Application of GPS Positioning Technology in Civil Engineering Survey

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Abstract: In the process of continuous improvement of my country's scientific and technological level, the development and application of new technologies are relatively fast, and the application of new technologies in various fields is relatively extensive. The full application of GPS positioning technology in the surveying and mapping line is of great significance, which can greatly improve the efficiency and accuracy of civil engineering surveying. With the continuous development and application of GPS measurement technology, it can promote the further development of my country's engineering measurement industry. In the actual operation of GPS positioning technology, the signals sent by the satellites can be obtained in time, and then the signal information is processed to accurately determine the specific spatial location of the measurement point. The three-dimensional navigation performance and positioning function of GPS positioning technology is relatively strong, with strong anti-interference ability, and can be fully applied in the measurement process of various civil engineering. In order to improve the application effect of GPS positioning technology, we need to further study the GPS positioning technology and discuss the specific application of mechanical positioning technology in the civil engineering measurement process, so as to provide corresponding reference for the popularization and application of GPS positioning technology.

1. Introduction
At this stage, my country's social and economic development is relatively fast, which has created good material conditions for the further development and innovation of science and technology. In the process of civil engineering construction, we need to use a variety of construction technologies. In order to ensure scientific and reasonable planning and arrangement of various construction technologies, we need to promote the wide application of GPS measurement technology in the construction process of civil engineering. In this way, we can not only improve the rationality and scientificity of the civil engineering construction design plan to a great extent, but also ensure the construction efficiency and construction progress of the civil engineering. In the process of practical application of GPS measurement technology, it is necessary to strengthen the research work of GPS positioning measurement technology, give full play to the application advantages of GPS measurement technology, and improve the application level of GPS positioning technology in order to promote the further development of my country's civil engineering construction industry.

2. Application Status of GPS Positioning Technology
The current GPS positioning technology mainly includes differential GPS and GPS dynamic positioning technology. First of all, differential GPS technology is a more widely used technology type in static positioning. Generally, the unified point signal difference is used to ensure positioning accuracy. The operation method in the civil engineering survey process is also relatively simple. We
complete the base station erection work according to the GPS fixed static positioning operation specification, and then set up the GPS detection receiver in the base station, so that both the correction number of the base station and GPS satellite can be calculated, and You can use the user receiving terminal to receive the correction data transmitted by the base station, and correct the positioning result in time to further improve the positioning accuracy. Secondly, in the application process of GPS dynamic positioning technology, satellite signals are mainly used for measurement, and the data content obtained is relatively large, mainly including three-dimensional coordinates, three-dimensional data and time parameters. The application of this technology is relatively common in the monitoring of civil engineering such as bridges and dams. In addition, by applying GPS dynamic positioning technology in high-rise buildings, we can obtain data such as settlement deformation generated by buildings to improve the quality control level of high-rise buildings [1].

3. Overview of GPS Positioning Technology

GPS positioning technology is an all-weather real-time space detection technology. The GPS positioning system mainly includes three parts: satellite constellation, ground monitoring station and user equipment. In the application of GPS positioning technology, three parts of coordination work are required to complete the measurement operation. First, the GPS space satellite constellation includes 24 satellites, 21 of these 24 satellites are operating normally, and the remaining three are spare satellites. During the operation of 24 satellites, the 6 space orbits will divide the 24 satellites evenly to ensure that the satellites in each area can operate normally in the plane. In the normal operation of space satellites, the L-band is the main band of satellite and radio propagation methods. The user also uses the L-band when receiving signals, and continuously sends signal information related to navigation and positioning. This can ensure that the satellites form unique points with known dynamic characteristics, laying the foundation for subsequent measurement work. Second, ground monitoring stations refer to different monitoring stations distributed throughout the earth. The ground monitoring station constitutes the monitoring system of the GPS ground control station. In general, in the application of GPS positioning technology, the main function of the ground monitoring station is to observe and measure the relevant total data of GPS satellites according to different monitoring stations, and to check the satellite orbit parameters to complete the statistical calculation of the parameter difference. Then, the total data obtained is summarized and analyzed, and a specific method is used to create a navigation message, and the message is transmitted to each station, and then the accurate information that is accurately checked by the station is sent to the satellite data storage library. In this way, spatial information data can be obtained in time when applying GPS technology. Third, users of GPS positioning systems use equipment. GPS receiver data processors, processing software, and other terminal data devices are all devices used by GPS users. The GPS precision receiving instrument can accurately capture each satellite signal at different altitudes and the satellite signal to be measured, and can track the actual running track of the positioning satellite, and at the same time process and exchange the tracked satellite signal, and then use the relevant The technical processing software completes the baseline calculation of GPS network adjustments and performs in-depth analysis and processing of the data. In this way, the GPS receiver can obtain three-dimensional coordinates, ensuring the accuracy of the measurement results and positioning results. In the actual application process, the device used by the user terminal is an important component for obtaining GPS measurement results. The data processing capability of the user terminal device will affect the accuracy of the GPS measurement result to a certain extent [2]. In the process of civil engineering measurement, it is necessary to select appropriate terminal equipment according to the accuracy requirements of the measurement data of the project to ensure reliable and accurate measurement results.
4. Application Advantages of GPS Positioning Technology

In the process of applying GPS positioning technology, its main advantages are shown in the following aspects: First, the accuracy of GPS positioning technology is relatively high, and the application of GPS positioning technology can ensure the accuracy of data measurement. Because the main factor that causes errors in GPS positioning technology is the interference of the information propagation process, there are not many factors that will interfere with the transmission of GPS information, and the accuracy of the information can be ensured to a great extent. In the civilian category of GPS positioning technology, the static mapping error of the GPS system can be controlled within centimeters. When there are few interference factors in the measurement environment, the error can be greatly reduced and the reliability of the measurement data can be improved. Second, the operability is relatively strong. When using GPS positioning technology to complete the surveying and mapping work, it is mainly realized by the satellite system. The ground surveyor only needs to receive the signal and carry out auxiliary operations. It can greatly improve the efficiency of surveying and mapping operations, and the operation procedure in the measurement process is relatively simple, which can improve the operation effect of GPS positioning technology and ensure the application benefit of the technology. Third, the coverage of GPS positioning system technology is relatively wide.
The GPS system can cover the whole world, and its coverage can reach 98% of the area. And in the measurement process, the external environment has little impact on the GPS positioning technology. Therefore, GPS positioning technology can be effectively applied in various environments. And because of the wide application range of GPS positioning technology, the cost in the application process of GPS positioning technology can be effectively controlled, the cost input of civil engineering measurement operations can be saved, and the economic benefit of the application of positioning technology can be improved [3].

5. The Specific Application of GPS Positioning Technology in Civil Engineering Survey

5.1 Bridge Engineering Survey
In the bridge project, the GPS positioning technology can be used to build a control network, and then the construction data can be precisely staked out and processed accurately. This is an important function that GPS measurement technology cannot lack in the application of bridge engineering. GPS measurement technology can greatly improve the accuracy of bridge engineering surveys. For example, in the actual construction process, we can accurately measure each construction link of the construction site, and GPS measurement technology can also be used in elevation measurement and cross-river inspection and measurement work, so that we can improve the measurement efficiency and ensure the accuracy of the data provides accurate and reliable data support for each link of the bridge construction, thereby enhancing the rationality and scientificity of the bridge construction plan design. In short, the use of GPS positioning technology to obtain the corresponding engineering geological data before the construction of the bridge project has a positive significance for improving the design level of the bridge project and can provide scientific guidance for the subsequent bridge construction.

In addition to the measurement before the construction of the bridge project, GPS measurement technology can also be applied in the field construction, and the 3D positioning technology can be effectively applied, which can not only improve the work efficiency of the construction personnel, but also reduce the existing in the construction process. Error situation. Therefore, we can scientifically and rationally plan the overall construction process of the entire bridge structure, so as to improve the efficiency of bridge construction, ensure the progress of construction, and ensure the quality of bridge construction. However, it should be noted that the application of GPS technology in the bridge construction process is relatively small, so the corresponding application experience is relatively lacking. This requires relevant staff to summarize and analyze the specific application of GPS measurement technology in measurement engineering, in order to provide a wealth of measurement experience for the corresponding similar projects. GPS measurement technology can provide high-precision three-dimensional positioning information for the construction process when it is applied, and improve the overall construction progress of the project. Therefore, GPS positioning technology has broad application prospects. During the construction of bridge projects, we need to gradually strengthen the research on GPS measurement technology, explore new application methods of GPS measurement technology in bridge engineering, and improve the application level of GPS measurement technology. This has a positive significance for promoting the further development of my country's bridge construction industry [4].

5.2 Line Survey
Using GPS measurement technology can carry out effective survey on the line to ensure that the line survey can be carried out smoothly. Under normal circumstances, the coverage of line engineering is relatively extensive. The main form of many engineering measurement control networks is a slender shape, and some line engineering will pass through uninhabited areas. If the traditional measurement work is adopted, it will greatly increase the difficulty of the measurement work and the danger of the measurement work. For example, when carrying out surveying operations in some relatively remote areas, surveyors cannot accurately grasp the environment around the control points, which may cause the exploration project to fail to proceed smoothly. There will be sudden changes in some locations,
which seriously affect the accuracy of the survey results. If the traditional survey method is still used, not only can it not meet the survey requirements of complex line projects, but also the accuracy of the survey data obtained will also have great problems, and it will also threaten the personal safety of the surveyors. Therefore, the GPS measurement technology needs to be effectively applied, especially in some long-distance off-road monitoring and the monitoring of line projects with relatively complicated terrain, GPS measurement technology has a strong application advantage. GPS measurement technology does not require complex measurement points in the application process, so the application of GPS is less disturbed by the terrain environment. This can not only greatly reduce the labor intensity and workload of the survey staff, but also reduce the adverse impact of measurement instability on the measurement results, thereby reducing the line survey cycle and improving the accuracy of the line survey results.

5.3 Urban Engineering Survey

In the process of urban engineering construction, the construction difficulty is relatively high. When carrying out vertical operations and horizontal operations, long-term monitoring must be carried out to be able to grasp the abnormal changes in the construction operations in time to ensure the safety of construction. In urban engineering, it is necessary not only to carry out survey work in the early stage of construction, but also to carry out construction monitoring during the construction process. The application of GPS positioning technology in the preliminary measurement work can accurately analyze the surrounding buildings and analyze the specific construction terrain at the same time. During the construction monitoring process, the surveyor can use differential GPS technology to locate the building piles and corners. Especially in the process of high-rise building construction, in order to prevent the groundwater flow changes from adversely affecting the high-rise building construction, we need to use GPS to accurately grasp the groundwater level. At the same time, we can dynamically monitor the settlement deformation of high-rise buildings during the construction process, so as to control the settlement deformation of high-rise buildings within a reasonable range, and improve the safety and quality of high-rise building construction [5].

6. Conclusion

All in all, the overall cost of GPS positioning technology in the application process is relatively small, and it can be fully applied in the process of large-scale measurement and normal monitoring. In the static positioning work, the staff only needs to select a reasonable location to complete the installation of the detection base station according to the specific conditions of civil engineering, so that we can complete the measurement work according to different accuracy requirements. In the measurement process, we can also use differential GPS positioning technology to improve the accuracy of the measurement results. When monitoring dams or bridge projects, our effective application of GPS dynamic positioning technology allows us to obtain observation point curves at different time periods, which not only facilitates staff to accurately grasp the accuracy of building structures, and improve GPS positioning technology operation level. In order to promote the development and application of GPS positioning technology in civil engineering, relevant researchers need to strengthen the research and innovation of positioning technology according to the current status of the application of GPS positioning technology and enhance the application effect of GPS positioning. Only in this way can we expand the application of GPS positioning technology in various fields and promote the further development of civil engineering measurement technology in my country.

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