

RESEARCH ARTICLE

Research on Application of UAV Remote Sensing Surveying and Mapping Technology in Engineering Surveying and Mapping

Ting Feng

Natural Resources and Planning Bureau of Yilong County, Nanchong City, Sichuan Province, Nanchong, Sichuan, 637000, China

Abstract: With the continuous progress of the economy, people have new requirements for the quality of engineering, so the accuracy of engineering surveying and mapping is constantly improving. UAV remote sensing surveying and mapping technology is a kind of aerial surveying technology. Based on remote sensing technology, it is of great significance to complete surveying and mapping through a variety of technical means. Therefore, in the process of surveying and mapping, it is of great significance to improve the quality of remote sensing technology. This paper is based on the application of UAV remote sensing mapping technology in engineering surveying and mapping.

Keywords: Engineering surveying and mapping; UAV remote sensing; Application of surveying and mapping technology

Citation: Ting Feng. 2018. Research on Application of UAV Remote Sensing Surveying and Mapping Technology in Engineering Surveying and Mapping. *International Journal of Geology*, 3(1): 15-19. <http://doi.org/10.26789/IJG.2018.01.004>

Copyright: Research on Application of UAV Remote Sensing Surveying and Mapping Technology in Engineering Surveying and Mapping © 2018 Ting Feng. This is an Open Access article published by Urban Development Scientific Publishing Company. It is distributed under the terms of the Creative Commons Attribution-Noncommercial 4.0 International License, permitting all non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited and acknowledged.

1. Introduction

At present, all countries pay more attention to the research and development of UAV, and China is also in the competition of UAV research and development, and has made considerable progress on the basis of innovation. Many countries have introduced UAV products developed by China and applied the technology developed by China. According to the current development direction, China may occupy an important position in the future UAV market. Unmanned aerial vehicle remote sensing is also an important achievement in the field of UAV research and development in China. The advantages of applying unmanned aerial vehicle remote sensing are that it can quickly collect and collate geographic information with high accuracy, speed and efficiency. It can be seen that UAV technology will have more room for development in the future.

2. Advantages of Unmanned Remote Sensing Technology

2.1 Safe and Reliable

With the continuous development of China's science and technology, unmanned remote sensing surveying and

mapping technology has been continuously developed with science and technology, and has been gradually applied to corresponding engineering projects. With the continuous development of China's construction industry, there are higher quality requirements for construction projects. In the concrete construction process, it is necessary to strengthen the geological survey work and combine the corresponding data information to strengthen the supervision and management of building quality. Compared with traditional surveying and mapping technology, unmanned remote sensing surveying and mapping technology has higher surveying and mapping quality. In the actual working process, the corresponding data images are obtained mainly through unmanned aerial vehicle control, so as to effectively ensure the safety of engineering survey. Compared with manual measurement, unmanned remote sensing mapping technology has higher accuracy and more reliable data information. To a certain extent, it can effectively guarantee the accuracy and authenticity of engineering measurement.

2.2 Flexibility

Unmanned aerial vehicle (UAV) is relatively small in size, running faster and more flexible. In the actual application process, the captured picture is clearer and the

image processing technology is better. In the traditional engineering surveying and mapping process, with the aid of UAV aerial photography technology, a lot of manpower, material resources and financial resources need to be invested, which will increase the engineering cost and investment cost of construction projects to a certain extent. With the help of unmanned remote sensing surveying and mapping technology, the cost of surveying and mapping of engineering projects can be effectively reduced. At the same time, it can make engineering surveying and mapping tend to be unmanned and efficient. In the actual application process, aerial photography can be carried out continuously. With the help of corresponding computer technology, the accuracy of UAV technical mapping can be effectively improved. The greatest advantage of UAV technology is its relatively flexible mapping process, which can efficiently carry out corresponding work and reduce unnecessary capital investment.

2.3 The Monitoring Scale is Large

Unmanned aerial vehicle (UAV) can monitor large objects, and at the same time, it can monitor small objects in a certain key area, which can effectively improve the monitoring effect. At present, unmanned aerial vehicle remote sensing is constantly improving the monitoring scale, which has great scalability. At the same time, UAV remote sensing is adopted to truly show the actual situation in the area, and three-dimensional mode is reflected in machinery and equipment, thus improving the intuitiveness of geographic information.

2.4 Strong Compatibility

Remote sensing technology itself has big loopholes, and if only one technology is adopted, the measurement results will be affected. Therefore, to improve the mapping efficiency of unmanned aerial vehicle remote sensing, it is necessary to absorb the advantages of other remote sensing systems, better integrate the effects of learning from each other's strengths, solve its own problems, and give full play to the application scope of unmanned aerial vehicle remote sensing.

2.5 Improve the Accuracy of Data

The comprehensive application of unmanned aerial vehicle remote sensing has effectively improved the accuracy of data, made the collected data safer, and provided high-quality guarantee for all kinds of engineering construction. Unmanned aerial vehicle remote sensing is a complex collection of various technologies, especially the application of new technologies such as satellite

positioning, digital sensing and unmanned technology, which has improved the efficiency and quality of data collection in an all-round way, greatly reduced surveying and mapping errors, and ensured the rapid collection of data. The application of high technology has improved the accuracy of data in an all-round way. With the continuous improvement of unmanned aerial vehicle (UAV) technology, unmanned aerial vehicle (UAV) technology is becoming more and more mature and perfect, which plays an important role in various fields. The characteristics of UAV, such as small size, flexibility and easy operation, have promoted engineering surveying and mapping, especially in complex areas, which can conduct detailed survey of surveying and mapping areas. Through the use of software, data processing is formed again in the later stage, thus avoiding data errors and losses and ensuring data safety and accuracy.

2.6 Improve Efficiency

Unmanned aerial vehicle remote sensing has effectively improved the work efficiency. Through the comprehensive application of technology, the manual operation procedures have been reduced, and the work speed has been improved. The application of various softwares has also greatly reduced the errors, ensuring the ability of fast data processing. Fast data processing not only improves the work efficiency, but also ensures the accuracy of data. Unmanned aerial vehicle (UAV) is used for external operations, which is not affected by bad weather and avoids casualties. UAV can work under various weather conditions, ensuring the progress of surveying and mapping. Compared with traditional operations using aircraft for surveying and mapping, UAV has a longer battery life, which improves the working efficiency and ensures the data quality.

2.7 Cost Reduction

Surveying and mapping is complicated, and its cost is greatly reduced by the use of unmanned aerial vehicle. The application of modern unmanned aerial vehicle remote sensing surveying and mapping technology has completely changed the traditional surveying and mapping methods, and made the surveying and mapping work more scientific and accurate. Ground information collection is an important data source. In traditional operation, satellites or manned aircraft must be used for data collection. This kind of data collection is costly and unsafe, and is easily affected by bad weather, which creates unsafe factors for pilots and makes it impossible to complete surveying and mapping work. The use of unmanned remote

sensing surveying and mapping technology has reduced the data cost and manpower expenditure in an all-round way, at the same time, it has also improved the overall efficiency of the operation and reduced the time cost. Unmanned aerial vehicle (UAV) can complete complex surveying and mapping tasks in a short time without restriction.

3. Application of UAV Remote Sensing Mapping Technology in Engineering Surveying and Mapping Field

3.1 Mapping Conditions Poor Environment

In traditional engineering surveying and mapping, it is necessary to select areas with better geographical conditions for aerial surveying and mapping, so that aerial surveying and mapping can play a higher application value. In the actual operation process, some areas have thick clouds and high terrain, which easily affects the accuracy of aerial mapping. Unmanned aerial vehicle (UAV) remote sensing mapping technology is less restricted by geographical conditions, which can improve the accuracy of engineering mapping when applied to poor mapping conditions. On the other hand, it can improve the engineering surveying and mapping quality. For example, when an engineering surveying and mapping unit carries out regional surveying and mapping, considering that the local clouds are low and the mountains are high, unmanned aerial vehicles are selected for local geomorphological surveying and mapping. In the first stage of surveying and mapping, technicians operate the unmanned aerial vehicle at a suitable flight altitude, collect the overall data of the area, and conduct 3D modeling on the landform of the target area by the remote sensing surveying and mapping system of the unmanned aerial vehicle, so that the survey team can have a preliminary understanding of the target landform. In the second stage of surveying and mapping, technicians change the flying height of UAV, and use high-definition cameras to collect data of the target area, thus increasing the scientificity of the measurement results. In the process of measurement, in the face of unexpected events, such as deep ravines and huge mountains in front of the measurement, etc. Technicians can evade with the help of flexible operation, which improves the safety of surveying and mapping work and speeds up the progress of surveying and mapping work.

3.2 Surveying and Mapping Image Collection and Processing

Before the application of UAV mapping remote sensing

technology, it is generally necessary to carry out route planning and flight test in advance. In the real surveying and mapping area, the staff should do simulation control to ensure the smooth operation of UAV. Before the UAV officially works, the GPS positioning system accurately locates the surveying and mapping area, and forms a coordinate system, such as a plane coordinate system and a height system. At the same time, the imaging resolution, scale and sheet size of the surveying and mapping image can be automatically debugged, which can ensure that the aerial surveying and mapping can simulate and process the captured images through a 3D model. Because the pixels are higher, the surveying and mapping image is clearer and more recognizable, and the staff is more convenient in the later processing. In addition, UAV mapping technology should have high DOM accuracy and image control point accuracy, which is mainly aimed at some places which are difficult to map, such as blind spots, strong concealment and forests. This can improve the integrity of mapping and ensure the smooth development of the project.

3.3 Data Acquisition

Accurate data is indispensable for engineering construction. Only when the surveying and mapping accuracy meets the requirements can high-quality project products be built. Then, engineering surveying and mapping data collection is very important, and good data support is an important basis for engineering decision-making. Through data analysis, we can do a good job in engineering planning and design. In all kinds of engineering surveying and mapping work, unmanned aerial vehicle remote sensing has been widely used to help engineers collect all kinds of useful data. At the same time, it can also collect and analyze data in time, which improves the speed and accuracy of data collection. In the actual operation process, the relevant operators need to input instructions to the computer, divide the mapping area, reasonably design the UAV route, and let the UAV execute the designed instructions under reasonable environmental conditions. In the flight process, as long as the UAV is safe, the relevant data can be obtained and the engineering mapping work can be successfully completed. At present, with the continuous innovation of technology, UAV has realized the function of precise positioning with the aid of positioning system, and according to the corresponding coordinate system, it can ensure a certain range of surveying and mapping capabilities. For all kinds of acquired data, it is necessary to recheck and test to ensure the accuracy of the data, and then fly again to supplement the required data and improve the accuracy of the data in an all-round way.

3.4 Image Acquisition

In addition to collecting data, engineering surveying and mapping also needs to collect and sort out various images to fully meet the needs of cartography, and image collection is an essential content. By using unmanned aerial vehicle technology, the information in the surveying and mapping range can be collected to form image shooting. In addition, the shooting picture can be further processed by using 3D modeling, which provides effective guidance for drawing work. Unmanned surveying and mapping is highly intelligent, which can automatically process images that do not meet the requirements. The system can process images, and the digital camera will automatically zoom for overlapping images, thus realizing the effective and rapid adjustment of image parameters and effectively ensuring the collected images to be clearer.

3.5 Low Altitude Operation

The use of unmanned aerial vehicle (UAV) greatly ensures the safety, especially for some engineering surveying and mapping projects, it is necessary to have clear images and accurate data. When working in some poor environments, UAV is more flexible in flying at low altitude and can complete surveying and mapping tasks without being affected by external conditions. UAV can adapt to flying in complex environments, and can complete various instructions safely and quickly on the premise of ensuring its own safety. With the continuous improvement of technology, the remote sensing technology of UAV low-altitude operation is also constantly upgraded, which effectively improves the rapid response capability of UAV and improves the overall effect and quality of surveying and mapping.

4 Matters Needing Attention in Applying UAV Remote Sensing Mapping Technology in Engineering Surveying and Mapping

4.1 Regularly Check Related Equipment

In order to effectively play the role of UAV remote sensing surveying and mapping technology in engineering surveying and mapping, and achieve the highest surveying and mapping quality, surveyors must regularly check and debug related equipment. First of all, before entering the site, the equipment must be thoroughly inspected according to strict quality standards. For the equipment that has passed the quality inspection, the equipment should be regularly adjusted according to the work requirements of actual engineering surveying and mapping. Secondly,

regularly check the relevant communication equipment, ground radio and power supply system, etc., so as to lay a solid foundation for the normal operation of the equipment; Finally, in the actual process of surveying and mapping, we should also check the quality of films in all directions to avoid overlapping films and winding routes. For example, when checking the image quality, you can visually check its clarity, color and other effects.

4.2 Optimize the Measurement Process of Image Control Points

In order to promote the application of UAV remote sensing surveying and mapping technology in engineering surveying and mapping, and make the layout of shooting control points more effective, the staff must constantly optimize and upgrade the process of measuring control points. Firstly, from the actual shooting range of UAV, the effect of free net in shooting area is tested, and fast jigsaw puzzles of free net are generated. Secondly, in the process of setting up the scheme of image control point measurement, we should focus on the topography of the target measurement range and other characteristics to ensure the quality of image control point photos. In the process of data collection or data processing, the staff must keep in mind that the original data cannot be deleted or modified at will, nor can any operation instructions that can reprocess and combine the data be set in the UAV data processing system, so as to save the real original engineering surveying and mapping data for scientific adjustment in the future. Finally, because a large amount of data information will be stored in the collector during the UAV shooting, it is necessary to organize the detailed information collector regularly according to the actual needs.

5. Unmanned Aerial Vehicle Remote Sensing, China

With the continuous innovation and development of technology, in order to develop in an all-round way, all countries in the world have conducted research on UAV technology and remote sensing technology, and achieved certain results, especially in the military field, which has strengthened national defense capability. China's UAV technology research and development started late, but its innovation ability is strong. In a short period of time, it has made remarkable achievements, and the gap between developed countries is narrowing. Especially in recent years, the development is getting faster and faster, and other countries are optimistic about China's UAV technology, which also proves that our UAV technology is getting more and more advanced. While investing in the

research and development of UAV technology, China's remote sensing technology is also making continuous progress and development, and its innovation ability is constantly improving. Under the background of technology convergence, the combination of the two technologies has achieved a driving force for all walks of life, and is constantly developing in a brand-new field, playing an important role in various fields such as emergency rescue and disaster relief, coal mine survey, long-range shooting, and news production. Although the UAV remote sensing mapping technology is developing and improving, there are still some problems in practical application, which need to be improved and improved through adjustment and improvement, so that it can be popularized and applied in a wider field. Technical deficiencies are mainly reflected in flight and communication. Affected by the flight fuselage, the UAV is light in size and windy in the air. If the operation is improper or the weather is bad, the flight of UAV will be affected, and the surveying and mapping effect will not meet the standard requirements. Only by doing a good job in design research and reducing wind obstacles can it be widely used. Communication is mainly affected by transmission, because unmanned aerial vehicle (UAV) needs to survey regional space, and all kinds of data should be transmitted in time to enter the command platform on the ground. Only in this way can all kinds of data be analyzed in real time, so as to prepare for drawing. The instability of the network has affected the rapid transmission of data, especially for operations in mountainous areas, and its data transmission speed is slow, which cannot guarantee the drawing needs.

6. Conclusions

Unmanned aerial vehicle (UAV) remote sensing technology plays an important role in engineering surveying and mapping, and brings great convenience to engineering surveying and mapping work. Only by continuously strengthening and popularizing, can we sum up experience in practice, continuously optimize technology and promote the healthy development of surveying and mapping. To sum up, the application of unmanned aerial vehicle

remote sensing in the field of surveying and mapping has improved work efficiency and quality. Especially in the complex geographical conditions, it can work with high intensity, which improves the efficiency and safety of surveying operations in surveying and mapping engineering to the greatest extent and ensures the accuracy of shooting data. In the future, UAV technology will be applied in more fields, and I believe China will reach new heights in UAV field.

References

- [1] Li Jun. Application of UAV Remote Sensing Mapping Technology in Engineering Survey[J]. China New Communications, 2018,20(18):91.
- [2] Luo Tianyu. Application of UAV Remote Sensing Mapping Technology in Engineering Surveying and Mapping[J]. Science and Technology Innovation, 2018(23):17-18.
- [3] Han jinrong. application of UAV remote sensing mapping technology in engineering surveying and mapping[J]. north China land and resources, 2018(04):61-62.
- [4] Wang Lu. Application Analysis of unmanned aerial vehicle remote sensing in Surveying and Mapping Engineering Survey[J]. Research on Urban Construction Theory (Electronic Edition), 2018(22):106.
- [5] He ying. discussion on the development and application of unmanned aerial vehicle remote sensing in Qinghai engineering surveying and mapping[J]. engineering technology research, 2018(06):95-96.
- [6] Liu jing. Application of UAV Remote Sensing Mapping Technology in Engineering Surveying and Mapping[J]. World Nonferrous Metals, 2018(24):156-157.
- [7] Li Jianwei. Application of UAV remote sensing mapping technology in engineering mapping[J]. Shandong Industrial Technology, 2018(10):139-139.
- [8] Kuang Zhijie, Guo Hangfeng. Analysis on the application of UAV remote sensing mapping technology in engineering mapping[J]. architectural knowledge, 2017(14):68-69.