Rock and soil reconstruction of mountain slope based on embedded Internet of things and evaluation of college students’ physical health

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Abstract
Based on embedded technology and wireless mobile communication technology, the development of physical data acquisition system is realized, and the overall architecture of physical data acquisition system is designed. The system is composed of sensor terminal and application service center. The application service center takes S3C2440 development board as the core, carries out remote information collection and data transmission through the Internet of things and uses VC + + 6.0 as the software development environment of sensor terminal to realize remote management and data analysis. Then, it studies the flexible configuration method of IOT embedded terminal supporting multi-sensor access, as well as the corresponding hardware interface, communication protocol, communication protocol, etc., and designs the middleware and application layer configuration tool. The network embedded terminal equipment realizes the interaction and configuration function of the terminal. Before the geotechnical reconstruction of the slope, the geological conditions of the slope were measured by the measurement technology, and the extreme value balance analysis method was used to detect the slope surface to observe the stability. The results show that if the rising coefficient is less than or equal to 1.0, the rising is unstable. When the safety factor exceeds 1.15, the recalculation rate of some treatment regimens remains stable. Then, the embedded Internet of things is used to detect the physical health of college students. Based on the college students’ physical health evaluation method, the evaluation model of college students’ health test is established. The evaluation grades of boys and girls are relatively concentrated in the passing and good groups, which indicates that the overall situation is good. In this paper, through the study of the mountain slope geotechnical transformation and college students’ physical health evaluation, it is applied to the embedded Internet of things, so as to promote the development of geotechnical engineering and college students’ physical health.

Keywords Embedded system · Internet of things · Slope geotechnical transformation · College student · Physical health

Introduction
With the rapid development of Internet and the popularity of embedded Internet of things, Internet of things is very important in connecting capture network and traditional communication network. Of course, there are still some problems to be solved, such as there is no unified gateway standard, application scenarios of network management equipment, changes in application protocols, etc., which will lead to high cost and restrict the development. We use embedded system technology to design and implement an IOT gateway system based on embedded Linux (Thanh 2019). It can realize the access to different recording devices and data interaction. In addition, there are some extended functions, such as transforming the COAP/HTTP protocol, sending/receiving short messages and displaying local dynamic curves, which can be used in different actual scenarios. For example, in the slope geotechnical transformation, China vigorously promotes the construction of roads, buildings and surface engineering. However, slope is the most common geological environment and natural life activity form. In construction engineering, the stability of slope floor has a significant impact on human natural activities. In the process of construction project implementation, especially in the construction process of slope excavation project, there is a loss of stability (Sánchez et al. 2007). Therefore, the relevant departments in China have reviewed and evaluated the stability, treatment and protection of rock slopes. Effective analysis, research, modeling and
specific protection measures of rock slope stability are of great practical significance in geotechnical engineering. It also plays an important role in the evaluation of college students’ physical health. According to the evaluation model of college students’ physical health, it is helpful for the related workers of school physical health test to carry out their work. Inputting the physical test data can directly get the individual evaluation and comprehensive evaluation of each test student. The results are clear at a glance, easy to operate, easy to understand and the results are fast, which greatly improves the work efficiency. In addition to the annual physical health test, we should also make good use of the model, refer to the final single evaluation results and do a good job of regular health supervision and testing, so as to enhance the understanding of college students’ physical health and stimulate their internal motivation to improve their physical health (Simeonov et al. 2003), in addition to medical examination, life guidance and other ways to promote the health of students. Especially for the non-sports majors, we should improve the teaching methods, increase the content of leisure sports and entertainment sports and not pay too much attention to the teaching of skills, and then collect the data of students before and after the intervention, compare the results of the model and put forward targeted modification suggestions in stages, so as to achieve the purpose of improving students’ physical health (Vasistha and Ganguly 2020).

Materials and methods

Analysis of engineering geological conditions

According to the regional geological data, field drilling and field testing, the strata from the current surface position to the depth of 35.0 are divided into quaternary flood to Cretaceous foundation in chronological order, and they are divided into strata (Singh et al. 2019). The lithology of each soil layer from top to bottom is as follows:

Pebble layer: yellowish brown, dense, the original rock is mainly sandstone, pebble gravel, oval to round, pebble
content is about 60 to 70%, the general grain size is 6–9 cm, some up to 20 cm.

Completely weathered mudstone stratum: brownish yellow, which destroys the original rock structure, but can still be identified, and retains the structural strength, so it can be drawn and drilled with dry drill.

Strongly weathered sandstone: grayish yellow, argillaceous siltstone and siltstone, layered structure, developed joints and fractures and broken core.

Seriously weathered conglomerate 1: mainly conglomerate and rock sandstone, gravel structure, massive structure, limestone cement, developed crevices and fractures and broken core.

Seriously weathered mudstone 2: grayish brown, clay like structure, layered structure, calcareous cementation, developed joints and fractures and broken core.

Moderately weathered conglomerate 1: variegated, conglomerate and sandstone, gravel structure, massive structure, calcareous cement, developed joints and fractures, complete core.

Moderately weathered sandstone 2: light gray, clayey siltstone and siltstone, sandy, layered structure, calcareous cementation, developed joints and fractures and complete core.

**Embedded Internet of things terminal structure design**

Figure 1 shows the overall plan outlined in this question. The plan is divided into three parts: handheld terminal, coordinator and terminal node. The handheld terminal is responsible for directly interacting with users and responding to various user requests, which is located in the application layer. The communication interface between coordinator and ZigBee node is located on the transport layer, which is responsible for the wireless transmission of information and data (Versari et al. 2002). It ensures the reliability of the transmission process, forms a network and flexibly adds new nodes to the existing network. Routing can be changed dynamically to meet different communication needs. Finally, there is a terminal node. This is also the most important aspect of this topic. The end node module is located in the sensor layer, communicates with the sensor to record the physical signals in each position and converts them into electrical signals for transmission to the terminal node module. The terminal node receives the required information through conversion and sends it up. The most important technology in this layer is sensor technology. After connecting different sensors, we need a mechanism and development framework to support a large number of sensors to meet current and future needs. The application module has a driver selection mechanism that can be configured at the application level. The application layer sends the information to the terminal node. The terminal node adapts to

**Fig. 2** Finite element model

Various sensors to ensure system performance, compatibility and scalability.

**Physical and mechanical parameter test of rock and soil**

Coulomb formula is used to describe the shear strength relationship of rock and soil.

\[ \tau = c + \sigma \tan \varphi \]

To further prevent water from entering, place paraffin paper on the top and bottom of the sample and apply Vaseline on it. Under the given conditions, the shear loss of the sample is faster when the normal pressure is applied. For high permeability rocks and soils, the samples should be sheared in 30–50 s. The strength is calculated as follows:

\[ \tau = C \cdot R \]

According to Coulomb law, there are two unknowns and four equations. Therefore, if the two sides of the equation are multiplied by the transformation matrix of matrix A, then f and C are obtained. The specific expression is as follows:

\[ A = \begin{pmatrix} \sigma_1 & \sigma_2 & \sigma_3 & \sigma_4 \\ 1 & 1 & 1 & 1 \end{pmatrix}^T \]

\[ b = \begin{pmatrix} f C \end{pmatrix}^T \]

\[ X = \begin{pmatrix} \tau_1 & \tau_2 & \tau_3 & \tau_4 \end{pmatrix}^T \]
$AX = b$

$A^T AX = A^T b.$

The results are as follows:

$$\left( \begin{array}{c} \sum_{i=1}^{4} \sigma_i^2 \\ \sum_{i=1}^{4} \sigma_i \\ 4 \end{array} \right) \left( \begin{array}{c} f \\ C \end{array} \right) = \left( \begin{array}{c} \sum_{i=1}^{4} \sigma_i \tau_i \\ \sum_{i=1}^{4} \tau_i \end{array} \right).$$

The solution is as follows:

$$f = \frac{4 \sum \sigma_i \tau_i - \sum \sigma_i \sum \tau_i}{4 \sum \sigma_i^2}$$

$$C = \frac{\sum \sigma_i^2 \sum \tau_i - \sum \sigma_i \sum \sigma_i \tau_i}{4 \sum \sigma_i^2 \sum \sigma_i^2}.$$
temperature, humidity and PM2.5 sensors and intelligent video monitoring. Among them, the hardware platform for sensor terminal analysis and processing is the central hub of the whole sensor terminal hardware platform.

Research methods of college students’ physical health

The research object is the university test; the test results of all students are: height, weight, standing jump, forward bending, sprint 50 m, strength, boys pull-up, long-distance running, boys 1000 m, girls 800 m.

The main research method of this paper is mathematical statistics. At the University Sports Center, we conducted eight tests: physique, weight, vitality, forward bend, vertical jump, 50 m, men’s climbing and men’s 1000 m (women’s 800 m). Microsoft Excel is used to store all college students’ physical test data and establish a database, spss22 statistical products and service solutions are used to filter the abnormal data and MATLAB7 software is used to verify the data. On this basis, according to the results of data processing, the mean and standard deviation are calculated at the same time, and the weight model is established by using the analytic hierarchy process. Using the fuzzy comprehensive evaluation method, this paper establishes the evaluation model of new students’ physique measurement, obtains the evaluation results of new students’ physique measurement and puts forward targeted training and remedial measures for the existing problems.

The commonly used comprehensive evaluation methods in statistics include principal component analysis, data envelopment curve analysis, and fuzzy comprehensive evaluation. Principal component analysis adopts dimension reduction technology, and comprehensive variables are not suitable for test and evaluation. The main method of analyzing data constraints is to provide decision-makers with information about management decisions, which is more suitable for evaluating project types. Therefore, this paper uses the fuzzy comprehensive evaluation method to evaluate the physical examination results of college students.

Results

Geotechnical numerical model design of mountain slope

The finite element calculation model is shown in Figure 2. The length in the X direction is 180 m, the depth in the Y direction is 123.6 m, the width in the Z direction is 60 m.
and the minimum height from bottom to top is 60 m, which simulates mudstone. The first step is 21.2 m high with a slope ratio of 1:1 to simulate siltstone. The second step is a height of 20.3 m and a gradient ratio of 1:1.05, which simulates granite porphyry. The third step is 22.1 m high, and the slope ratio of simulated andesite is 1:0.95. The model is divided into 14,025 units and 16,112 nodes. The lower edge of the model is a fixed boundary condition, and the left and right surfaces have a fixed degree of freedom in the X direction.

When the load is applied, the acceleration of gravity is applied along the Y direction. In ANSYS software, a large deformation is activated, the load sub step is set to 50, the maximum number of cycles is set to 100, the expansion angle is set to 0 and the displacement convergence accuracy is set to 0.005, as shown in Figure 3.

It can be seen from Figure 4 that the plastic strain region penetrates according to the reduction factor. In this case, the required safety factor is the reduction factor. According to this gradient, the safety factor is 1.02. The safety factor of 1.02 is very low. When it rains or vibrates violently, the slope becomes unstable and landslides may occur, so strengthening measures are needed.

**Stability analysis of rock soil slope**

After the slope is separated into a rock block + structural surface system by block element, the time history curve of seismic acceleration and the time history of seismic inertia force of units 1–18 in a complete period are obtained in step $\Delta t = 0.001$ s according to the knowledge of geotechnical dynamics and the principle of pseudo dynamic method, as shown in Figure 5.

Fig. 6 shows the time history curves of horizontal and vertical seismic accelerations of units 1–18 when the step size $\Delta t = 0.001$ s. Since this paper assumes that the vibration form of the earthquake is sinusoidal steady-state vibration, the seismic acceleration time history curve of each rock block should be a sinusoidal curve, which is consistent with the calculated seismic acceleration time history curve.

According to the principle of pseudo dynamic method, the seismic action of any rock block in the slope is expressed by the horizontal and vertical seismic inertial forces acting on the centroid of the rock block varying with time and the height of the centroid. Fig. 7 is the seismic inertia force time history curve of rock blocks 1–18 in one cycle under the seismic dynamic action of the joint rock slope with the step size $\Delta t = 0.001$ s.
Because the seismic inertia force is equal to the product of the mass and acceleration of the rock block, the seismic inertia force time history curve is equivalent to multiplying a fixed mass value before the acceleration time history curve of the rock block, which makes the seismic inertia force time history curve of each rock block show the same characteristics as the acceleration time history curve of the corresponding rock block, such as sinusoidal curve. The phase value is consistent with the phase value of the acceleration time history curve and shows a consistent law of increasing or decreasing in one cycle. Just as the time history function value of horizontal seismic acceleration of any rock block is twice that of vertical seismic acceleration, the function value of horizontal seismic inertial force of any rock block at any time is twice that of vertical seismic inertial force at the same time. This is because the horizontal seismic acceleration coefficient $K_h$ is twice that of the vertical seismic acceleration coefficient $k_V$, as shown in Figure 8.

It can be seen from Figure 9 that at the initial time of $T = 0$, the shorter the period is, the larger the corresponding slope safety factor is. At this time, the slope safety factors of $T = 0.1$ s, 0.2 s, 0.3 s and 0.4 s are 1.405, 1.338, 1.329 respectively. In addition, according to the calculation results, the longer the period is, the smaller the minimum value of the safety factor is, and the larger the maximum value is. For example, when $t = 0.2$ s and 0.3 s, the minimum value of the safety factor of slope in a complete period is 1.059 and 1.057 respectively.

In seismic dynamic analysis, the minimum value of the dynamic safety factor is often taken as the index to evaluate the stability and safety of slope. Therefore, this section will give the statistical results of the minimum value of the safety factor in a complete period of $T = 0.2$ s to 1.0 s, as shown in Figure 10.

In this calculation, the control step $\Delta t = 0.01$ s, the period of seismic sine wave $T = 0.2$ s, the horizontal seismic acceleration coefficient $K_h = 0.1$, the vertical seismic acceleration coefficient $k_V = 0.5k_h$ remain unchanged, respectively. At 1.5 and 1.7, the slope stability under seismic dynamic action considering both translational and rotational mechanical properties is calculated, as shown in Figure 11.

In order to explore the influence of horizontal seismic acceleration coefficient ($K_h$) on slope stability, the stability of jointed rock slope in case 1 under the conditions of seismic sine wave period $T = 0.2$ s, step length $\Delta t = 0.01$ s, seismic amplification coefficient $F_S = 1.1$ and vertical seismic acceleration coefficient $k_V = 0.5k_h$ was analyzed. The time history curve of the slope safety factor considering both translational
and rotational mechanical effects under seismic dynamic action is obtained, as shown in Figure 12.

**Analysis on the effect of rock and soil transformation on mountain slope**

In order to strengthen the slope, the prestressed anchor cable grid is used to explain the slope of the K39 + 130-k39 + 190 section of the L6 section of Zhangshisi Expressway, which is prone to instability. The reinforcement diagram is shown in Figure 13. The surface of each step is reinforced with two layers of prestressed anchor cable truss beam.

For the sake of simplicity, an elastic integral plastic model is used for the concrete used for beam erection, which simplifies the stress-strain curve of concrete to diagonal and horizontal lines. It is assumed that the first part is linear elastic, and once it has plasticity, its tension will not change, and the burden continues to increase. The specific simulation uses 3D solid elements. The material of the anchor cable is simulated by a bar element with two nodes. The ideal elastic-plastic von Mises model is used to construct the model, which corresponds to the characteristics of metal materials. By reducing the temperature of the cable, the pretension of the cable can be released. The elastic modulus of the cable is 206 GPA, and Poisson’s ratio is 0.3, as shown in Figure 14.

With the help of ANSYS software, the X direction displacement diagram and equivalent plastic strain diagram of the slope strengthened by prestressed anchor cable lattice beam are shown in Figure 15.

Figure 16 shows the prestressed anchorage truss beam, see the inclination in the figure. The tension state of the soil has been significantly improved, with no plastic area above and near the middle of the surface, but a small amount of plastic below and above the surface. This shows that the lattice beam of prestressed anchor cable is playing its due role at present. Using the strength reduction method of finite element, the total safety factor of the reinforced slope is 1.47. After adding anchor, the slope is in a safe state, and the design of the reinforcement scheme is more reasonable.

**Evaluation results of college students’ physical health**

According to the fuzzy comprehensive evaluation model, the excellent rate of boys is 12.65%, the good rate is 38.61%, the qualified rate is 40.38% and the unqualified rate is 8.36%. The excellent rate of girls was 10.45%, the excellent rate was 35.72%, the qualified rate was 49.56% and the unqualified rate was 8.36%.
In the evaluation results, we see that the excellent rate of boys is only 0.64%, and that of girls is only 0.62%, and most of the students are qualified. The qualified rate of boys was 79.53%, and that of girls was 75.20%. The unqualified rate of boys (11.90%) is much higher than that of girls (2.90%). The good rate of boys is only 7.93%, and that of girls is 21.28%. The distribution of boys’ total scores is shown in Table 3.

The distribution of the total score grades of girls is shown in Table 4.

**Discussion**

**Failure form and influence mechanism of rock and soil slope**

If the forces on the rock and soil on the slope are distributed to varying degrees during the formation of the slope, the balance will be lost. Under these conditions, the deformation degree of slope is different. It may be local or overall deformation, thus achieving a balanced effect again. The deformation and damage of slope can be structural or the structure of rock and soil itself. In a word, it is the result of many comprehensive factors.

There are many kinds of shapes that can be divided into two types because of the classification and mechanical properties of rock slope. Among them, according to the classification of the damage phenomenon, it can be divided into two types: partial damage and total damage. Landslides and erosion on the earth surface are the most common phenomena of local slope damage. Most of these phenomena are caused by long-term wind and sun exposure, weathering, evaporation, freezing and other physical effects on the surface, which can cause local damage. By cleaning the rain, the rainwater can be removed from loose soil and formed a groove without any effort of blowing ash (Jabbar and Grote 2020). Therefore, the damage to these small slopes should be repaired as soon as possible to avoid future problems and safety problems, and all waterproofing work should be carried out appropriately. The common collapse of bedrock slope mainly shows in the phenomenon of slope bulge, wide crack and slope collapse. For these signs, relevant departments need to do well in governance and prevention in a timely manner, and strengthen and stabilize them to prevent them from being accidentally hit and causing major disasters. The bottom should be observed first, excavated to avoid large-scale collapse and bring serious consequences (Renard et al. 1991). Generally speaking, before solving the slope instability in geotechnical engineering, research and design preparation work need to be carried out, taking into account all possible effects of slope failure, so as to avoid problems before the problem occurs.
Factors affecting the instability of rock and soil slope

Influence of rock structure factors of geotechnical slope

The structural surface of rock slope directly affects the stability of rock slope. The existence of the structure surface has significantly reduced the overall structural strength of bedrock to some extent and maximized the deformation potential (Chhetri et al. 2020). Under the influence of physics, the most prone area with strong reaction is the main reason for the instability of rock slope, and it is easy to bring about hidden danger. It can be seen from the accident site and the sliding body that the instability of bedrock slope is mainly caused by the structural surface. However, according to the surface properties of the rock structure, it can be classified into three types of rock structure, diagenesis and secondary. In the analysis from the mechanical point of view, the structural plane can be divided into five types, the diagenetic structural plane can be divided into three types and the secondary structural plane is in overload state based on the first two. According to the
scale classification, the structural level of rock slope can be divided into four types: large, medium, small and micro (Renard and Freimund 1994).

**Influence of mechanical factors**

In the analysis of mechanical factors, the main failure factors are caused by the stress in the rock. These include earthquake disasters and strong vibrations caused by explosions. These vibrations directly affect the stability of rock surface and are important factors. If we check a lot of data, we can find that the stress distribution is different due to earthquake (Bhateria and Jain 2016). The larger the earthquake stress intensity factor, the greater the damage will occur. However, it can be concluded that directivity is important for the degree of cliff failure and the intensity of earthquake. If blasting is the most common phenomenon of rock slope instability in the process of construction and excavation, the strong impact force under the action of explosive force will immediately compress the rock and soil edges around the rock and soil. The slope collapsed and immediately deformed and suffered varying degrees of damage.

**Influence of water factors**

Many facts have proved that the factors affecting the instability of rock and soil slope are inevitably linked with water activity, and these factors are diverse and have a certain level of activity. In areas with melting ice and snow and abundant rainy season, landslides, damages and accidents are easy to occur. It also shows that the consequences of floods are more serious than droughts (Anandhi and Kannan 2018). In some cases, in the process of absorption and dehydration, the rock itself will be affected by chemical action, the rock itself will expand and contract, the rock surface will be unbalanced and the force will relax. Inattention can lead to cliffs and slopes, instability and destruction. From a physical point of view, the fractured rock surface will suffer from rain erosion, icing, thermal expansion and contraction. This force is sufficient to tear and break down the original cracks on the rock slope surface. Therefore, it can be seen that the water factor has a significant impact on the instability of bedrock slope.

**Principles of rock soil slope treatment**

According to the geological conditions of geotechnical engineering, attention must be paid to the qualitative and quantitative evaluation of rock slope landslide. Among them, quantitative evaluation is based on the satisfaction of qualitative evaluation.

Safety: according to the slope of rock and soil to be protected and treated, we carry out detailed design according to the degree of damage, so as to plan the service life. According to the local earthquake and groundwater conditions, the landslide thrust is adjusted economically, reasonably and effectively, and the stability safety factor is further calculated (Afilal et al. 2018).

Technical and economic rationality: according to the conditions of the area, the shape and geological conditions of the area should be used properly and effectively, and the technical and economic rationality should be used as the main method to stabilize the landslide.

The possibility of implementation: during the construction stage of rock slope, all warranty works in the construction stage should be carried out, and all procedures should be adjusted before and after the construction stage to stabilize the sliding body gradually. At the same time, the safety of construction personnel should be checked.

Social and human factors: the first step to protect and deal with the stability of rock slope and floor slope is the development of construction sequence, laws and measures. Before construction, the local people must carry out further

| Table 1 | Fuzzy comprehensive evaluation results of male students (unit: person) |
|---------|------------------|
| Boys    | Excellent | Good   | Pass    | Fail    |
| Number of people | 2492      | 7600 | 7951 | 1646 |
| Proportion        | 12.65%   | 38.61% | 40.38% | 8.36% |

| Table 2 | Fuzzy comprehensive evaluation results of girls (unit: person) |
|---------|------------------|
| Schoolgirl | Excellent | Good | Pass | Fail |
| Number of people | 924      | 3157 | 4380 | 377 |
| Proportion        | 10.45%   | 35.72% | 49.56% | 4.27% |

| Table 3 | Distribution of total scores of boys (unit: person) |
|---------|------------------|
| Boys    | Excellent | Good   | Pass    | Fail    |
| Number of people | 126      | 1562 | 15658 | 2343 |
| Proportion        | 0.64%   | 7.93% | 79.53% | 11.90% |

| Table 4 | Distribution of total scores of female students (unit: person) |
|---------|------------------|
| Schoolgirl | Excellent | Good | Pass | Fail |
| Number of people | 55      | 1881 | 6646 | 256 |
| Proportion        | 0.62%   | 21.28% | 75.20% | 2.90% |
coordination work in order to establish a good relationship with the local people. During the construction, please do not disturb the residents or affect their life.

Pay attention to environmental protection and greening: the implementation of the cornerstone project should take into account environmental protection and greening. If the economic cost of the transformation process is high, the terrain is complex and there are certain difficulties, the reasonable and economic design must be carried out in the aspects of treatment, protection, scope, cost, etc., and a series of feasible schematic diagram is designed for comparison.

In case of landslide danger and serious deformation, effective protection and treatment should be carried out in time. For large-scale landslides with slow slides, we must first investigate, plan, repair, observe and monitor the causes of landslides in order to take measures. If major landslides occur during construction or operation, they should be carefully considered, and prevention and treatment plans should be made when necessary. If the above plan is not feasible in production, a final reasonable plan must be made combining partial relocation and preventive measures. After a comprehensive and effective comparison, a decision can be made. At this time, appropriate prevention and control measures have been taken to prevent them from leading to major new landslides.

Treatment of rock soil slope combined with deep and shallow layers

Retaining wall

The greatest advantage of retaining walls is that they can bear lateral pressure, increase the stability of rock and soil slopes and prevent collapse of rock and soil slopes. When building rock and soil slopes, slopes can be supported to prevent erosion.

For retaining walls usually used on rock and ground slopes, the design scheme must be designed economically, reasonably and effectively according to the technical and design requirements. Installation location includes rock wall and street shoulder wall where anchor retaining wall is usually used.

Anti-slip pile

The anti-slip pile can bear lateral load, bear landslide thrust and play a role in support and stability. In many engineering practice, the use of anti-slip piles is safer, more economical and cheaper, which greatly reduces the project problems, so the development is relatively fast.

Conclusion

With the rapid development of the Internet of things, the gateway of the Internet of things, which connects the collection network with the traditional communication network, also plays a core role. Aiming at the problems of low integration and single application scenario in today’s IOT gateway, this paper implements the IOT gateway system based on embedded Linux. This kind of IOT gateway is applied to different scenarios, and the effect is very good. Protecting and treating slopes of rock and soil are an arduous task. It is very different from other roads, bridges and other projects. The construction process is affected by such factors as geology, topography, climate, structural load and other conditions. However, the change makes the construction of rock slope more difficult, the investment is relatively high and the cost is high. At the same time, the collection process of collecting various data (such as survey data) has not been completed before construction and surrounding areas. Therefore, the design is not perfect. Before working on rock and soil slopes, all preparations must be made based on data collection, including survey data, environment, geological topography, climate change and soil quality. It is carried out in the field, but also for research, analysis and detailed understanding.

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Declarations

Conflict of interest The authors declare that they have no competing interests.

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