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Research on Concrete Crack Monitoring Based on Digital Image

Ruijuan Liu[1,*], De Zhao[2], Lina Xiang[1], Yan Jiang[1] and Chunyan Zhang[1]

[1]Intelligent Road Detection in Mountainous City Engineering Research Center of Chongqing Education Commission of China, Chongqing Jianzhu College, Chongqing, China, 400072
[2]Chongqing Academy of S&T for Development, Chongqing,China, 401120

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Abstract

Concrete monitoring technology has equipment data detection functions, concrete data sharing functions, concrete accident auxiliary analysis functions, alarm and authority functions, etc. The realization of these functions is inseparable from the concrete central monitoring automation system, also known as the concrete monitoring SCADA system. The system is equipped with a high-performance computer and uninterrupted UPS power supply. The system consists of an on-site measurement and control unit and a measurement and control center. The measurement and control center conducts centralized monitoring of system configuration, maintenance, management and alarm processing, which is a core part of the system. The basic element of the system is the on-site measurement and control unit, which is generally composed of PLC or RTU to realize data acquisition and control of local I/O points. The main task of the central monitoring system is to detect and store the data of the metering station RTU and the concrete RTU. Use the system query function to obtain relevant data and provide system alarms to the monitoring personnel, which is conducive to troubleshooting on-site faults in the fastest time. The application of concrete monitoring technology in the concrete automation system plays an important role in saving concrete human resources and ensuring the quality and efficiency of concrete production. Only by giving full play to the advantages of concrete monitoring technology and doing a good job of monitoring concrete under different management methods can we truly ensure the smooth progress of concrete production.

Keywords: : *Concrete, Image, Monitorin*

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Introduction

The problem of concrete construction cracks has always been a key issue affecting the quality and efficiency of concrete construction. During the construction of the project, affected by the surrounding environmental climate and temperature factors, certain cracks will inevitably exist during the concrete construction process, which will affect the project. The smooth construction of the project and the construction quality of the project. Therefore, it is necessary to strengthen the research and attention to the control of concrete construction cracks, clarify the main reasons for concrete construction cracks and take targeted measures to solve and optimize them to ensure the stability, safety and reliability of the construction of the project[1].

1. Image monitoring technology

2.1. Data matching

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As a real-time information processing method, instant messaging monitoring technology, the level of data matching, to a large extent determines the effect of instant messaging monitoring technology. Specifically, in traditional digital data matching, many processing technologies use general string matching methods. This method not only occupies relatively large system resources, but also when faced with massive amounts of communication information processing, numbers are prone to appear. Inaccurate data matching. However, when the instant messaging monitoring technology is in actual use, it saves system resources to the greatest extent. The instant messaging monitoring technology uses the instant message text protocol analysis method, which is the length of the first message text and the separator of the instant message. , Carry out sufficient instant message text extraction and then perform character matching on the repeated parts, so as to quickly judge and deal with the abnormal information of the monitoring information and reduce the inaccuracy of various information processing. Compared with the traditional digital data matching method, the data matching method of the instant communication monitoring technology has outstanding advantages in use, which can solve the large memory occupation of system resources to the greatest extent, so that the information processing efficiency of the instant communication monitoring technology can be significantly enhanced[2]. The concrete monitor system is in the figure below.

Figure1. Concrete monitor system.

2.2. User function interface

When instant messaging monitoring technology is in use, it will provide users with a user interface and the interface functions include user login, user operations, database query and user settings, etc. When users use instant messaging monitoring technology, they are based on their personal needs, Select the corresponding page to operate. In order to ensure the security of user information, if the user wants to enter the operating system along the login page, the login page contains the user name, password information, database server address, database name, database password input, etc. The user only has to enter the user correctly Name and password are required to obtain permission to enter the operating system. From this aspect of login restrictions, the use of instant messaging monitoring technology is very secure. The user operation is a page for users to obtain information. The user operation contains multiple levels of sub-menus, which can provide users with different levels of real-time information monitoring functions according to their monitoring needs and can set

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harmful keywords. After obtaining the information, the database generates logs in different formats according to the content of the information and submits it to the user after obtaining the operating permission and then processes the information accordingly[3]. The concrete interface management system is in the figure below.

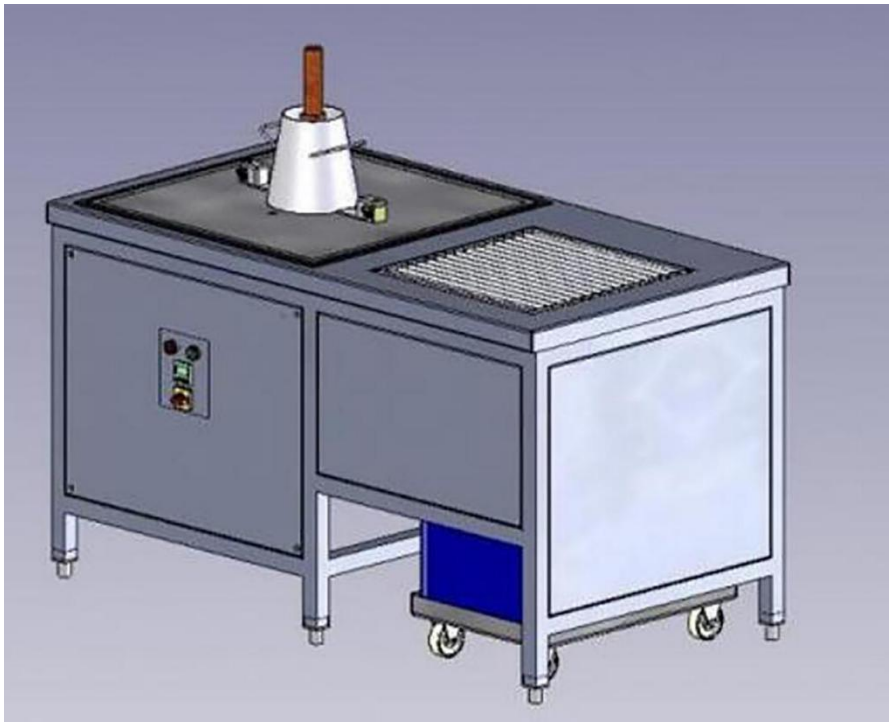

Figure2. Concrete interface monitor system.

2. Analysis of concrete cracking

3.1. Structural factors

First of all, concrete is a mixture. It is a mixture of cement as a cementing material and crushed stone and sand as filler. Good quality crushed stone and sand have good water stability and their volume will not change when exposed to water. As a cementing material, cement is mainly composed of silicate minerals C3S and C2S (generally 75%), aluminate (generally 22%), C3A, C4AF and other minerals (1%). The chemical mechanism is that C3S (tricalcium silicate), C2S (dicalcium silicate), C3A (tricalcium aluminate), C4AF (tetracalcium aluminate) react with water to form hydrates such as CaSIO3·nH2O and The macroscopic appearance of these hydrates is hardened cement. From a microscopic point of view, at the beginning, a mixture composed of multiple silicate molecules and free water molecules undergoes hydration reaction and merges into a larger molecule, shortening the distance between molecules. The volume shrinks naturally, causing cracks. This kind of crack is characterized by no obvious directionality, irregularity, both inside and outside. The size of the crack is related to the amount of cement (a smaller amount means less hydration reaction causes less volume shrinkage) and is related to the type of cement related[4]. The concrete temperature is in the figure below.

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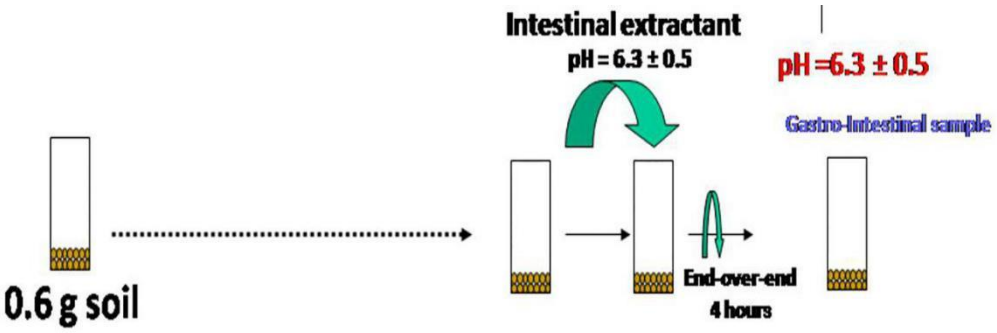

Figure3 Concrete temperature system.

3.2. Proportioning factors

If the mixing ratio is improper or water is added arbitrarily on site, the free water in the concrete will not only meet the needs of the hydration reaction, but the remaining free water will evaporate directly on the surface and the free water inside will also pass through the capillary pores for a long period of time. It will evaporate and leave tiny cavities[5]. For example, during the hardening of concrete, the surface slurry tension is greater than its strength, the surface tension will pull these cavities through, forming irregular tortoise cracks on the concrete surface. In engineering practice, after the concrete is poured, if there is a layer of floating slurry on the surface of the structure that is not removed in time, network cracks will occur after the floating slurry is solidified because of the above reasons. The concrete factor is in the figure below.

Figure4. Concrete factor.

3.3. Hydration factors

Cement will release heat during the hydration reaction. There is a process of thermal expansion and contraction. When the temperature is high, the concrete has formed a solid due to the hydration reaction. Therefore, when the temperature drops, the interior and surface of the concrete body will follow Cracks caused by temperature drop. This kind of crack is characterized by no obvious directionality, irregularity, both inside and outside and is closely related to the change of concrete temperature. The concrete hydration factor is in the figure below.

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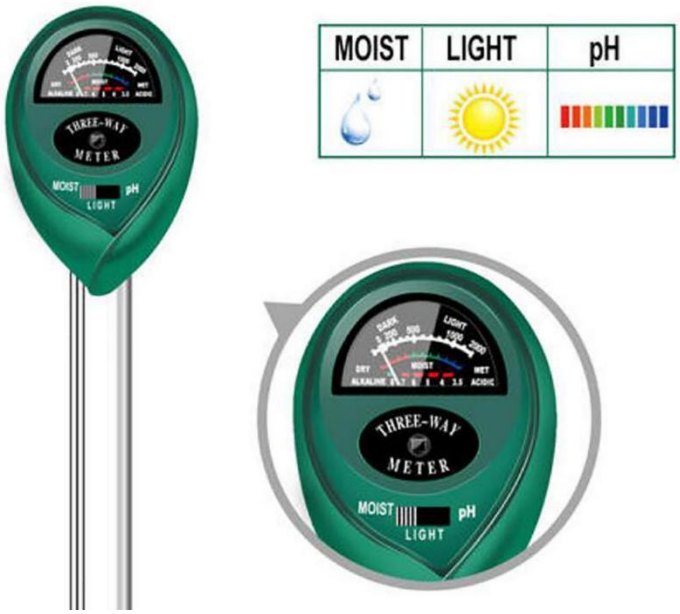

Figure5 Concrete hydration factor.

3.4. Deformation factors

From a macro point of view, large concrete blocks will also cause cracks. There is no ideal rigid body in the world[6]. Deformation after force is common. No matter how high the load-bearing foundation is, elastic deformation and inelastic deformation are always It exists objectively. Therefore, when the concrete is poured to exert pressure on the corresponding foundation, if the uneven settlement and deformation of the foundation occurs after part of the concrete has been consolidated, due to the insufficient early strength of this part of the concrete, the local stress often exceeds the strength of the concrete at that time. This part of the concrete will crack. The characteristic of this kind of crack is that the general direction is perpendicular to the foundation and it is composed of one or several main cracks. The width of the cracks varies according to the settlement and deformation of the foundation. The concrete deformation is in the figure below.

Figure6. Concrete deformation.

3. Monitoring and treatment of concrete cracking

4.1. Choose reasonable concrete materials and mix ratios to control cracks

Concrete is a mixture of sand and gravel aggregates, cement, water and other additives. The quality of raw materials is the prerequisite to ensure the quality of concrete. Secondly, the mix ratio of concrete is also an important factor affecting the quality of concrete. Choosing an appropriate mix ratio, strictly controlling the mud content of sand and gravel and avoiding excessive water-cement ratio, cement content and sand ratio are the key to the tensile

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strength of outline concrete. The improvement of tensile strength is important for reducing the occurrence of cracks. effect. In addition, measures can be taken to add fly ash or superplasticizer to reduce the amount of water and cement, thereby reducing the volume shrinkage of the concrete itself and controlling the occurrence of cracks.In the process of concrete construction, it is often found that the formwork leaks, which not only reduces the overall quality of the building, but also has honeycomb gaps on the surface of the concrete, which affects the overall aesthetics of the concrete. When mixing concrete for hydration, construction workers need to release a large amount of heat generated by cement mixing through mixing, and at the same time, they need to add new concrete to continue mixing. In this process, the heat that the mixed concrete wants to emit is covered by the later added concrete, and the temperature difference between inside and outside is large, and then a certain degree of cracks are generated. Therefore, attention must be paid to template leakage. Treatment method: The gap formed between the formwork and the concrete floor needs to be cleaned up, the excess part is scraped, and then the strip sponge is placed in the middle of the gap for fixing. If the distance between the wall formed by the template and the top of the floor slab is higher than 10mm×30mm, the joint form of groove seam is usually adopted, and the 5mm×15mm strips are directly fixed in it, and ensure that there is a space between each sponge strip A gap of not less than 3mm and not more than 5mm. Scissor bracing is also the focus of formwork construction of formwork concrete structures. It is usually placed at the lower end of the load-bearing support and arranged according to actual needs. Generally, it is divided into horizontal and longitudinal scissors. A horizontal scissor brace needs to be placed under every four shelves, and so on. The longitudinal scissor supports need to be distributed according to the actual height of the plate, and the connection with each bracket is strong.

In the process of making and installing the concrete building structure formwork, it mainly involves three links: selection, production and installation. In terms of template material selection, currently most of the plywood is used, which on its own can basically meet the construction requirements, but the fly in the ointment is that the quality stability is relatively poor, so that a certain amount of internal moisture will be absorbed during construction. As a result, it interferes with the formation of concrete. In order to solve this problem, the surface of the formwork is often coated and waterproofed during actual construction to reduce water absorption and avoid chromatic aberration defects after the formwork is poured. In terms of template production, due to the cumbersome process, advanced equipment such as adjustable-angle cutting machine, double-saw blade high-speed sawing machine, high-speed drilling machine, etc. are used more frequently, but before sawing, drilling, and cutting, It is necessary to check whether the template is in a horizontal position. After confirming that there is no problem, make the template strictly in accordance with the implementation standard, and then take scientific protection and waterproof measures. In general, apply waterproof paint and protective paint to the specified template position. If in the production process Some quality defects found in the process should be remedied according to the actual situation, or replaced or remade in time to avoid hidden dangers in the subsequent safe construction. In terms of template installation, you should carefully follow the installation sequence to combine and install different marks and different numbers of templates, and avoid quick success.After the concrete structure reaches the strength level requirements, the formwork removal operation is started. Before the formal construction, the concrete pouring quality needs to be checked, and then the concrete strength is actually measured. After the concrete strength reaches 1.2MPa, the formwork can be removed. In the specific construction process, the dismantling should be carried out in the order of

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non-load-bearing formwork and load-bearing formwork. Control the technical actions during the demolition process to avoid damage to the concrete structure. The dismantled formwork should be stacked at the designated place to ensure the construction work surface is neat and orderly and avoid safety problems. By grasping the construction process of formwork removal, it provides guarantee for the construction quality of the project, and finally ensures that the quality of the concrete structure can meet the requirements.

4.2. Strictly control the temperature difference and effectively improve the external constraints

Strictly controlling the temperature difference between the inside and outside of concrete and preventing excessive temperature difference are important methods to prevent temperature cracks. Control the temperature of concrete entering the mold. In the hot season, control the temperature of entering the mold not to be higher than 30℃ to avoid the exposure of raw materials. You can also use ice water for mixing. A reasonable monitoring plan must be formulated to grasp the dynamic changes of concrete temperature in time to determine the concrete The internal and external temperature difference control standard does not exceed 25℃ and the measures that should be taken after exceeding the standard value are specified so that the temperature control measures can be adjusted in time when the concrete temperature is abnormal. In terms of restraint control, the construction personnel can effectively reduce the temperature stress by placing a movable layer and can choose to use reinforcement, by arranging a certain amount of small diameter steel bars or applying a certain amount of diagonal steel bars around the concrete reinforcement holes , In order to effectively resist the appearance of temperature cracks.At the construction site of a construction project, the construction management department needs to strengthen the control of the entire construction process, take reasonable measures against various unfavorable factors, coordinate the relationship between various construction elements, and provide support for the smooth implementation of construction. In addition, it is necessary to strengthen the supervision and management of the construction process, and immediately order rework if the quality is found to be unqualified. In addition, rationally deploy work procedures, contract construction plans, construction procedures and construction personnel, and strengthen technical exchanges between construction personnel, and do a good job in quality supervision and management of construction sites.After the concrete pouring of the construction project, the curing treatment is also very important. If the concrete curing method is not strictly implemented in accordance with the requirements, the service life of the concrete and the performance of the material will be linearly reduced. In the current relatively common concrete maintenance measures, they need to be implemented according to different seasons. In the winter construction phase, in addition to carrying out the daily maintenance of concrete, relevant insulation treatments must be implemented, such as laying a layer of straw mat on the concrete to ensure that the concrete curing time is longer than For half a month, in the summer construction stage, in order to effectively avoid the concrete temperature stress caused by the large amount of hydration heat in the concrete, we must spray water on the concrete surface to achieve cooling treatment, and avoid stacking task heavy objects on the concrete.

4.3. Strengthen concrete pouring work to reduce cracks

Effective control of the concrete pouring and pounding links is an important link to reduce the occurrence of cracks. According to the requirements of different concrete slumps in the construction of the building site, reasonable vibrating time and vibrating strength should be set to achieve quick insertion and slow extraction. Claim. After pouring and tamping, in order to strengthen the control of

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cracks, certain measures must be taken for water storage and heat preservation, usually by covering the surface of the building with a film or covering wet sacks for maintenance. The purpose of this is to prevent the temperature difference between the inside and outside of the concrete from being too large, which may cause temperature cracks. Pay attention to weather conditions when pouring concrete and try to avoid pouring in rainy or windy weather. If you encounter wind and rain, you can set up a defensive color stripe cloth to cover and at the same time do a good job of drainage to avoid water flowing into the foundation pit. For low-structure concrete, backfill soil as early as possible, which is also an effective measure to reduce cracks. When the concrete is poured onto the surface, it must be smoothed and compacted to remove internal air bubbles and moisture, increase the density and reduce the occurrence of cracks.

4. Conclusion

The problem of concrete construction cracks seriously affects the strength, quality and use safety of buildings and it is necessary to strengthen the control and research of concrete construction cracks. According to the survey, the temperature difference between the inside and outside of the concrete, construction technology, construction materials and construction environment are the main causes of concrete cracks. Project construction personnel need to take targeted measures to solve and avoid the source of concrete cracks to ensure the construction quality and construction level of concrete projects.

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