoring center through the mobile phone, and then the monitoring center processes, stores, displays and alarms the monitoring data. Finally, B/S structure is used to build a remote Web data service publishing platform, so that it can carry out real-time monitoring at any place, and improve the speed, efficiency and intuition of high-speed slope disaster. It is proved that the method has the advantages of stable operation, accurate data, fast transmission speed and high monitoring accuracy through the practical application of a highway project foundation pit slope monitoring.

Keywords: Geographic Information System; Network Development Platform; Geological Disasters; Highway Slope; Disaster Prevention and Mitigation.

I. INTRODUCTION

Due to heavy rainfall, earthquake and large-scale man-made construction, geological disasters occur frequently. In China, geological disasters such as landslides, landslides and debris flows occur frequently, causing huge economic losses. However, slope instability caused by geological processes often leads to landslide, collapse and other serious consequences, has been listed as the world's three most serious geological disasters together with earthquakes, volcanoes, etc., resulting in various types of slope deformation and damage worldwide [1]. It is estimated that the annual economic loss caused by natural factors in the world is more than 40 billion, of which the slope instability caused by human factors is a geometric increase. With the continuous development of China's infrastructure construction and the construction of expressway, it is often inevitable to excavate rock and soil mass to form a large number of engineering slopes related to human engineering activities. The linear project of mountain expressway passes through many geomorphic units and encounters complex geological conditions [2]. The slope management occupies a large proportion in the project construction. At present, the traditional manual itinerant testing and recording data processing are mainly used to deal with the landslide hazards of highway excavation in China. This way of sending personnel on duty not only consumes a lot of human resources and funds, but also most of the disaster sites are dangerous terrain, and the on-site work of personnel lacks personal safety protection, and the efficiency is also very low. Consequently, there is an immediate need to investigate methods for mitigating and surveilling these hazards and develop an appropriate surveillance and alert mechanism for landslide geological risks. Certain academics have suggested utilizing wireless sensor networks

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for landslide detection, having devised a comprehensive framework for wireless sensor networks and sensor nodes. Their research, supported by simulations and empirical trials, has validated that the wireless sensor network model they propose is capable of fulfilling the criteria for prolonged monitoring and data transmission [3]. Intentionally, the practical implementation of wireless sensor network technology in landslide surveillance within the Three Gorges reservoir region will be expanded upon. Researchers have conceptualized a landslide monitoring framework rooted in wireless sensor networks, conducting theoretical evaluations and error assessments utilizing the empirical data gathered. They have determined that such a wireless sensor system possesses traits of energy efficiency, extensive adaptability, and robust utility, which are instrumental in addressing the uncertainties inherent in landslide surveillance. This system is poised to effectively oversee and regulate landslide activity within the Three Gorges reservoir area as well as in other challenging environments [4]. This paper introduces a monitoring data transmission by short message based on GSM network, and publishes the monitoring data into a Web service platform, which realizes the function of remote monitoring of slope status in any place with Internet, and gives an application example in combination with specific projects. The system proposed in this paper is proved to be energy saving, wide applicability and strong practicability.

II. Functions of geographic information systems

The Geographic Information System (GIS) represents an inevitable progression arising from contemporary advancements in high technology. GIS facilitates the acquisition, processing, stewardship, and dissemination of geographic information and correlated data, while additionally managing and delineating the spatial and attribute data of terrain features and associated agricultural crops. It is equipped with robust capabilities for handling graphic, image, and attribute information. Furthermore, GIS boasts formidable analytical prowess in areas such as spatial overlay, buffering, geocoding, and network analysis. The integration of GIS technology holds significant implications, notably enhancing the system's functionality and effectiveness:

(1) An information system for geological disaster prevention has been established. The data processing of GIS is an important guarantee for the efficient storage and management of geological disaster data [5]. The system has data display, query, update, maintenance and other functions.

(2) Evaluate the earthquake disaster. The rapid report of geological disasters, disaster information and field information collection are realized based on the comprehensive spatial geological disaster database and professional calculation and analysis model. The risk, loss, casualties and secondary disasters are evaluated quickly, and the temporal and spatial distribution of disasters are judged and explained [6].

(3) Emergency meeting for emergencies. In the sudden geological disaster event, GIS presents the information in a visual way to the disaster prevention and reduction workers and decision makers scattered in various regions of the country, so as to understand the current geological disaster situation in an intuitive way. Summary of various geological disaster response plans provided by the members of the expert group; At the same time, in accordance with relevant laws and regulations, in order to ensure the safety of people, property and major projects, as far as possible to reduce the harm of disasters and the adverse impact on the environment and ecology, formulate corresponding emergency plans and carry out scientific evaluation and decision-making.

(4) Publish information on geological hazards. The information is released by various information dissemination methods such as the Internet and mobile phone short messages based on the comprehensive geological disaster database. With disaster prevention and relief departments of governments at all levels, scientific research and technical support departments, science popularization and education departments and the general public as targets, the knowledge on disaster prevention and reduction of geological disasters shall be released to them at different levels.

III. System design

A. Design objectives

Through the research of this project, it can improve the level of disaster prevention and reduction and reduce the loss to people's production and life for the prevention and control of geological disasters in China.

(1) With the goal of monitoring, early warning and emergency command, and on the basis of fully understanding the type, scale, spatial and temporal distribution and disaster-causing geological disaster information, geological disaster investigation, exploration and prevention, group measurement and mass prevention, professional monitoring and other work should be integrated, and the basic data and monitoring and early warning data generated in the prevention and control of geological disasters should be used as important information sources. Establish an emergency response and command system.

(2) Realize data storage and management, professional comprehensive analysis and information transmission and publication, real-time information processing and rapid judgment, and build an efficient, stable and secure network information service platform.

(3) The scientific forecast of geological disasters has improved the level of response to sudden geological disasters in China. This improves the rapid response of emergency rescue and achieves disaster reduction and prevention.

B. System Principles

The system consists of four aspects: field monitoring, network transmission, monitoring center, network announcement. After the short messages are analyzed and processed by the monitoring center, the data is stored in the database [7]. The system adopts B/S structure and establishes a network information service publishing platform to monitor the slope condition in real time. Figure 1 isa block diagram of the geological hazard prediction system (the picture is quoted in Research on Prediction of coal-gas compound dynamic disaster based on ICSA-CNN).

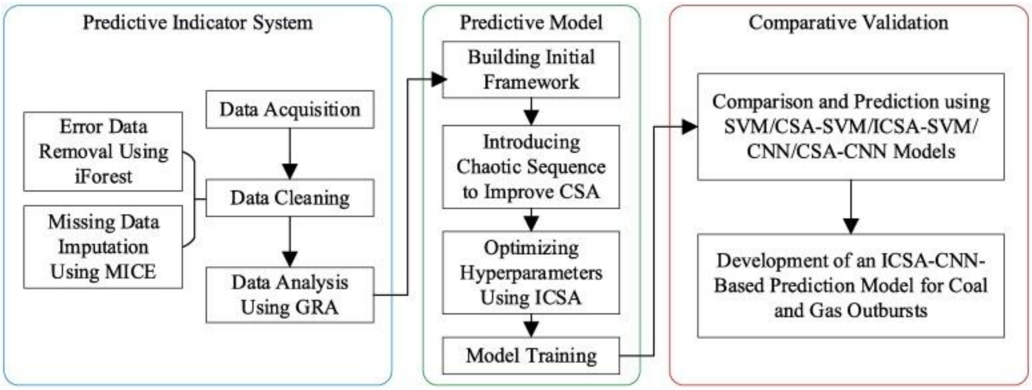

Fig.1 Block diagram of geological hazard prediction system

C. Architecture

The system consists of data layer, MapGIS application support layer, application layer, and user layer (Figure 2 is referenced in Sustainability 2019, 11(9), 2620). With the support of various types of information, the network development platform based on Map GIS IG Server has established a unified management system for professional users, management users and public users.

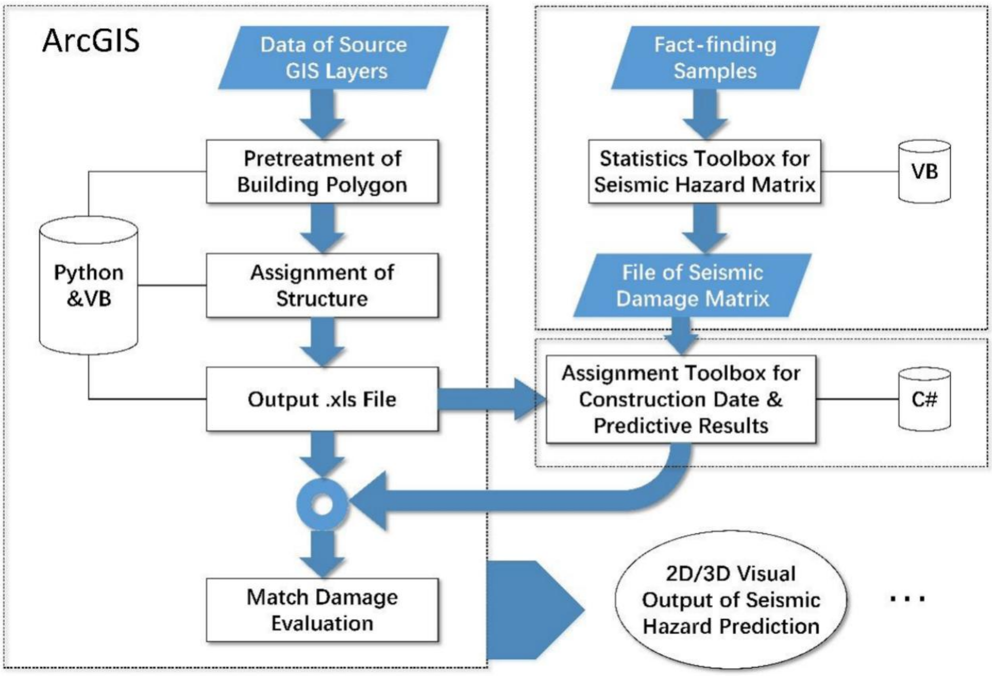

Fig.2 Architecture of geological hazard prediction system

D. Database Design

The system mainly consists of space basic data, monitoring and early warning dynamic data, document data and so on. The establishment of the database is to achieve the management and sharing of data information (Table 1).

Table 1. System database design

Data type	Data content
Spatial basic data	Administrative zoning map, residential map, topographic map, water map, highway, geographical name, disaster sites, monitoring sites, etc
Monitoring and early warning dynamic data	Site survey and monitoring data of landslides, landslides, landslides and other disasters; Weather factors refer to temperature, rainfall, wind direction, etc., which are obtained immediately.
Document data	Geological disaster historical record description files, disaster description files, all kinds of disaster monitoring cards, program files, and some documents, scientific research, equipment, data files and so on.

(1) Spatial basic data has laid a solid theoretical and technical foundation for the establishment of a complete geological disaster monitoring and early warning system. Among them, 3D GIS data such as vector data, raster data and DEM is an important part.

(2) The core content of the system is to collect the relevant data of each monitoring point in real time, monitor the meteorological factors, record the geological disasters on the spot, and analyze the dynamic evolution of the induced factors. It is based on quantitative measurement and statistical data, and includes spatial data, text data and multimedia data.

(3) In the process of geological disaster emergency work, each work process will include word, pdf, txt, excel and other document forms of information, but also includes photos, videos, report documents and other multimedia materials.

E. Function Design

The command system includes real-time information management, meteorological early warning, group test and mass prevention, monitoring and early warning, major disaster management, disaster prevention plan, rapid reporting and processing, emergency investigation, emergency disposal, and emergency response [8]. Emergency meeting and other functional modules (Figure 3 is quoted in the Index establishment and capability evaluation of Space-Air-Ground remote sensing cooperation in geohazard emergency response).

Information system

(1) Real-time monitoring information of 6 kinds of monitoring devices, such as rainfall, ground cracks, water level, water temperature, geodetic deformation, earth pressure, pore water pressure, and ground water level, can be accurately positioned for various types of monitoring points, and the latest 6 monitoring records can be displayed.

(2) The weather warning system can select the weather warning for a certain area during a specific period of time.

(3) Group test and group prevention, complete the disaster information inquiry, statistics and institutional inquiry of the group test and control station within the jurisdiction. The data statistical model calculated the number of disaster points and the economic losses caused by the disaster in each disaster category in the area [9]. Unit query module monitors the organization of information query: equipment, personnel and other basic information.

(4) Through the information query statistics of each monitoring point, the early warning of each monitoring point is carried out, and its model analysis is carried out, so as to achieve the purpose of early warning of each monitoring point. Through the investigation of the disaster points that have been monitored, the various monitoring measures and charts of various monitoring measures under the disaster points are counted [10]. Monitoring point early warning means that at the disaster point found, the alarm status under the corresponding monitoring type can be seen, if the alarm threshold is exceeded, it will automatically flash, and send an alarm message to the relevant personnel.

(5) The processing of important disasters has realized the functions of querying and statistics of major disasters in various counties and districts. Ask for basic information about the major natural disasters that have

occurred in the jurisdiction. The statistics of various major disasters occurred in the specific period of each jurisdiction were carried out.

(6) The disaster prevention plan realizes the basic information query of regional emergency plan, the drawing of emergency path planning, and the statistics of emergency plan information. Relevant basic information about the emergency plan of the jurisdiction: basic information of the plan, detailed information, annual inspection, work card, dangerous personnel work card [11]. An emergency path map is a road map that can be drawn to have a specific role in an emergency. Calculate the number of various disaster bodies in each jurisdiction, and the impact of each disaster site on residents, families and economic losses.

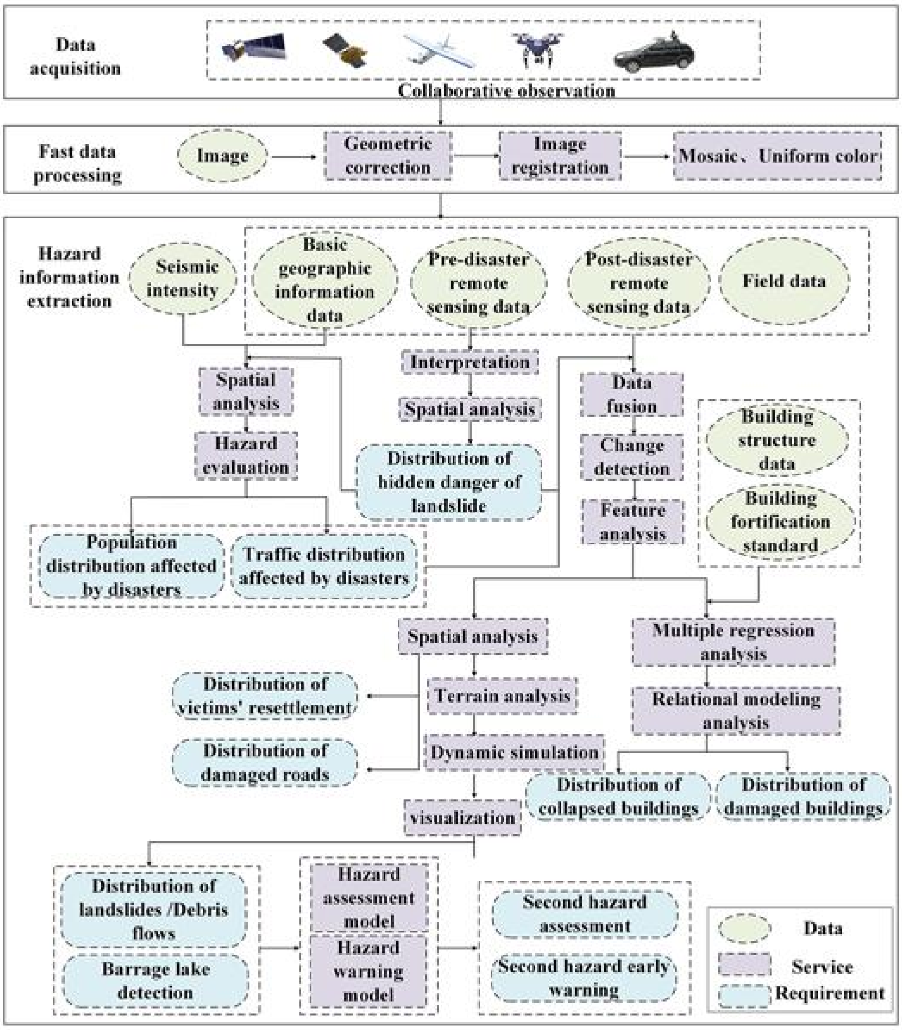

Fig.3 Main functional structure of geological disaster emergency command

(7) The rapid reporting process is a process of reporting to superiors as soon as a disaster occurs. The present situation is briefly introduced, including the place, time, the number of casualties and missing persons, as well as the direct property losses, as well as the types of geological disasters, the size of the disaster body, the potential causes, and the direction of its development, and the countermeasures that the relevant authorities should take.

(8) The investigation methods of emergencies include: on-the-spot and real-time investigation and research of geological disaster sites, and the contents of the investigation are completed in the form of reports. The query, display, modification and statistics of emergency information are important components of emergency.

(9) The emergency handling system realizes the efficient management of geological disaster rescue objectives, rescue organizations, rescue teams, rescue plans, rescue expert group members and other information. Complete the inquiry, inquiry, input, modification and audit of the disposal data. The function of the system is to retrieve relevant data that has been processed after a disaster, and to provide a detailed introduction to the personnel, teams, agencies and members of the expert group involved.

(10) After the disaster, find all the information about the earthquake. It can conduct real-time GPS positioning of a single individual's GPS positioning, carry out corresponding disaster assessment, and comprehensively analyze the economic status of the region where each disaster point is located and related information such as

roads, farmland, cultivated land, etc., to obtain the degree of damage to the disaster [12]. The investigation information, monitoring information, emergency plan auxiliary information, emergency plan auxiliary information and emergency rescue information are integrated to provide comprehensive command and coordination services for the superior, and have auxiliary decision-making function.

F. Data Processing

1) Collection of monitoring data

At present, the corresponding automatic monitoring equipment is set up at each monitoring point along the highway, and the real-time monitoring is carried out. A remote sensing image analysis method based on remote sensing image is proposed. The method includes: 1) analysis of landslide engineering conditions, landslide characteristic parameters, motion characteristic parameters, location characteristic parameters, material parameters and other parameters. 2) The selection of forecasting methods mainly includes forecasting location, forecasting stability assessment and forecasting activity intensity. Commonly used stability coefficient prediction method, neural network method, information model method, fuzzy comprehensive evaluation method and so on. Time prediction is to predict the exact moment of slope instability. The process includes: 1) Factor analysis method is adopted to determine the key parameters affecting slope stability by studying the influential factors of landslide aging and prediction. 2) Fuzzy probability analysis method, confidence distribution method and reliability analysis method of parametric data were used to analyze the reliability of landslide hazard prediction model and verify its reliability. 3) Select the corresponding forecast indicators according to the relevant principles. This paper mainly studies Saito method, grey theory model, nonlinear dynamic model and multi-parameter feedback model. The monitoring data of the system include: 1) two deformation detection devices at different positions are used, one end is connected with the sliding surface, and the displacement of the two positions is obtained by using the relative displacement between the two positions. 2) In the monitoring of groundwater, a device equipped with a water level sensor is used to measure the change of groundwater. 3) Depth deformation measurement: a inclinometer tube is buried in a inclinometer tube with an inclination sensing device. With the movement of the sliding body, the inclinometer tube will also change with the change of position, and then the transverse deformation of each section of the inclinometer tube will be obtained. 4) Use devices with moisture sensors to monitor soil moisture content.

2) Transfer of Monitoring Data

In the monitoring system, the data transmission of the monitoring system is realized by the communication between GSM components. The AT command interface provided by the GSM engine assembly is consistent with the GSM07.5 and GSM07.7 specifications, and when the GSM engine assembly receives a short message from the network, it sends the receiving message indication to the serial port to obtain the data information. SMS is a kind of data service provided by GSM to customers [13]. It is transmitted on the wireless control channel, and the data is stored and sent by the SMS service center. A GSM engine can be used between the monitoring terminal device and the data monitoring center to communicate with the various instructions in the form of short messages. The generic AT command is shown in Table 2.

Table 2. Common AT commands

AT command	Feature	AT command	Feature
AT+CSMS	Select Mail service	AT+CMGS	Send a text message
AT+CMGF	Select the form of the message	AT+CMGW	Write the message to memory
AT+CSDH	Displays text mode parameters	AT+CMSS	Send messages in the storage area
AT+CNMI	New email alert	AT+CSMP	Set text mode parameters
AT+CMGR	Read a short message	AT+CMGD	Delete SMS
AT+CMGL	List SMS messages	AT+CSCA	Set up SMS Center

3) Data Monitoring Center

The data monitoring center mainly completes the reception, processing and forwarding of monitoring data, as well as system alarm and other functions. Its main functional modules are shown in Figure 4 (image cited in Monitoring optimization of telecommunication networks for generation of reserve capacity in system).

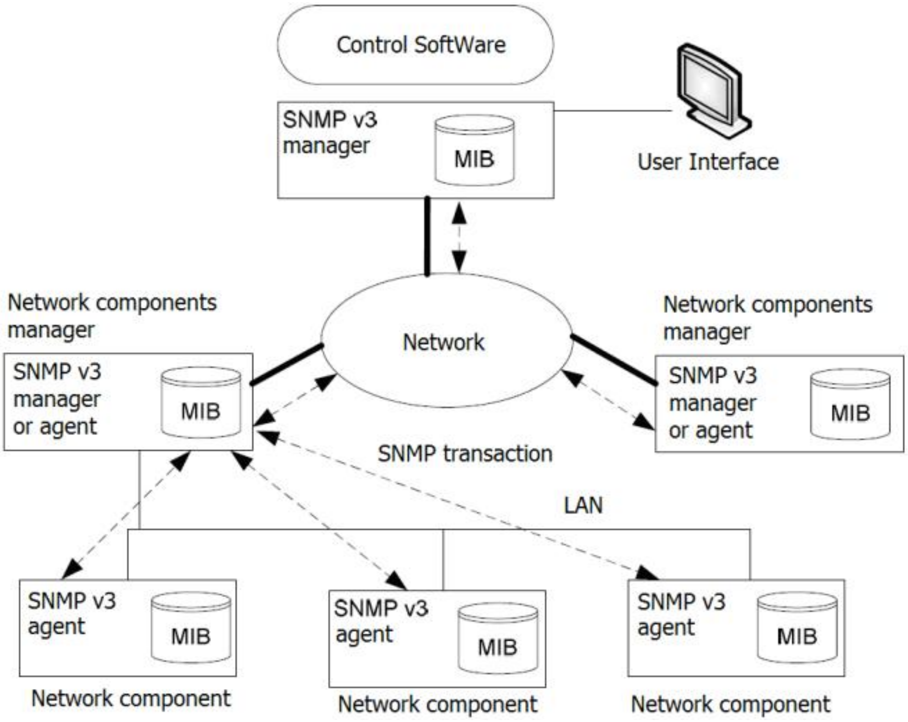

Fig.4 Schematic diagram of function module of data monitoring center

The data transmitted from the monitoring site to the data monitoring center mainly includes the location information of the monitoring point, the type of the monitoring equipment, the working status parameters of the monitoring equipment, and the data collected by the monitoring equipment. The system takes the mobile station as the observation station and locates on the measured landslide surface [14]. The base station is set in a relatively stable position around the landslide. Besides GPS receiving, radio transmitting and other functions, the base station also uses GPRS for remote transmission. The two base stations simultaneously observe the satellite synchronizes, and transmits the original data of the base station to the reference station using the short-range radio module, and then transmits the data of the two reference stations through the data acquisition module to the distant monitoring center using GPRS technology, and the monitoring center further analyzes these data and makes predictions according to the relevant principles. So people can work out the corresponding early warning measures [15]. Data transmission mainly includes wireless module, GPRS module, Internet, and the current use of data broadcasting, GSM, CDMA and so on. After the base station GPRS module is turned on, it will automatically log in to the GSM network, obtain a new IP address using PPP technology, and connect with the computer with a fixed IP in the monitoring center to achieve communication in two directions. The system communication process is shown in Figure 5 (Power-Based Non-Intrusive Condition Monitoring for Terminal Device in Smart Grid). Table 3 shows the format.

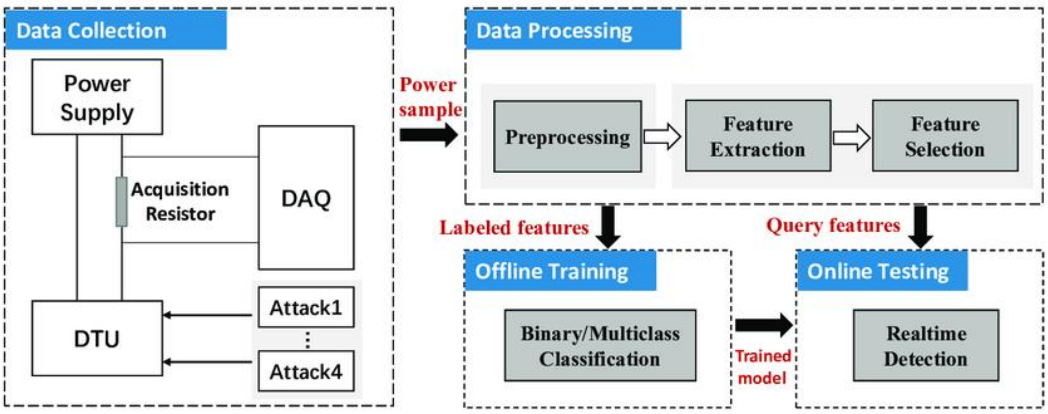

Fig.5 System communication flow

Table 3. Communication protocols

Byte number	Content
1	Head
2	Type
Three, four, five	Location
6	State
Seven, eight, nine, ten	Data
11	Verify

The heading indicates the start of the group; Type represents the type of facilities on the site (00: fracture displacement monitoring; 01: groundwater level monitoring; 02: deep displacement monitoring; 03: Monitoring of land moisture; 04: Monitor the water pressure in the pores); The location represents the longitude and latitude coordinates of the monitoring point; State indicates the current working status of the monitoring device (00: normal; 01: low pressure; 02: The communication module is damaged); Data represents the data collected by the monitoring device; Verify stands for an 8-bit CRC check, not a header. In the process of sending and receiving services, it is necessary to initialize the serial communication interface, confirm that the communication between the communication network and the GSM module is in good condition, and then open a receiving thread to receive new SMS. When data is received, it is first imported into the data processing module and then stored in the database [16]. If there is a dangerous message in the information received, an alert will be issued and the message will be sent to a pre-set phone number or the message will be sent to a mobile phone, so that the person concerned can get the message in the shortest possible time, so that they can respond in a timely manner. When the monitoring center needs to query some parameters of the device or operate some devices, it can issue commands through the GSM module to achieve. Its receiving workflow is shown in Figure 6 (image referenced to EdgeWorkflow: One click to test and deploy your workflow applications to the edge).

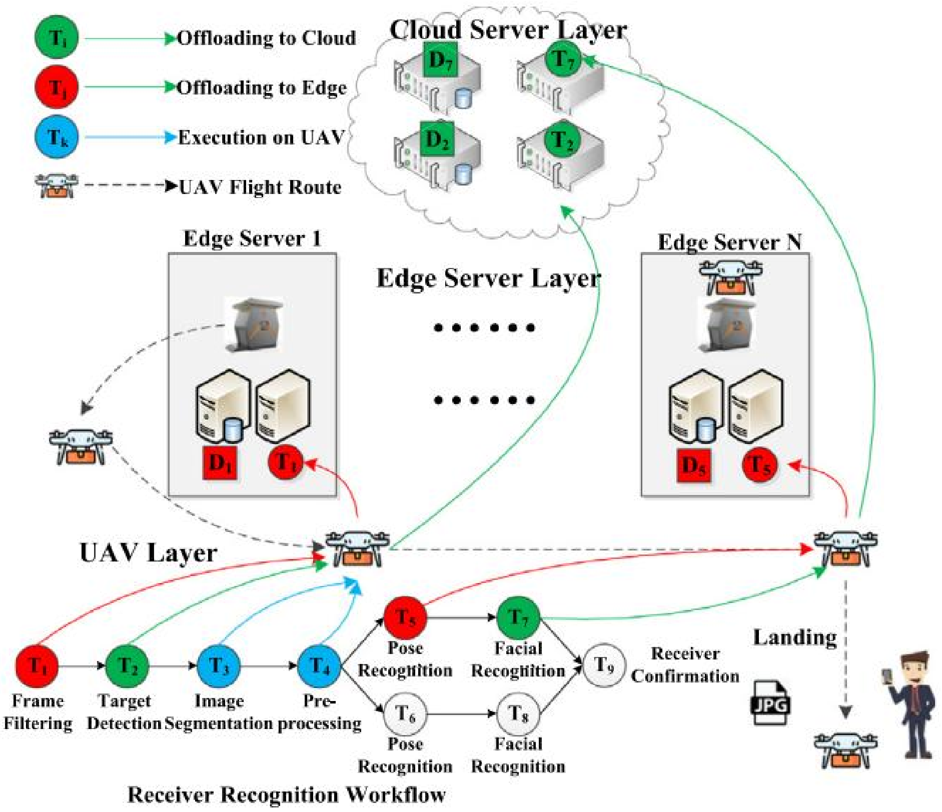

Fig.6 Receiver Workflow

The collected data are displayed in real time and dynamically in the form of charts, so that it can have a better understanding of the monitored landslide situation [17]. The system can dial a pre-set phone number or forward information to a mobile phone, voice alarm, so that people can understand the development of the disaster, so that disaster can be minimized. Since most of the monitoring sites are outdoors, most of the power is provided by the battery, so in the case of insufficient voltage, it is necessary to remind the monitoring center to replace the battery, so that it can be better monitored. The data acquisition subsystem is composed of a variety of sensors and related equipment required by the system operation support system, among which, the BDS receiver, surface and deep displacement sensor, rain gauge and other sensors are sensors, and the data monitored by the sensor is collected from the monitoring sensor to the transmission terminal, and then the data is uploaded [18]. The data transmission subsystem consists of a monitoring point data transmission terminal and a remote data transmission terminal. When receiving the data upload command, the monitoring device of each monitoring point first transmits the collected data to its own data transmission terminal through the transmission mechanism of the monitoring point, and then, The data transmission terminal of each monitoring point uses Mesh network or satellite transmission technology to transmit its own data to the control center of the monitoring site, and then transmits the data to the monitoring center for further processing and use through the control center of the monitoring site. The data processing part mainly consists of data collection, data storage, data analysis, change curve drawing, report generation and forecast alarm. Among them, the work assistance subsystem of the system is composed of power supply system, lightning protection system and various control institutions related to the system work. To achieve this effect, a threshold hop count M can be set to control the received packets with a larger hop count than this threshold. The algorithm has a great influence on the selection of threshold M, mainly due to the degree of network connectivity and the proportion occupied by each signal point. The threshold value M is positively correlated with the ratio of beacon nodes in the local area and the degree of connectivity. The selection of threshold M should ensure that all unknown nodes can be found as much as possible, and at the same time approximate the best possible solution as much as possible, so that the network traffic is relatively small. (1) The range of values set under ideal conditions for the formula M:

$$M > \frac{1}{S}\sqrt{\frac{\lambda^2 \times W}{R \times E \times \omega}} \tag{1}$$

λ is the side length of the square in the total network area, S is the radius of node transmitting power, E is the proportion of anchor nodes, W is the average number of beacon nodes required for each unknown node to locate, and R is the total number of nodes in the network. In practical engineering, it is difficult to achieve very uniform node distribution, so the value of M should be appropriately increased to meet the overall coverage of the network. The observation gross error is further reduced, and the error accumulation and energy consumption during flood propagation are reduced based on the robust least squares algorithm [19]. Least square method is a relatively common method of regression analysis and is often used in statistics. It shows the best consistency, unbias and minimal variance in strictly normal distribution of data, but it has no ability to resist gross errors. A new robust least squares method is proposed, which can effectively reduce the influence of rough errors on model parameter estimation. The linear equations with errors can be expressed as: $\lambda U + c = \xi$, where: c is the error vector of order $(m \times 1)$, λ is the coefficient matrix of order $m \times n$, $(m > n), U$ is the unknown parameter vector of order $(n \times 1)$, and ξ is the observation vector of order $(m \times 1)$. The criterion function of the classical least square method is $\sum_{i=1}^{m} c_i^2 = \min$, which does not have the ability to exclude the influence of gross error, while the criterion function of M estimation (maximum likelihood estimation) is $\sum_{i=1}^{m} \varphi(c) = \min$. By selecting a suitable $\varphi(\cdot)$, the influence of gross error on the function is reduced to the minimum, so that the unknown parameters solved are closer to the actual value or deviate from the real value [20]. According to the conditions for taking the extreme value of the multivariable function, people can know:

$$\lambda' \cdot (\zeta(c_1)\zeta(c_2)\cdots\zeta(c_m)) = \lambda' \begin{pmatrix} \frac{\zeta(c_1)}{c_1} & 0 & \cdots & 0 \\ 0 & \frac{\zeta(c_2)}{c_2} & 0 & 0 \\ \vdots & 0 & \ddots & \vdots \\ 0 & 0 & \cdots & \frac{\zeta(c_m)}{c_m} \end{pmatrix}, \lambda' \phi c = 0 \tag{2}$$

Where, function $\zeta(\cdot)$ is the derivative of $\varphi(\cdot)$, ϕ is the weight coefficient matrix and the final unknown parameter is:

$$\hat{U} = (\lambda'\phi\lambda)^{-1}\lambda'\phi\xi \tag{3}$$

In the selection of criterion function, this paper adopts the commonly used Tukey double weight method to carry out the robust estimation, which belongs to the M estimation with elimination zone, and its criterion function is as follows:

$$\varphi(c) = \begin{cases} [1-(1-c_i^2)^3]/6, & |c_i| \le 1; \\ 1/6, & |c_i| \ge 1, \end{cases} \tag{4}$$

Where, $c_i = (\varepsilon_i - \sigma_i\hat{U})/(c \times MAD), MAD = med\,|\,\varepsilon_i - \sigma_i\hat{U}\,|, \varepsilon_i$ is the i element of ξ, σ_i is the i row of λ, and c is the regression factor, generally taking a value between 6 and 12 to balance the ability and efficiency of resistance. med stands for taking the median and sorting the n statistics [21]. If n is odd, the median is the center of symmetry of the ordering statistic; If n is even, the median is the average of the two sorting statistics in the middle.

G. Description of the improved location algorithm

In it, each node sends its own location packet to neighboring nodes, including node ID, coordinate position, and jump number [22]. The unknown node will record the least number of hops received, while larger packets sent to the same beacon node will be ignored. When the value of the received code-hop packet is lower than the threshold N, +1 is sent to the neighboring node. If the packet cannot be sent, the packet is discarded and rejected. Secondly, the traditional DV-Hop method is used to calculate the average moving distance of each signal point by using the number of interval jumps known to other beacon stations, and the data is propagated in the whole network. A new algorithm is proposed, which can effectively improve the performance of the network. The third step is to process the data of the node mentioned in the second stage and obtain the coordinates of the node to be measured.

IV. SYSTEM OPERATION AND IMPLEMENTATION

Combining data fusion and integrated management technology, spatial analysis and retrieval technology, and computer network technology, a comprehensive and multi-function information system is constructed. The system works smoothly on the whole and can clearly show the emergency situation of various geological disasters. In figure 8 shows the results of the system (reference picture onhttps://www.ni.com/docs/en-US/bundle/labview-real-time-module/page/part-4-building-the-user-interfa ce-real-time-module.html).

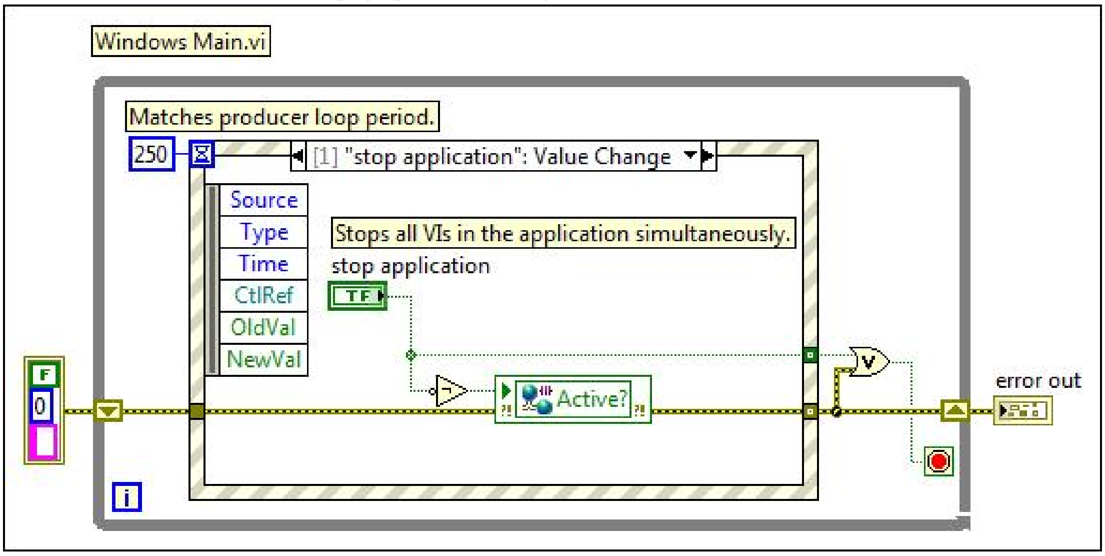

Fig.8 Real-time information display function interface

V. Conclusion

An efficient, stable and secure network information service platform has been established. The real-time query, automatic analysis and real-time alarm of geological disaster information are carried out, which provides a basis for the classified management of geological disasters in China, and makes scientific prediction and forecast of geological disasters, thus improving the response to sudden geological disasters and the rapid response of rescue work, so as to achieve the goal of disaster reduction and prevention. In one area, the fracture movement method was used for monitoring, and the data were sent to the monitoring center at 5 monitoring points every 2 hours. After more than one month of monitoring, the slope was basically in a stable state. The project will integrate Web and SMS, through the integration of network and SMS, to carry out remote and real-time monitoring and early warning of highway slopes, and establish a remote network information service release platform based on Web/Server, which is convenient for relevant personnel and related personnel to view in different places. Compared with the conventional manual monitoring method, this method is fast, efficient and intuitive. The practice proves that the method is effective.

Acknowledgements

[The Scientific Research Project of Hunan Provincial Department of Education-Outstanding Youth Project] under Grant [23B0737; 22B0790; 23B0736]; [National Natural Science Foundation of China] under Grant [4164104]; [Heilongjiang Natural Science Foundation] under Grant [LH2023D021]; [The Hunan City University students innovative training program project] under Grant [S202311527032].

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