Application of Deep Foundation Pit Support Technology
Based on Big Data Analysis in Construction Engineering Construction

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Abstract. In recent years, the rapid development of deep foundation pit support projects has become an important problem in urbanization construction. The role of deep foundation pit support projects in the construction and development of large and medium-sized cities has become increasingly important. In order to ensure the safety of foundation pit engineering and avoid accidents, people not only need to strengthen supervision in survey, design, construction and other aspects, but also apply monitoring technology to foundation pit engineering, so that engineering and technical personnel can master the dynamic changes of foundation pits. Improve the early warning capability of foundation pit engineering. In this paper, by using big data internet thinking and deep foundation pit support technology, real-time monitoring simulation prediction of foundation pit support structure in building construction is performed. Use big data to make a comparative study on the application scenarios of deep foundation pit technology in building construction, and use mathematical analysis and mathematical statistics to verify the collected data, so as to achieve the purpose of monitoring and prediction. So as to lay a theoretical foundation for the formulation of foundation pit support construction plans and foundation pit monitoring construction plans.

Keywords: Big Data Analysis, Foundation Pit Support, Foundation Pit Monitoring, Monitoring Simulation

1. Introduction
With the rapid development of China national economy and the significant improvement of people living standards, the rapid development of various construction projects, high-rise buildings are increasingly showing a trend of development to the upper and lower levels. But at present, the foundation pit supporting design, there is no mature can both considering various factors influence the
calculation theory and method, construction monitoring is not yet formed a scientific quality control system, as well as the monitoring data from the field can't make forecast in time, to the safety of foundation pit excavation is also an important cause of the accident.

Underground engineering, such as foundation and foundation, plays an extremely important role in various kinds of construction. The construction quality directly affects the safety and life of buildings, and the construction speed directly affects the construction period of the whole project [1]. It is one of the functions of foundation pit engineering to create appropriate and safe underground working space for foundation and foundation construction. The success or failure of foundation pit support engineering determines whether the foundation and foundation engineering construction can be carried out smoothly. Therefore, compared with other foundation engineering, foundation pit engineering has more prominent importance and particularity [2-3]. The safety of foundation pit engineering also directly affects the safety of buildings around the foundation pit and underground pipelines. Accidents such as subsidence of surrounding roads, collapse of buildings and rupture of underground pipelines caused by foundation pit engineering accidents are common in history.[4].

This article takes a deep foundation pit project as a background, and through the combination of theoretical analysis, numerical simulation and big data Internet thinking of the foundation pit support structure, the in-depth analysis and research on the deformation of the deep foundation pit support structure is carried out. The contents are as follows: (1) This article first briefly explained the deep foundation pit support structure, briefly introduced the deep foundation pit support type, and theoretically focused on the analysis and analysis of the deep foundation pit engineering deformation phenomenon and mechanism[5]. Preliminary understanding of the basic theoretical knowledge of the protective structure. (2) Combined with the engineering example of a deep foundation pit in a certain place, some standard sections of the foundation pit were selected for finite element software MIDAS / GTS for three-dimensional modeling, and the ground surface settlement, supporting structure deformation and soil stress around the foundation pit were obtained And other data, and analyzed the reasons for the changes[6-7]. (3) I want to compare the 3D modeled data with the case of big data, use data such as bim to simulate the problems that may occur, and comprehensively monitor the surface settlement and pile top displacement of the deep foundation pit. According to the monitoring data, And its cumulative change chart, in-depth analysis of its change law and its reasons, as well as the judgment and warning of the safety and stability of the entire deep foundation pit. (4) Analyze and compare the numerical simulation results with the monitoring data. It is found that the overall change and growth trend of the data obtained during the excavation of the foundation pit during the excavation process are basically consistent with the actual monitoring data. To a certain extent, it can reflect the real deformation of the supporting structure, provide theoretical basis and practical experience for the design and construction of similar foundation pit projects, and have certain reference value for later similar projects.

2. Method

2.1. Supporting technology of deep foundation pit
In the past ten years or so, the construction technology of deep foundation pits has developed rapidly, and many new forms of foundation pit support have emerged. The foundation pit monitoring
technology has been greatly developed. The combination of big data and development software is used to make the forecasting and forecasting system intelligent[8].

2.2. Features of foundation pit support engineering
The construction of foundation pit projects often intersects with many factors, such as foundation pit excavation, foundation structure engineering, environmental engineering, and many other factors [9]. It is also a temporary and comprehensive project that involves a wide range of knowledge fields and construction with space-time effects. It involves many classic soil mechanics issues, the impact of groundwater on the supporting structure, the combined effect of soil and foundation, and earthwork development. Many problems such as the influence of excavation on the supporting structure, monitoring of foundation pits, etc[10].

3. Experiment
The case studied in this article belongs to one of the core cities in the Yangtze River Delta region. Its engineering geology is relatively complicated. During the construction of deep foundation pits, some problems that affect the safety and stability of foundation pits are often encountered, such as the frequently occurring "soft soil, These problems, such as quicksand and slope instability, will adversely affect the safety and stability of the foundation pit. Because of the relatively complex engineering geological structure, it is difficult to accurately analyze the various engineering problems that may occur in the project. Therefore, the safety monitoring of the supporting structure on the foundation pit site during the construction process has become an indispensable link in the project. One is to use big data thinking, compare and analyze the construction data of the other side, use this project scenario to perform 3D modeling combined with bim technology to simulate related data, design a scientific and safe foundation pit safety monitoring program, and establish reasonable feedback. The mechanism can effectively avoid the problem of excessive deformation during the construction process, thereby ensuring the safe and stable operation of the foundation pit.

4. Discuss

4.1. Surface settlement and comparative analysis
According to representative monitoring points and necessary surface settlement monitoring data, the settlement law and development trend of the foundation pit can be analyzed. To monitor the abscissa denotes the date, the surface subsidence cumulants as the ordinate, the surface subsidence monitoring data fed cumulative curves, for monitoring data more clearly expressed, monitoring data for the extraction and analysis of its cumulative settlement sorting result shown in Figure 1:
Figure 1. Cumulative Change Curve of Surface Settlement

The above data are collected daily from monitoring points on the construction site. The figure 1 shows that the surface before August 18 at the rapid subsidence stage, the average cumulative settlement is 3.25 mm, maximum subsidence for monitoring DL143, as the largest settlement is 3.86 mm, this is because the foundation pit deeper and deeper in the topsoil of the primitive stress state is destroyed, and the surface settlement stabilized after August 18, the monitoring points accumulated settlement basic did not change. According to the numerical simulation results, the numerical simulation value of the surface settlement is 3.5mm, which is slightly larger than the average accumulated settlement value monitored and within a certain error range.

4.2 Pile top settlement and comparative analysis

In this paper, typical monitoring points in the standard section are selected as the research objects to analyze the monitoring data of pile top settlement value. The specific monitoring data are shown in Table 1 below:

| Date | ZQC107 | ZQC106 | ZQC140 | ZQC141 |
|------|--------|--------|--------|--------|
| 7.7  | 0.03   | 0.06   | -0.02  | -0.02  |
| 7.13 | -0.15  | -0.08  | -0.09  | -0.10  |
| 7.19 | -0.22  | -0.17  | -0.22  | -0.26  |
| 7.25 | -0.37  | -0.29  | -0.40  | -0.31  |
| 7.31 | -0.40  | -0.31  | -0.51  | -0.47  |
| 8.6  | -0.54  | -0.50  | -0.65  | -0.57  |
| 8.12 | -0.77  | -0.68  | -0.86  | -0.89  |
| 8.18 | -0.72  | -0.78  | -0.77  | -1.01  |

As shown in Table 1, during the 60 days of the monitoring period, the cumulative change trend of pile top settlement at all monitoring points is nearly the same. The average value of settlement is about 1.18mm, and the maximum settlement is about 1.37mm. Before August 18, the settlement rate of the pile body was relatively fast, and the pile body settled rapidly under the white weight. After foundation pit excavation, there is a small recoil phenomenon in the settlement amount of pile top, which is mainly due to the decrease of the contact surface between pile and soil after excavation, and the support structure sinks under the action of its own gravity, while at this time, the friction of soil pushes the pile body up slightly. This section of the foundation pit is relatively shallow in depth, with
good containment measures. The cumulative variables and change rates of monitoring data are all within the control index and the variation trend fluctuates less. Combined with the analysis of monitoring data, the foundation pit and the surrounding environment are basically in a safe and controllable state.

5. Conclusion
As one of the important branches of geotechnical engineering, deep foundation pit engineering has very strong regionality, complexity and comprehensiveness. Based on the local engineering hydrogeology of a city, this paper mainly discusses the support structure of the deep tube pit of the comprehensive pipe gallery. The simulation of this article intercepts a standard section of the strip pit, and combines the finite element software MIDAS / GTS carried out analysis and research, mainly analyzing the three aspects of surface settlement, pile top displacement and pile top settlement, and carried out three-dimensional modeling and analysis of its surface settlement, pile top displacement and pile based on big data numerical simulation and data from foundation pit monitoring. The change of the term settlement, the deformation data of each working condition remain consistent within a certain error range, and the maximum displacement does not exceed 30rnm, which meets the requirements of technical specifications. When performing big data numerical simulation work, due to the many influential factors on the site, the relevant influencing variables cannot be set according to the actual situation of the site, and some empirical values will be used for simplified replacement. Therefore, the results of big data numerical simulation cannot completely reflect the project. The actual situation can only be used as a reference for site construction. Comparing the actual monitoring data on site with the results of numerical simulation can infer the extent to which the model restores the site engineering condition and judge the degree of refinement of the model.

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