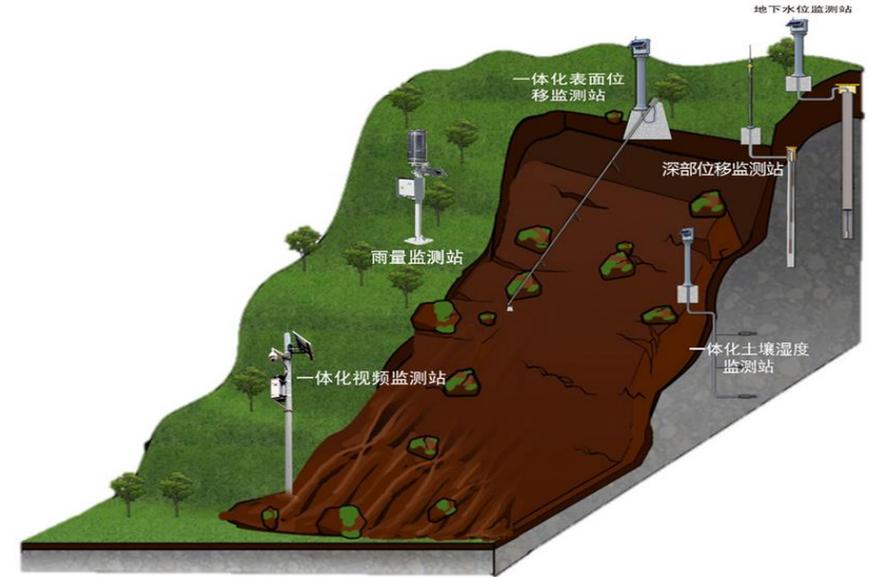


Slope Monitoring Solution **SOUTH**

◆ Field Application

Highway as linear structure building, frequently cross all different kinds of geological mass, will meet various slopes. the highway in mountain and hilly area, its roadbed was built on natural slopes, usually use the dig and fill to construct, that's easy to happen slope slip, and the rainfall also can cause the slope slip. The slope of highway has the feature of sudden strong, wide range distribution, great damage, serious disaster impact, with a certain of hidden, for the unstable geological area, it's necessary to establish the automatic monitoring solution to reach high frequently, highly sensitive, and timely alert effect. make sure the safety of people's life and property.



Schematic plot of slope monitoring

◆ Monitoring Items

In slope monitoring projects, adopt general applicability monitoring equipment as the monitoring sensors, built-in advanced information communication modules which support 4G, NB-IoT, LoRa etc. Support multiple power supply methods, It's convenient for the construction; it can well cope with a variety of complex disaster environment. There is the general items of road slope monitoring as below.

Monitoring Items	Automatic Monitoring Instruments	Monitoring Items	Automatic Monitoring Instruments
Ground Displacement	GNSS	Crack of Slope	Pull Cord Crack Gauge
Slope Emergency Monitoring	Robotic Total Station	Underground Water	Water Level Sensor
Rain Volume Monitoring	Rain Gauge	Displacement of depth soil mass	Stationary inclinometer or ADM
Settle Monitoring	Hydrostatic Level	Landslide	Vibration Accelerometer
Soil Pressure Sensor	Soil Pressure Meter	Video Monitoring	Automatic Camera
Soil Water Ratio	Soil moisture temperature Sensor		

◆ General Applicability Equipment



GNSS monitoring station (MR1)

MR1 is a special purpose model for deformation monitoring.

As the general applicability equipment, MR1 is widely applied to monitor for the displacement of earth surface. Usually, MR1 base station is built on a stable bedrock which near by monitoring stations, monitoring stations are built on the risk slopes.

With stable and high accuracy GNSS monitoring engine and dual independent GNSS process algorithms, it can automatically and continuously monitor the slopes status for 24 hours, the accuracy coordinate values were calculated as you need after setting interval.

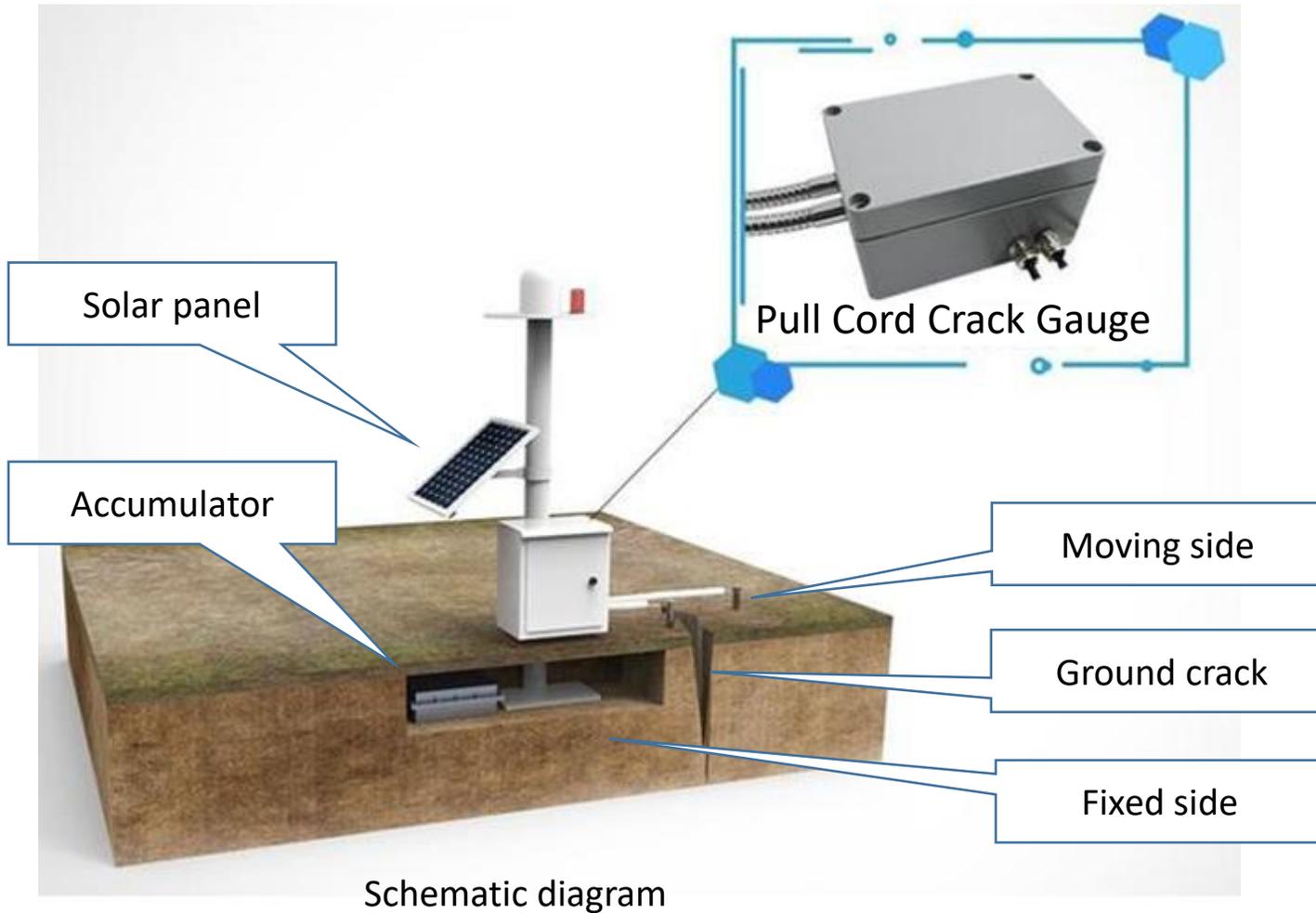


Install on disaster site

◆ General Applicability Equipment

Pull Cord Crack Gauge

It's the special purpose equipment for crack monitoring, with advantages wide range, low cost, easy to build high sensitivity and quick response, it's able to supplement with GNSS in slope monitoring



Install on disaster site

◆ General Applicability Equipment



Rain gauge

Occurrence of Slope disaster often with long time rainfall accompanying. There is an obvious directly proportional relationship between rainfall and slope slip and collapse, so the rain gauge is necessary in slope monitoring.

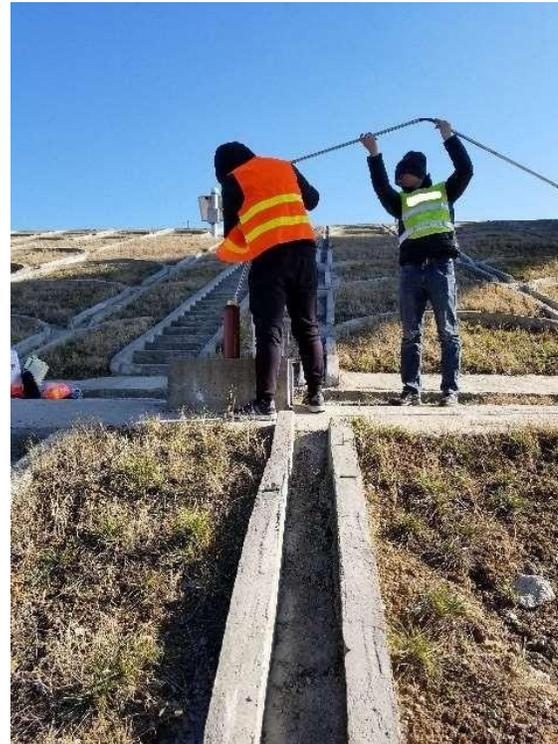


Install on disaster site

◆ General Applicability Equipment

Stationary Inclinator

The occurrence of slope disasters is mostly caused by the internal soil-mass slipping . Earth surface quickly crack when the internal soil-mass slip accelerates. Displacement of deep soil-mass is also a very important monitoring item. Generally stationary-inclinometer or Array Displacement Meter(ADM) is used for monitoring.



Stationary Inclinator

Install on disaster site



Total station



Video monitoring



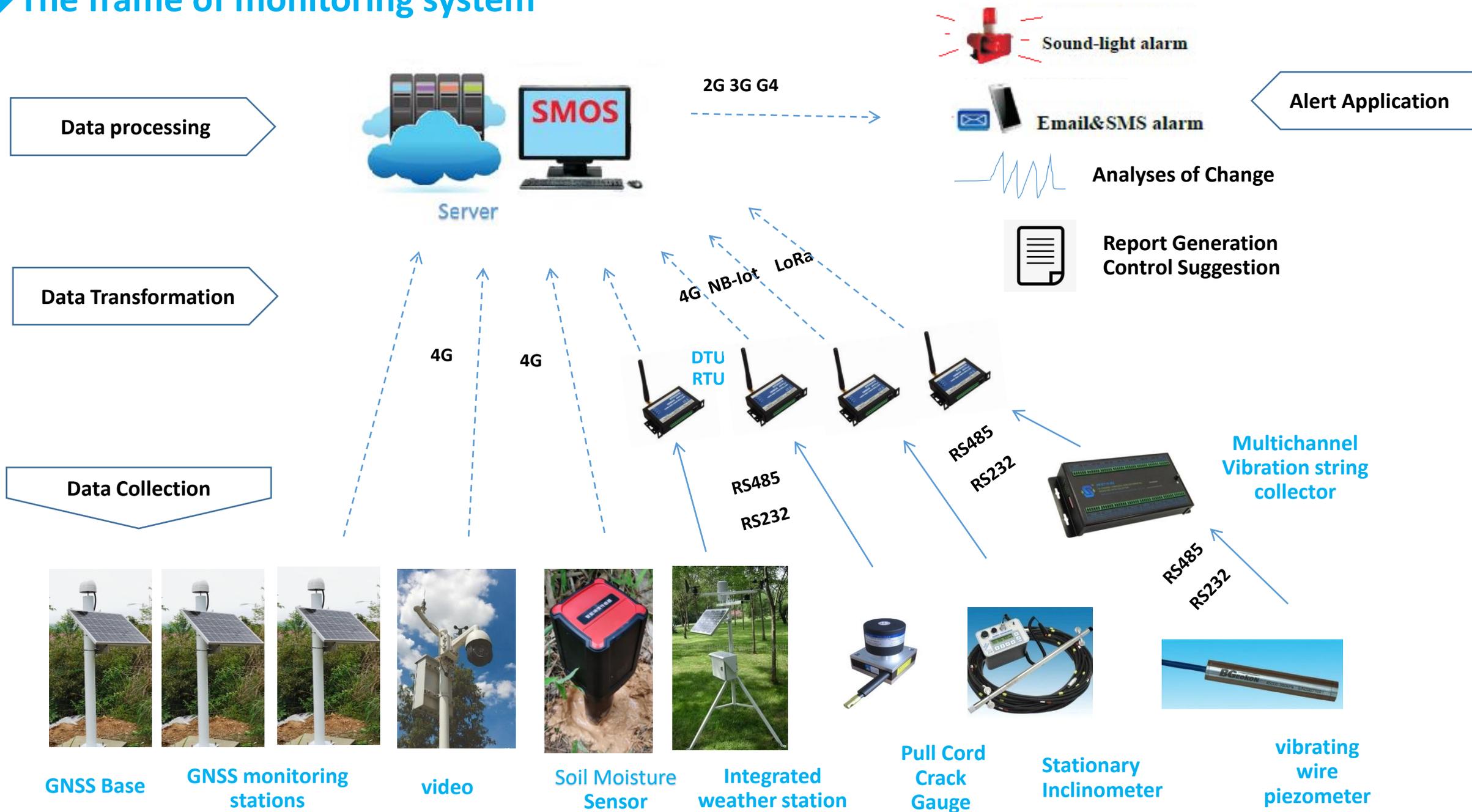
Tilt sensor

◆ The frame of monitoring system

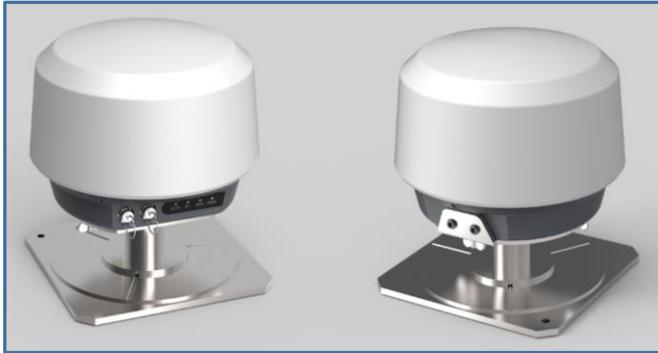
South slope monitoring solution consists four layers:

1. Data Collection Layer includes all sorts of sensors for obtaining information.
2. Data Transformation Layer mainly includes the data transmission equipment, which decode and send the data to the platform,
3. Data processing layer centralized analysis and processing the data.
4. Alert Application Layer shows changes of data curves, and automatically creates report and timely send the alert commands to different alert terminals, such as Email, SMS, local sound and light alarm.

◆ The frame of monitoring system



◆ South Slope Monitoring Solution



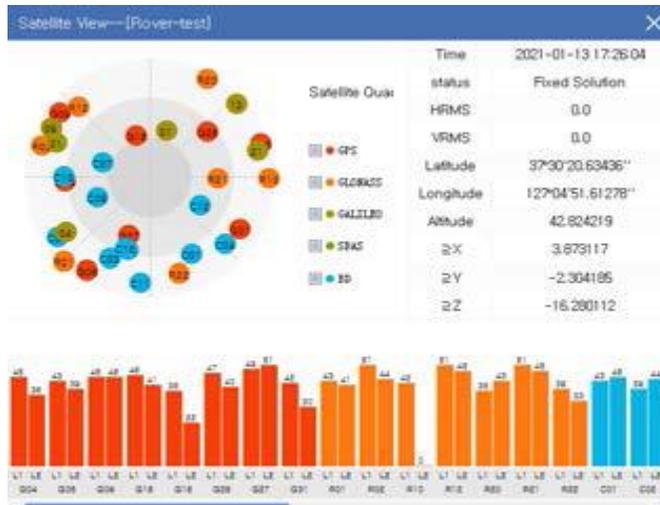
Integrated Design High Accuracy Low-power Consumption Remote Control

Anti-Steal Design Multiple Communication Cloud Service IP68

- General applicability monitoring GNSS
- Optimization Algorithm
- Monitoring Accuracy 1mm/ 24 hours in short baseline

● Stable and high accuracy GNSS monitoring engine and dual independent GNSS process algorithms

● Real-time and history data and graphic view, report data export



◆ South GNSS models

MR1



- Multi-frequency and Multi constellations GNSS board
- Integrated Design easy to install
- Low-power Consumption
- 3G/4G network unit
- Internal battery
- Bluetooth, WIFI
- WebUI
- Remote control
- magnesium aluminum alloy housing
- IP68

NET S10 mini



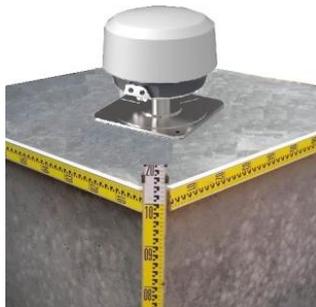
- Multi-frequency and Multi constellations GNSS board
- Support high speed network
- Bluetooth WIFI
- Support 5 independent data streams transmission
- Low-power Consumption
- Internal radio (option)
- Remote control
- magnesium aluminum alloy housing
- IP68

NET S10



- Multi-frequency and Multi constellations GNSS board
- 3G/4G network unit
- Bluetooth/ WIFI
- Support multiple data format
- Internal battery
- LCD screen
- Support connection weather station and tilt sensor
- Built in 13000mAH battery
- IP68

◆ Installation



Install on observation pillar



Install on stand column

SMOS Automatic monitoring system of **SOUTH**

SMOS is a fully automatic monitoring system based on advanced IOT technology, which is compatible with conventional monitoring solutions. It can achieve real-time and effective dynamic analysis and safety early alert of the monitoring target by various means, improve the accuracy and credibility of the monitoring data while reducing the workload of personal.

Solved pain points that man-made more factors in conventional monitoring and automatic monitoring.

Using IOT sensor to monitor the target (include geologic disasters, slope slip, foundation pit, Bridges health, DAMS, Trailing pond, rail transportation, etc.) for all-weather automatic real-time monitoring. Transmit all status and data of monitoring targets to the data processing center in real time by various wired or wireless network technology. To complete analysis, judgment, alert. Terminal devices can passively receive the alert information, also can actively log in the platform to acquire various status and data of monitoring targets, which is the basis for decision-making.



Road Slope Monitoring



Geological Disaster monitoring



Dam Monitoring



Tailings pond Monitoring

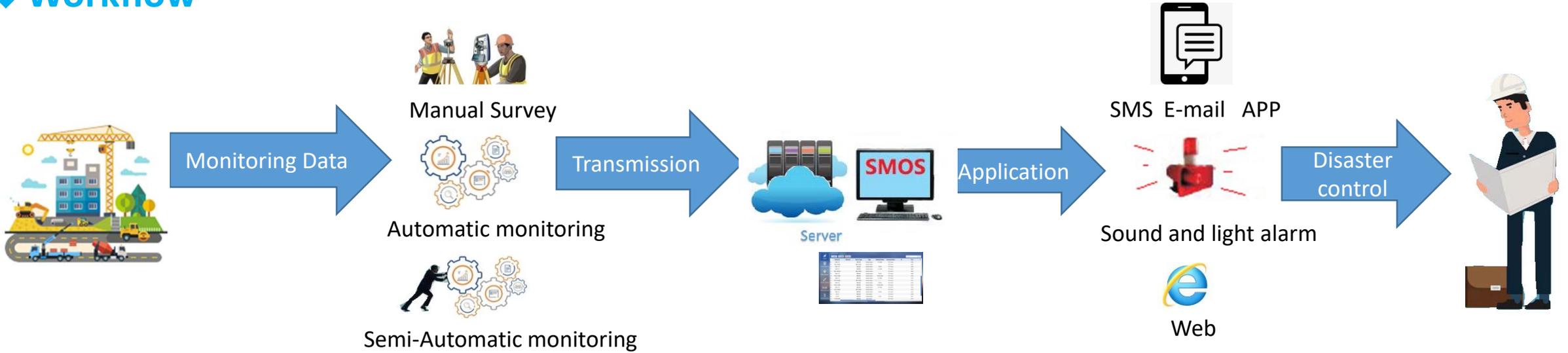


Foundation Pit Monitoring



Bridge health Monitoring

◆ Workflow



Application Field

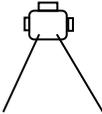
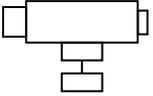
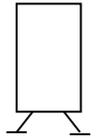
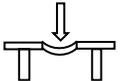




- ◆ Geological Disaster
- ◆ Bridge health Monitoring
- ◆ Foundation Pit
- ◆ Dams
- ◆ Tailing Pond
- ◆ Highway Slope

- Monitoring Units
- Construction Organization
- Natural resource Dept.
- Regulators
- Electrical power

Monitoring items Access

			
GNSS	Robotic Total station	Electric level	Rain of environment
			
Inclinometer	Stress and strain	Crack	Vibration

◆ Software interface

SMOS system manage / user manage

NO.	User name	userAccount	currentDb	currentRole	Operation
1	Simon	Simon	127.0.0.1:33061:smos_server_v3	3.0普通人员	dbConfig roleConfig forbidden Edit Delete
2	admin	admin	127.0.0.1:33061:smos_server_v3	3.0平台超级管理员	dbConfig roleConfig forbidden Edit Delete
3	admin	admin	127.0.0.1:33061:smos_server_v3	3.0平台超级管理员	dbConfig roleConfig forbidden Edit Delete

Multi-user management

SMOS monitor manage / History Data

scatterDiagram

SMOS monitor manage / data comparison

HistoricalDataDisplay

Powerful Data analysis and chart show

◆ Software interface

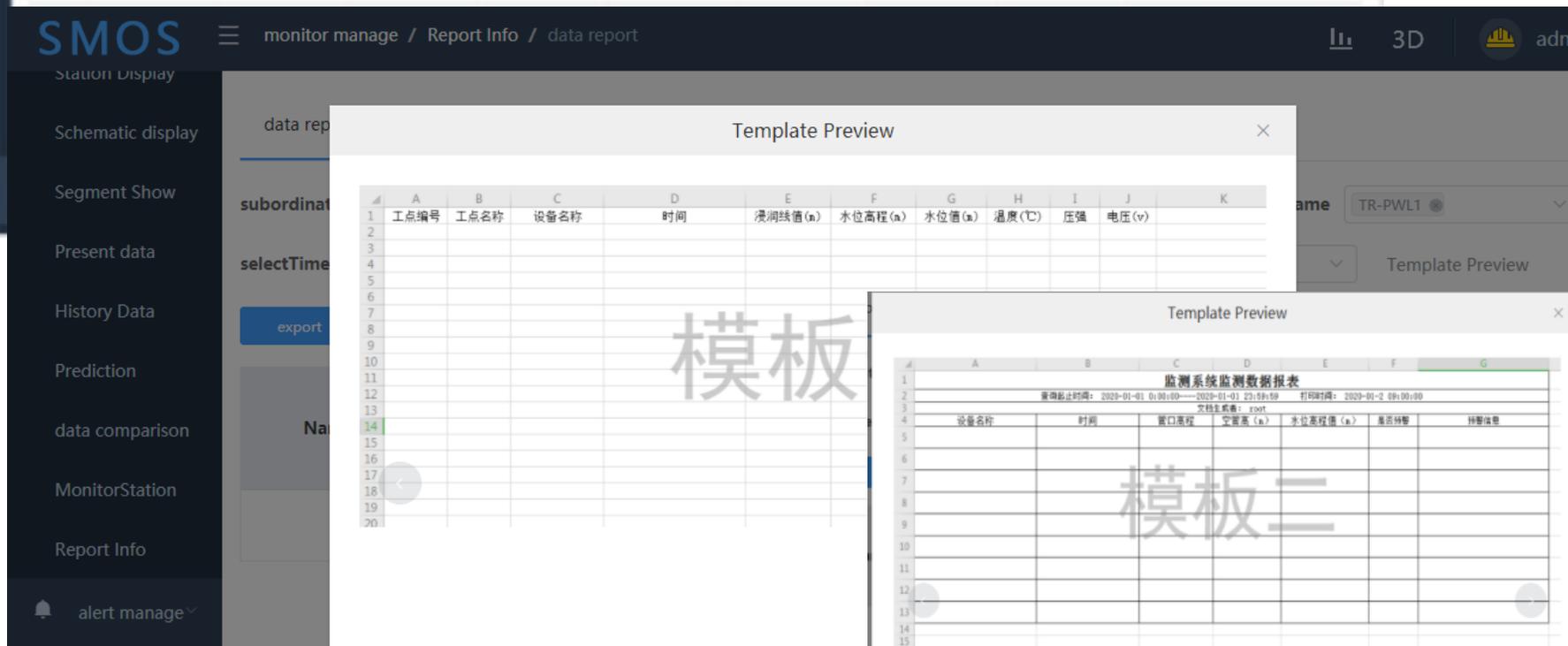


The screenshot shows the 'alert manage / alert Value' page in the SMOS system. It features a sidebar on the left with navigation options like 'Prediction', 'data comparison', and 'MonitorStation'. The main area has filters for 'singleDevice' and 'multiDevice', and radio buttons for 'variation' (selected) and 'speedAcceleration'. A table lists alert configurations with columns for NO., Name, moduleName, device name, alertThreshold, alertLevel, alertType, alertmethod, alertNumber, and Operation. Two rows are visible, both for 'SOUTH-TEST' with 'GNSS' modules and 'TR-PWL1' devices.

NO.	Name	moduleName	device name	alerThreshold	aleLevel	alertType	alertmethod	alertNumber	Operation
119	SOUTH-TEST	GNSS	TR-PWL1	2	4	静态平面	cumulativeChangeAlert	1	Edit Delete
120	SOUTH-TEST	GNSS	TR-PWL1	10	3	静态平面	cumulativeChangeAlert	1	Edit Delete

Smart alert model

User define report export



The screenshot shows the 'monitor manage / Report Info / data report' page. A sidebar on the left lists various report options. Two 'Template Preview' windows are overlaid on the page, showing spreadsheet templates. The first window shows a table with columns for '工点编号', '工点名称', '设备名称', '时间', '洪洞线值(m)', '水位高程(m)', '水位值(m)', '温度(℃)', '压强', and '电压(v)'. The second window shows a more complex report header with dates and a table with columns for '设备名称', '时间', '窗口高程', '交变值(m)', '水位高程(m)', '报警类型', and '报警信息'. Large Chinese characters '模板' and '模板二' are overlaid on the templates.