

Application Analysis of GPS Surveying and Mapping Technology in Engineering Surveying and Mapping

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Abstract: *As a new modern technology, GPS technology has achieved good applications in multiple fields of modern social and economic development, and is constantly expanding its application scope. At the same time, it also provides strong guarantees for the quality and efficiency of work in different fields. The application of GPS technology in engineering surveying and mapping has many advantages compared to traditional surveying and mapping techniques in the past. It not only has high accuracy in surveying and mapping, but also has a relatively simple operation, requiring low proficiency of surveying and mapping technicians. Therefore, GPS surveying and mapping technology has been increasingly applied in engineering surveying and mapping. Therefore, we should pay attention to the application of GPS surveying technology in engineering surveying, continuously improve its surveying quality and efficiency, and promote the healthy and stable development of engineering construction.*

Keywords: GPS surveying and mapping technology; Engineering surveying and mapping; application.

1. INTRODUCTION

Since the release of the “Opinions on Building a Data Infrastructure System to Better Play the Role of Data Elements” (hereinafter referred to as the “Twenty Data Articles”), the goal of building a data property rights system has received numerous practical and theoretical attention. Data property rights, as a product of the data age, reflect the value of digital development in the era, while also endowing data and data rights with more contemporary connotations. As a production factor that can bring value to society, data, as a non property content, contains an unprecedented property nature[1]. The enjoyment of rights is a prerequisite for the exercise of the rights subject, as well as the basis for the rights subject to protect their own rights and obligations not to infringe on the rights of others. It represents the active and creative exertion of the rights subject and the enjoyment of material and spiritual interests[2]. The market value and role of data elements lies not only in the active initiative of data subjects but also in the enjoyment of data rights. In the process of rapid integration of data into market production, circulation, and utilization, disputes over the ownership of data rights have become a major obstacle to the development of the digital economy. For example, in the first national big data ownership case and the first public data unfair competition case tried by the Hangzhou Internet Court, the plaintiff Taobao Company and the defendant Meimei Company have resolved the dispute over the rights they have to develop and operate data products[3]. This is a microcosm of the unclear ownership of data property rights. The innovative exploration of the structural separation system of data property rights in the “Twenty Data Articles” is sufficient to demonstrate the importance of data property rights for the development of data elements. The latest “Data 23 Regulations” issued by Beijing on June 20, 2023 also prioritize the implementation of data property rights and income distribution systems, demonstrating the importance of data property rights. The existing legal system does not clearly define the ownership and content of data property rights, and the legal issues arising from data ownership disputes urgently need to be resolved. Therefore, it is necessary to analyze the construction of a structural division system for data property rights from the perspective of ownership.

1.1 Overview

GPS technology is mainly a positioning and navigation system evolved from ground data transmission equipment, monitoring units, and satellite receiving equipment information transmission channels. In the process of applying such technology, on the one hand, it can effectively utilize satellite high-definition cameras to monitor the surface environment; On the other hand, image information can also be transmitted to computers through data channels to obtain more detailed data content in a shorter time. Therefore, the application of GPS technology in surveying and mapping engineering can continuously improve the efficiency and quality of engineering data collection, avoid

problems caused by data verification, shorten time and cost, especially when combined with communication equipment, enable real-time monitoring of changes in quality environmental data along the way through data transmission, and reduce a series of problems such as surface changes. The impact on engineering surveying and mapping can be further expanded through intelligent and automated technologies, enabling the application of GPS technology.

1.2 Principle analysis

GPS technology is a data transmission technology based on satellite positioning systems. In the application process of this technology, the satellite and ground monitoring station data form triangular coordinates, and the data is calculated through a data processing platform. On this basis, the specific location and elevation of the area are determined through base station data transmission. In addition, the satellite system can use high-definition cameras to capture and restore the on-site topography in the first time, collect data, and is more conducive to determining the position of the reference station. In this way, visual topographic maps can also be developed in advance with the help of relevant data, significantly improving the accuracy and scientificity of measurement data [1].

1.3 Short videos on "agriculture, rural areas, and farmers" have fewer options for promoting agricultural product marketing

The traditional sales method of agricultural products is too narrow, and most of them are sold offline, with a single sales channel. The main circulation channels are agricultural product wholesale markets, supermarkets, and marketing intermediaries such as individual businesses, specialized businesses, and consortia. At the same time, traditional marketing concepts are relatively weak. It is still difficult for current Chinese farmers to achieve integrated marketing concepts in the agricultural market, as the agricultural market requires three major supports: funds, technology, and information. At present, the concept of agricultural marketing layout is relatively lacking, and there is a lack of professional guidance. Both the concept and methods of domestic agricultural product marketing need to be further improved and enhanced.

1.4 Short videos of "agricultural products, rural areas, and farmers" helping to create brand effects for landmark agricultural products are relatively single

Tiktok E-commerce targeted to carry out agricultural aid activities, tracking the origin of agricultural production areas, focusing on covering 146 counties and cities in 8 provinces within a year, helping farmers and new farmers with high-quality business by means of special assistance, training guidance, long-term large-scale operation, and supporting the industrialization of agricultural products in 69 landmarks. The topic of helping farmers on the top page of Shanhuo has been liked, commented on, and shared nearly 90 million times. Interest e-commerce not only promotes the diversified value display of rural products, but also accelerates the continuous development and "rejuvenation" of regional agricultural product brands. Yanbian rice in Jilin, Luosifen in Liuzhou in Guangxi, kiwi fruit in Shaanxi and other landmark agricultural products On the basis of sales growth, the product continuously expands brand awareness. In addition, the platform also leverages the characteristics of global interest in e-commerce, expanding multiple channels including shopping malls, search, and store windows, providing incremental markets for agricultural products in various regions. Although multiple activities are increasingly being carried out, short video marketing activities with the theme of "agriculture, rural areas, and farmers" still need to be more diverse in order to achieve the benefits brought by short videos in other sectors.

2. CHARACTERISTICS OF GPS MEASUREMENT TECHNOLOGY

The "three rural areas" refer to farmers, rural areas, and agriculture. Therefore, the three agricultural products are related to them. These products include agricultural products such as grains, oil, cotton, fruits, vegetables, medicinal herbs, etc; Handicrafts processed by agricultural producers themselves, such as straw weaving and handicrafts; Animal husbandry and fishing are also included. Compared to images and text, short videos can express content in IP format and penetrate consumers' hearts more deeply. To some extent, short videos are replacing graphics and text, bringing more possibilities to brand marketing due to their creative interaction, strong communication skills, and youthfulness. Short videos of agricultural products, by exploring product characteristics, can present brand agricultural products in a three-dimensional manner. At the same time, they can express and present the differentiation of agricultural products to users in the shortest possible time, enabling consumers to purchase and convert. It is not difficult to shoot and produce a short video of agricultural products. The existing platforms and technologies are already very mature, and the entire shooting and production can be completed by

mobile phones. The key lies in the content output of the short video. Output high-quality content and continuous output is the direction of short video marketing for agricultural products. Starting from content and interests, integrate agricultural product brands into short videos; At the same time, based on social responsibility, making short videos a new force for poverty alleviation and agricultural assistance, allowing branded agricultural products to enter the market in a more intuitive and three-dimensional way, and helping to build regional agricultural product brands.

2.1 High positioning accuracy

Through practical application, it has been found that GPS technology has very high positioning accuracy. Dual frequency GPS receivers generally have a baseline resolution accuracy of 5mm+1ppm, while infrared instruments have an accuracy of 5mm+5ppm. Compared with the two, the accuracy is basically the same. However, the application of GPS technology in the measurement process will not have adverse effects on the measurement work due to environmental and distance factors, and plays a very important role in some poor terrain conditions and local key projects. At the same time, GPS technology can achieve real-time positioning, dynamically and accurately obtain the three-dimensional position and velocity of measurement targets, and this technology also has high measurement efficiency.

2.2 Short observation time

When using GPS technology for measurement, the measurement time is short, especially in real-time dynamic positioning mode, the corresponding measurement work can be completed in a short time, effectively ensuring measurement efficiency. Moreover, during the measurement process, GPS technology is used to observe the station without the need for inter visibility. Only by ensuring the openness of the observation station above 15° can measurements be carried out, effectively solving the limitations of inter visibility conditions and environmental factors during the measurement process. This not only effectively reduces the time investment in the measurement process, but also reduces financial investment. During the measurement process, more flexible measurement points can be selected to ensure measurement efficiency and quality [2].

2.3 High level of automation

With the rapid development of science and technology, the volume of GPS receivers has shown a trend of miniaturization, and the operation is very simple. Staff only need to center the antenna to perform automated observation, and use data processing software to process measurement data, while obtaining the three-dimensional coordinates of measurement points. And other capture satellites and observation tracking can be achieved through machine automation.

3. DISCUSSION ON THE SPECIFIC APPLICATION OF GPS SURVEYING AND MAPPING TECHNOLOGY IN ENGINEERING SURVEYING AND MAPPING

Short videos of three agricultural products are a new marketing trend in recent years, in which major characteristic agricultural products rely on short videos and live streaming platforms to present agricultural product stories, growth processes, ecological environment, cultural customs, etc. more intuitively to consumers through forms such as "short videos+online celebrities+live streaming", forming new consumption scenarios. This immersive scene, with a realistic and intuitive experience, as well as the freshness brought by rural life scenes, has attracted a large number of fans to agricultural short videos. At present, the field of agriculture, rural areas, and farmers in short videos is quite popular on major live streaming platforms. Through the content creation of short videos, agricultural characteristic products are promoted with local customs, thereby helping to promote the sales of agricultural products and drive local tourism. The explosive success of the "Three Rural" short video has given great energy to the rural revitalization strategy. The creators of short videos integrate food, agricultural techniques, and rural life, bringing more possibilities to the public in innovative forms through the highly innovative expression of short videos themselves. Short videos themselves are a tool, and the carrier of empowerment is the agricultural products with three agricultural characteristics. It is best to shoot agricultural products in their original growth site. The process of agricultural products from planting to production, and then to post-processing can all be IP based on short video content. For example, using short videos to record the growth process of gourds, as well as processing and painting on gourds, can be used as materials for IP based short video content. The content is vertical, and both video content and live streaming content should focus on the theme as much as possible. If the content is not complex and diverse, it can increase fan verticality.

3.1 Application of Surveying and Mapping

In the specific surveying and mapping process, there are strict requirements for the setting of measurement points, and surveying and mapping personnel need to combine actual needs in their work. To conduct relevant tests to avoid the use of measurement points being affected by external magnetic fields, radio waves, etc., and to avoid adverse interference during the measurement process as much as possible. After selecting the measurement point, it is necessary to apply relevant measuring equipment to perform height measurement to ensure accuracy. There are strict requirements in the GPS network layout work, which need to ensure that there are no water surface, mirror surface of high-rise buildings, and other issues within the control network area. Surveying and mapping personnel need to conduct tests in advance to save known points. In addition, it is necessary to correctly recognize the actual needs of joint testing in order to optimize the layout of the control network.

3.2 Application in urban construction

Nowadays, the process of urbanization is relatively fast. In urban construction, comprehensive consideration, reasonable planning and design are needed to make the urban infrastructure more complete, meet people's living needs, and protect the urban ecological environment. The standards and scale of urban construction vary from city to city, and the surveying and mapping work carried out is also different. This means that urban construction is relatively complex and requires a lot of planning, such as roads, residential areas, parks, etc., which require reasonable design to make urban construction more perfect. The application of GPS surveying and mapping technology in urban construction can effectively survey the corresponding areas, fully understand the actual situation of the terrain and landforms in various areas of the city, and then staff can carry out corresponding designs, make reasonable layout for urban construction, improve infrastructure and equipment, and provide a good living environment for people. It is also necessary to effectively protect the ecological environment of the city, make corresponding environmental protection plans in advance, and make urban construction harmonious with the ecological environment.

3.3 Application of real-time Deformation monitoring control

In the application of GPS technology, monitoring and control is a very important component, playing an important role in specific surveying and mapping engineering applications. In the actual surveying and mapping process of engineering, surveying and mapping personnel can use GPS measurement methods to control the dynamic deformation of surveying points in the measurement area, and obtain dynamic data from it. Especially in some severely deformed measurement areas, the effect is particularly obvious, which can effectively prevent quality and safety hazards in engineering construction and ensure the quality of engineering construction. If GPS technology is applied in mining engineering surveying and mapping to detect surface deformation in mines, permanent observation points can be arranged in key and third areas to achieve continuous observation, thereby ensuring the safety of mining.

3.4 Application of real-time dynamic measurement

Real time dynamic measurement technology is RTK technology. In actual measurement work, a GPS receiver needs to be installed at the ground reference point as the reference station, and then the GPS satellite receives measurement information and connects it to the point to obtain real-time and effective information. At the same time, the measurement information can also be timely and effectively transmitted to the measurement mobile station. Mobile stations mainly receive and process information, and can also display relevant information. Mobile measurement stations need to receive satellite signals while also obtaining relevant information.

Reference station information. Scientifically and effectively integrate all obtained information, fully leverage the application advantages of GPS technology, to achieve research and analysis of various data information. The coordinates of the measuring mobile station will be uploaded to the computer information system and the relevant information will be transmitted back, and the actual operation status of all relevant satellites within the operating range will be displayed, forming good dynamic surveying parameters, and thus achieving dynamic surveying and mapping [2]. For example, in earthquake prediction, GPS technology is applied to study the movement of the Earth's crust and to analyze and summarize the terrain changes before earthquakes.

3.5 Application of underwater engineering surveying and mapping

For underwater construction projects such as docks and seaports, it is often necessary to carry out underwater engineering surveying and mapping work. During specific underwater surveying and mapping operations, surveying and mapping personnel need to accurately measure the three-dimensional coordinates and water depth of the project. At present, GPS surveying technology has been widely used in underwater engineering surveying and mapping work, which not only allows for three-dimensional coordinate measurement of the surveying area, but also enables the delineation of underwater terrain in the surveying area. In addition, surveying and mapping personnel can also carry out specific operations based on the tidal displacement of seawater, and combine it with detectors to obtain accurate and complete underwater surveying and mapping systems, effectively improving the quality and efficiency of underwater surveying and mapping work [3].

4. THE PRACTICAL APPLICATION OF GPS SURVEYING AND MAPPING TECHNOLOGY IN ENGINEERING SURVEYING AND MAPPING

The online celebrity review and promotion activities for the sales of agricultural products are new measures to assist internet agriculture and serve agriculture, rural areas, and farmers. The short video on "agriculture, rural areas, and farmers" includes the subjective emotions and value judgments of the creators, creating a spokesperson for agricultural products. Use a unique person as the spokesperson for agricultural products in your hometown. Improving personal image, frequent interaction, and cultivating fan stickiness are ways to enhance the value of agricultural products.

By using short videos and live streaming, combined with stories of rural life and local agricultural products, we can bring users' love and expectations for agricultural products with our own stories. Simultaneously integrate agricultural products with other industry sectors and tie them together with related festival activities. Therefore, "short video+live streaming+agricultural products+festival activities" is a highly innovative promotion method. The common feature of popular short videos on agricultural products is the effective use of "emotional poison". When users watch short videos, they become very engaged, laughing, sighing, angry, and crying... all because the video content triggers various emotions such as joy, anger, sadness, and joy, which in turn triggers resonance and empathy. Emotions are aroused, and the adrenaline secreted will lead users into a purchasing state, achieving immersive marketing. One is to convey happiness to users. The purchase itself is for the pursuit of a happy experience, and people are prone to making purchases in happy emotions. A short video that makes people happy, creating content and scenes that are definitely also joyful.

4.1 Application of GPS surveying and mapping technology in highway surveying and construction

Highway construction has promoted the rapid development of China's social economy, and GPS surveying and mapping technology plays an important role in highway construction, which is reflected in the following aspects. Firstly, the drawing of topographic maps. During the construction process of highway engineering, it is necessary to draw large-scale topographic maps. During the process of drawing topographic maps, a large amount of data information needs to be collected, covering a relatively large range. Due to technological limitations, traditional rendering methods take a long time and require a lot of manpower and material resources, and the comprehensiveness, accuracy, and timeliness of data information cannot be guaranteed. The application of GPS surveying and mapping technology in the drawing of topographic maps greatly reduces the time required to collect information data, and at the same time, high-precision and comprehensive information data can be obtained in a relatively short time, improving the quality and efficiency of topographic map drawing work. Secondly, measure the longitudinal and transverse sections of the highway. By using GPS surveying and mapping technology, combined with relevant drawing software and the stake points of the centerline, the longitudinal and transverse sections of the highway can be drawn. Thirdly, measure the centerline of the highway. In highway engineering construction, GPS surveying and mapping technology can be used to quickly locate and measure the centerline of the highway, providing reliable basis for construction and greatly improving construction progress.

4.2 Application of GPS surveying and mapping technology in urban construction

With the growth of China's social economy, the improvement of people's living standards, and the increasing number of urban populations, the pace of urban construction is also gradually accelerating. Urban construction is a highly systematic project that needs to fully consider the factors of each link, and carry out overall coordination and planning work from a global perspective to ensure the development of the city. Exhibition is more humanized, meeting people's basic needs such as living and living, while also ensuring that the natural ecological environment is not damaged. Based on the current situation, the scale and development speed of various cities in China are

different, and the demand for surveying and mapping is also different. In order to ensure the scientificity, rationality, and orderliness of urban construction, it is necessary to introduce GPS surveying and mapping technology in urban construction, accurately measure the data of various construction stages, ensure the comprehensiveness, accuracy, and timeliness of the data, and provide reliable data support for urban construction work. Urban construction work should consider multiple aspects, such as ensuring the rationality of transportation, the rationality of drainage systems, and the aesthetics of urban landscapes. In the process of urban development, it is necessary to do a good job in protecting the natural environment and ensuring the harmonious development of humans and nature. The use of GPS surveying and mapping technology can comprehensively plan these contents, ensuring the rationality and scientificity of urban construction design schemes. GPS surveying and mapping technology can provide a large amount of effective data in a very short time, providing important data guarantee for urban construction work.

5. CONCLUSION

In summary, in the new era of engineering surveying and mapping, the introduction of advanced GPS technology has become an inevitable choice. When conducting specific surveying and mapping, it is necessary to follow the actual situation on site as a guide, and develop practical and feasible surveying and mapping plans based on experience and working conditions, which is conducive to promoting the successful completion of surveying and mapping work. In this process, it is necessary to clarify the principles and advantages of GPS technology application in order to maintain its application, provide more feasible platforms, and provide comprehensive technical support through satellite positioning technology surveying projects. In the above eight perspectives, China's basic education curriculum and teaching reform focuses on the relationship between teachers and students, and its practical effectiveness in curriculum implementation may be worth considering. According to an online survey, 74% of teachers agree with cooperative, independent, and inquiry teaching. Based on the thousands of middle school and secondary school language teachers I have spoken to, the percentage of students who support the new curriculum changes is much higher than that. However, some people think that the three-dimensional goal is still only on paper in the current classroom. The thinking process is ignored, and the thinking of seeking differences is excluded, which leads to limited time and space for students to think independently. If cooperation, autonomy and inquiry are only regarded as a teacher-student relationship, it is difficult to transform them into learning activities with specific subject content and implement them into teaching practice. Compared with this connection between teachers and students, it has more guiding significance and operability. According to the goal or task, the teaching content is used as the starting point to match the learning activities. From the perspective of educational principles, it is necessary to implement educational principles such as meaningful premises and communication into students' learning process. From the perspective of the teaching model, the honest implementation of cooperative learning, problem-based learning, classroom discussion, etc., should follow standard steps and processes. Then, design high-quality learning activities according to the theories and principles of the above other perspectives with stronger usability, and the advanced ideas as the basis should be comfortable. Ideas must be reflected in the design of learning and should not appear outside of learning, much less hang above the teaching of students. The above 74% of primary and secondary school teachers approved of the curriculum reform, and they may only approve of good words such as cooperation, autonomy and inquiry. As long as the idea is right, everything will be solved: the concept of our basic education curriculum and teaching reform.

REFERENCES

- [1] Yang Wei. Application Analysis of GPS Surveying and Mapping Technology in Surveying and Mapping Engineering [J]. Urban Construction, 2019000 (007): 199
- [2] Chen Zewen Application Analysis of GPS Surveying Technology in Surveying and Mapping Engineering [J] Building Materials Development Orientation, 2020018 (005): 179
- [3] Li Qingjun. Application Analysis of GPS Surveying and Mapping Technology in Surveying and Mapping Engineering[J] Building Materials Development Orientation, 2020 (5): 175-175
- [4] Liu Zhiqiang, Zhang Xiaolin. A preliminary study on the translation activities of sports scholars in the Republic of China. Sports Research and Education, Vol. 37(2022) No.2, p.39-44.
- [5] Zhang Bisheng. The significance of ideological history in the translation of science and technology in the late Ming Dynasty: A study on the Chinese translation of Geometric Elements. Foreign Language in China, Vol. 19(2022) No.3, p.94-99.
- [6] Tan Jie. Translation of Western learning and cross-cultural community in Jiangzhou, Shanxi Province in the late Ming Dynasty. Journal of Zhaoqing University, Vol. 42(2021) No.4, p.72-77.

- [7] He Qi, Mi Liying. Study on the Dissemination and Influence of Modern Chinese Mathematical Translations in Japan from the perspective of Skopos Theory. *Frontiers in Educational Research: Chinese and English*, Vol. 13(2023) No.1, p.72-80.
- [8] Wei Kai. Realistic He Xiang: Some basic Problems in translation of history education. *Middle School History Teaching Reference*, Vol. 10(2021) No.8, p.45-46.
- [9] Ma Peihong, Zhu Man, Qi Yan. A comparative analysis of the two Chinese versions of A Dream of Red Mansions from the perspective of feminist translation theory. *Journal of Heihe University*, Vol. 12(2021) No.9, p.124-126.
- [10] Wang Tianjian, Li Zhengtao. Theoretical system of pedagogy with Chinese characteristics: Historical review and contemporary review. *Journal of Education Abstracts*, Vol. 8(2022) No.4, p.39-47.
- [11] A study on the subtext of music translation by Tian Binhua and Yang Yandi. *Journal of Xinghai Conservatory of Music*, Vol. 7(2021) No.3, p.167-174.
- [12] Yang Yuhong. Bibliometrics analysis of engineering ethics teaching resources. *Journal of Kunming University of Technology: Social Science Edition*, Vol. 21(2021) No.1, p.107-114.