Application Status and Limitations of Digital Surveying and Mapping Technology in Engineering Survey

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Abstract: Digital surveying and mapping technology has been widely used in engineering survey, and it has become an essential basic technology in engineering survey. In the process of rapid socio-economic development, the role of modern engineering surveying and mapping technology has gradually become clear. Reverse engineering plays a significant role in shortening the development cycle of new products, reducing costs and improving the independent development ability of products. Data collection and pre-processing of point cloud data are key links in reverse engineering. Digital surveying and mapping technology has completely changed the traditional engineering surveying method, and its application in engineering surveying has become more and more extensive. At this stage, digital testing technology has become an important means in engineering measurement, and has been widely used in various domestic engineering projects, effectively improving the efficiency and quality of the engineering measurement process, and making the surveying and mapping data more accurate. Some are difficult to manually survey and map. It is easier to complete the surveying and mapping work by using digital surveying and mapping technology for the locations and parts. The development of science and technology promotes the development of digital surveying and mapping technology, which is widely used in engineering surveying.

1. Introduction

In terms of current geological engineering survey, digital mapping technology plays an important role in it [1]. It can not only provide an important driving force for the development of the project, but also guarantee the authenticity and effectiveness of geological engineering survey data [2]. In order to improve the accuracy and efficiency of engineering survey, digital surveying and mapping technology has been widely used in the construction process of engineering survey in recent years, which greatly reduces the error rate in the process of engineering survey and conforms to the development trend of the times [3]. Advanced technologies such as GIS and GPS are widely used in digital surveying and mapping technology in China, which greatly promotes the rapid development of digital surveying and mapping technology, improves the engineering surveying level in China, provides a reliable guarantee for improving the comprehensive strength of surveying units, and enables surveying units to generate more economic benefits [4]. Surveying and mapping technology is the foundation of engineering construction, which has great influence on the quality and progress of engineering construction [5]. Digital surveying and mapping technology not only embodies its own value in engineering survey, but also improves the accuracy of engineering survey, making engineering survey develop in a more accurate, fast and convenient direction as a whole. My country's digital surveying and mapping technology is widely used in engineering surveying. The foundation of engineering construction is surveying and mapping technology. The quality and progress of engineering construction are affected by surveying and mapping technology. Digital surveying and mapping technology plays a very important role in engineering surveying [6]. Engineering survey work mainly includes surveys in construction engineering, traffic engineering,

water conservancy engineering and other fields. Reasonably apply modern surveying and mapping technology to realize the intelligent development of engineering [7]. With the continuous improvement and enrichment of the level of computer technology and measurement methods, the application field of digitization has gradually expanded, and it has been applied in many industries and has a positive impact.

2. Advantages of digital surveying and Mapping Technology

2.1 High precision rate

Digital surveying and mapping technology has incomparable advantages over traditional surveying and mapping technology, and is an important way to improve the accuracy of geological engineering surveying and mapping [8]. Compared with traditional surveying and mapping technology, the application of digital surveying and mapping technology in engineering survey greatly improves the accuracy of surveying and mapping data. The use of digital surveying and mapping technology for engineering surveying operations reduces the participation of surveying and mapping personnel, avoids deviations in surveying and mapping data caused by improper human operations or differences in operating levels, making engineering surveying more and more scientific, comprehensive and precise, and improving engineering the accuracy of surveying and mapping during the measurement process [9]. In engineering survey, the reasonable application of digital surveying and mapping technology can also be used to actively store, effectively save the time of data recording, reduce the workload of survey staff, reduce the tedious workload for the measurement work and improve the work efficiency. The error phenomenon of artificial measurement is avoided to the greatest extent. The accurate collection of 3D coordinate information in engineering survey is the use of map mapping technology. The application of digital surveying and mapping technology has greatly improved the mapping accuracy of traditional surveying and mapping work, and achieved a qualitative leap in mapping accuracy. Traditional surveying and mapping work requires a lot of manpower, and manual surveying and mapping results in certain deviation of the final data. The use of digital surveying and mapping technology is not only easy to operate but also flexible.

2.2 High degree of automation

Digital surveying and mapping technology is based on computer technology, which not only promotes the automation of geological engineering survey, but also improves the efficiency of geological engineering survey. In the process of digital surveying and mapping at present, digital surveying and mapping can automatically carry out engineering survey, so that technicians can collect measurement data, sort out data, locate positions and automatically draw relevant data models by means of computers, thus avoiding errors in the measurement process, bringing great convenience to relevant technicians and reducing their workload. Through computer software, digital surveying and mapping can automatically calculate, select icons, and identify, etc., so as to ensure the accuracy of data, the beauty and standardization of maps, and the level of automation is further improved. Human errors can be minimized. Engineering surveying the error rate has also been reduced. These are all achieved by using computer technology to realize the automatic recognition of graphic symbols and other tasks in engineering surveys.

3. Application of digital surveying and mapping technology in engineering survey

3.1 Application of digital technology

The application of digital technology in the field of engineering surveying is a typical example of digital surveying and mapping technology. With the increase in the speed of urbanization in my country, the number of engineering construction projects has increased year by year, engineering surveying work has greatly increased, and the difficulty of surveying and mapping work has

continued to increase. The demand is increasing. The main characteristics of digital surveying and mapping technology are high measurement accuracy and fast measurement results, which enable the rapid development and application of digital surveying and mapping technology in all walks of life. Digital earth also originated from the basis of computer technology, through the integration of social, economic and other aspects of content, as well as the unity of geographical coordinates, a framework system is formed, which can not only display geographical coordinates, but also save important social information [10]. In order to get a clear image, the staff can use the graphic scanning technology when editing the image. When applying the digital original map mapping technology, the relevant staff should pay attention to the rational use of other advanced technologies such as graphic scanning, walking tracking and GPS. Usually, in engineering survey work, if the requirements for digital topographic map are not high or there is no specific requirement, and the project funds are obviously tight, the original map can be directly digitally converted.

3.2 Discussion on Digital Surveying and Mapping Technology

Due to the increasing demand for cadastral map, digital mapping technology has been widely used in cadastral mapping. Cadastral surveying and mapping can measure the parameters of land area, attribute and economic value in the region, so as to improve the land management information system, and use digital surveying and mapping technology to improve the measurement accuracy in cadastral surveying, so as to quickly map, reduce the measurement cost, and achieve good application effect in urban large area surveying. Original map digitization technology can also be said to be map digitization technology, which can convert map graphics or satellite maps and other information into clear and accurate maps by digital conversion, and can also scan paper drawing information and input it into a computer for processing and analysis, so as to construct a new original map, and can also construct and generate a three-dimensional digital model, providing convenience for subsequent data management and information inquiry [11]. The continuous improvement and renewal of digital surveying and mapping technology has provided convenience and effective value for the work of engineering surveying, as well as convenient conditions for construction work. When the ultrasonic pulse reaches the object under test, echo reflection will occur on the boundary surface of the two media of the object under test. The distance between each surface and the zero point is calculated by measuring the time interval between the echo and the zero point pulse as shown in Figure 1.

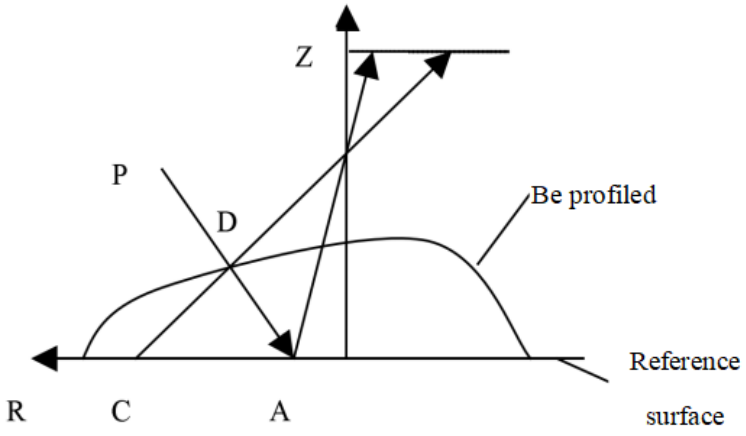

Figure 1. Base principle of structured light

In one measurement, the current exposure value is recorded as 0.045, and the distance between the scanning head and the sheet metal part is 70. According to the thought of the controlled variable method, the relative position, distance and angle of the scanning head and the sheet metal are kept unchanged, only the exposure value is changed, and the sheet metal is scanned separately when the exposure value is different, and the measurement results and exposure obtained are when the value is 0.045, the measurement results are compared, and the measurement error is shown in Table 1.

Table.1. The influence of the dawn value on the measurement results

Distance between scan head and measured object	Exposure value	Difference
70cm	0.025	-0.021~+ 0.022
	0.035	
	0.045	
	0.055	
	0.065	

In the digital surveying and mapping technology, the use of GIS system accelerates the processing speed of digital maps, and uses computer scanning and processing technology instead of traditional manual drawing, thus reducing labor consumption, and rendering efficiency is higher and more accurate. The application of this technology has implemented digitization of map information, and the importance of the establishment of geographic information technology GIS systems has become more and more prominent. The establishment of geographic information technology GIS systems also requires the cooperation of relevant departments to jointly accelerate the digital processing of maps. The speed is very important. Engineering measurement technology is a comprehensive measurement technology, not only because the measurement process requires technical personnel and advanced instruments and equipment, but also because in the actual engineering measurement process, it is not the same measurement standard and technology, but according to the different types and accuracy of data information in the process of design, construction and construction of different projects, it is necessary to allocate special data the surveyors and monitoring personnel of the door report the data information and process the data content.

3.3 Reverse engineering

Reverse engineering is a general term for a series of operation methods and technologies that are used to understand and digest existing things or technologies and then improve them. Reverse engineering is not only limited to a certain field, but a broad concept. Three-dimensional digital measurement technology refers to the relevant measurement technology that expresses the three-dimensional contour of the surface of the measured object in the form of discrete spatial points through a specific shape measurement device. Through the known coordinates of the points, the spatial geometric position of the object shape is obtained. On this premise, it can be used for surface fitting, modeling, evaluation, manufacturing and other operations. At present, reverse engineering has been widely applied in practice. Many enterprises take it as an important means to shorten the development cycle of new products and enhance the competitiveness of enterprises, and a number of reverse engineering commercial software have been launched in the market accordingly. In the field of manufacturing, reverse engineering has a wide application background. According to different measurement principles, non-contact measurement generally includes optical measurement, ultrasonic measurement, electromagnetic measurement, etc. This method mainly uses a certain object phenomenon that interacts with the surface of the object to obtain its three-dimensional information, as shown in Table 2.

Table.2. Digitalized methods of object

Data acquisition method									
Contact method		Non-contact method							Other
Robotic hand	CMM	Optics					Sonic	Electromagnetic	Chromatography
		Triangulation	Distance	Structured light	Put one's oar in	Image analysis			

The development of science and technology and the progress of society are changing with each passing day. All countries are making unremitting efforts to achieve high efficiency and high returns. The gradual maturity of reverse engineering provides a prerequisite for various industries to speed up the design and production and shorten the production cycle, so it has been widely used.The processing object of engineering is point cloud data, which can only be obtained by certain

measuring means, that is, the product surface is digitized. It refers to transforming the surface shape of an object into discrete geometric point coordinate data through specific measuring equipment and methods, and then modeling, evaluating and improving the manufacturing of complex surfaces.

4. Conclusions

Digital surveying and mapping technology has a good application prospect in the process of engineering surveying. It gives full play to the advantages of advanced technologies such as computers and information, improves the efficiency of engineering surveying work, guarantees the quality of engineering surveying work, and solves the problems encountered in traditional surveying and mapping work. Various problems. In the actual application process of digital surveying and mapping technology, enterprises should constantly combine with the requirements of engineering survey, modify the unreasonable and impractical parts in the process of digital surveying and mapping, improve the quality of construction projects, and promote the rapid development of China's engineering construction. Digital surveying and mapping technology plays a very important role in modern engineering survey, because it has the advantages of high accuracy, high degree of automation, rich graphics information and easy storage. Digital surveying and mapping technology has solved the drawing problem of traditional surveying and mapping large-scale maps, and it is highly automated, easy to store, and the efficiency and accuracy of surveying and mapping work are well guaranteed. The continuous application in modern engineering survey has greatly reduced the workload of relevant surveyors and improved the accuracy of relevant data. Digital surveying and mapping is carried out in combination with the actual engineering demand and the data obtained from the engineering construction environment, and the unreasonable and impractical points are modified to avoid the inability of engineering construction or the quality failing due to the influence of environmental factors or internal factors, thus promoting the smooth implementation of the project. In fact, various surveying and mapping techniques and tools can be reasonably selected according to the type and requirements of the project, and management can be strengthened through modern methods to make it more intelligent and digital. Reverse engineering is a popular technology emerging nowadays, and it needs the assistance of multiple disciplines to cross each other. Due to the complexity and variety of objects processed by reverse engineering in practical applications, there are many problems that need to be solved, and there are still many technologies that need to be studied in depth.

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