

Application of UAV aerial survey technology in mine environmental geological survey

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Abstract: With the continuous development of science and technology, UAV technology is becoming more and more mature. It has simple operation and less environmental restrictions. It can engage in some high-risk activities. Especially in the field of Surveying and mapping, instead of the traditional manual surveying and mapping method, it can measure and analyze some difficult geological environments. Based on the characteristics and methods of UAV aerial survey technology at the present stage, this paper mainly analyzes its application in mine environmental geology, provides new ideas and solutions for geological environment treatment, and hopes to provide practical help for the development of similar work in the future.

1. Introduction

1.1 Overview of UAV aerial survey technology

UAV aerial survey technology is a new remote sensing technology, a supplement to satellite remote sensing, and an effective integration of aircraft technology, communication technology and positioning system. The perspective of satellite remote sensing is wider, the information is more macro and comprehensive, and can be monitored continuously without the limitation of terrain and other natural conditions; The UAV technology is shooting at low altitude, with high resolution and precision, and is less affected by the weather. It can shoot or video as needed at any time, but its observation range is relatively small, the cost is relatively high compared with the satellite, and the data processing is difficult. UAV aerial survey technology has greatly filled the vacancy of aerial photogrammetry. It has the characteristics of flexibility, fast and efficient, accurate and fine, short operation cycle and so on. It is a new development direction in the field of aerial remote sensing.

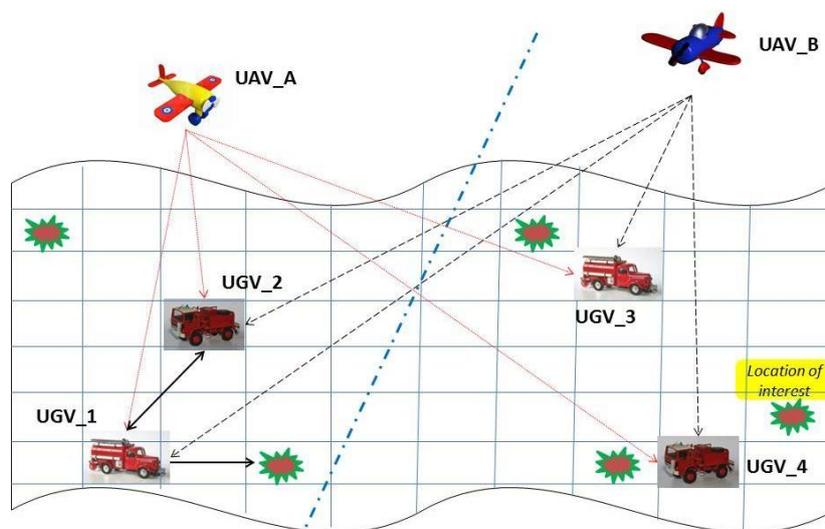


Figure 1 Utilizes a combination of unmanned aerial

1.2 Advantages of UAV aerial survey technology

Firstly, it has higher data resolution. In the process of using UAV aerial survey technology, no one has the opportunity to carry sensors for aerial survey, while the sensors carried by UAV

generally have high pixels, which can collect centimeter unit images and realize centimeter level ground image resolution, So as to meet the needs of remote sensing image map production with various scales, which is not possessed by other measurement technologies. Secondly, it has faster data update speed. The UAV technology is characterized by automatic collection of ground data under unmanned conditions. Because it needs to fly at low altitude in the surveying and mapping process, the geographical conditions have less restrictions on it. As long as the weather conditions adapt, it does not encounter rain, snow, typhoon, hail and other weather, UAVs can carry out effective aerial survey. This advantage greatly improves the timeliness of data acquisition and update of UAV aerial survey technology.

2. Specific application of UAV aerial survey technology in mine geological environment treatment

2.1 Specific application in mine geological environment treatment

(1) Collect data

In order to improve the safety and reliability of UAV operation, firstly, the topographic data of the corresponding area should be collected in combination with the geographical characteristics of the mining area. Before using the UAV, you should have a certain understanding of the situation in the area. You must not use the UAV under unknown circumstances, so as to avoid safety problems as much as possible. In the specific work process, it is also necessary to check all equipment needed to accurately delimit the coverage of UAV and ensure the safe and stable flight of UAV. By collecting the terrain data in the corresponding area, the safe use of UAV can be ensured and the incidence of fault problems can be reduced. The images obtained by UAV aerial survey are rich in bearing information and completely cover the surface information of the disaster body. Through image interpretation, the disaster pregnant environment and disaster bearing body of the geological disaster body can be quickly investigated, so as to provide a basis for the selection of disaster response methods (governance, avoidance and further observation). The high-resolution UAV aerial survey results can interpret the land use and the construction of engineering facilities on the disaster body, comprehensively evaluate the feasibility and rationality of its utilization and construction in combination with the disaster pregnant environment, and correct the unreasonable utilization methods in geological disaster areas such as landslide and collapse, such as slope excavation, road and house construction. It can monitor the slow geological disasters, such as the sliding of the back wall of the landslide mass on the soft matrix, the collapse of the topsoil in the swelling area at the front of the landslide, the outburst of groundwater, the destruction of surface vegetation and so on. Combined with geological geophysical exploration, groundwater observation and other means, the three-dimensional comprehensive observation of geological disaster body in environmental geological survey can be realized.

(2) Aerial survey

In the actual detection stage, the staff only need to scientifically and reasonably control the UAV to achieve clear shooting. In this process, attention should be paid to the following points: ① speed control of UAV to ensure stable flight and appropriate speed of UAV. ② Control the height of the UAV. If the height is low, it may encounter tall trees or buildings. If the height is high, it will reduce the definition of the image.

(3) Data sorting and analysis

After completing the aerial survey, the staff sorted out the obtained image data and screened out the clearer and intuitive images for subsequent analysis. During image processing, the staff can use professional software tools to process the selected images to a certain extent, and draw them into the current situation map of geological environment damage according to the corresponding proportion, so as to provide necessary reference data for the development of geological environment remediation. In addition, the staff can also use the encryption software to securely encrypt the obtained image to ensure the security of the information. Through the sorting and analysis of various data and information, it can intuitively show the application effect of the remediation

scheme, help relevant personnel to improve the existing scheme, and then improve the development efficiency of geological resources around the mining area.

2.2 Practical application

For the implementation personnel of geological environment treatment, the wide application of UAV equipment not only saves labor cost and speeds up work efficiency, but also effectively avoids mistakes and ensures the accuracy of data information. In the subsequent construction process, the staff can also apply the obtained data to improve the construction scheme in operation, ensure that the corresponding geographic location information is more accurate and reduce the waste of resources as much as possible.

3. Advantages of UAV aerial survey technology in geological environment treatment

In view of the above shortcomings of traditional surveying and mapping in geological environment governance, UAV aerial survey technology can compensate for the shortcomings of traditional surveying and mapping technology and give play to its advantages in geological environment governance.

3.1 High efficiency

Traditional surveying and mapping requires a lot of manpower to enter the site, divide the survey stations through traditional instruments, measure one by one, collect data and draw images. If the terrain is complex, not only the manpower and material resources invested will be doubled, but also safety accidents and potential safety hazards may occur when working in some areas with steep terrain. UAV requires less personnel, which can greatly improve work efficiency and ensure the smooth progress of geological environment treatment.

3.2 Image

UAV aerial survey technology is intuitive and can graphically display the surrounding geographical characteristics, so that the management workers can better grasp the surrounding situation, so as to provide operable means for decision-making and final management scheme. As a new technology, there are many advantages and disadvantages in application, such as endurance ability and requiring professional operators to have high professional quality. However, the shortcomings do not hide the shortcomings. UAV aerial survey has a wide application prospect in geological environment treatment and is also the trend in the future.

4. Measures to improve surveying and mapping quality

4.1 Scientific use of mapping

Ensure the accuracy and accuracy of the surveying and mapping drawings. In order to speed up the progress of the work, the accuracy and picture definition of the surveying and mapping drawings should be strictly required. The preliminary preparation of the ground should be far from the underground mining. The mining work should be carried out according to the precise relationship with the underground roadway, which not only provides flexible judgment for the production command, It not only ensures the steady state of work, but also improves the ore survey efficiency.

Table 1 Statistics of aerial survey accuracy of UAV

Range of range (CM)	quantity	Proportion
[0,3)	2	2.82%
[3,6)	5	7.04%
[6,9)	8	11.27%
[9,12)	14	19.72%
[12,15)	24	33.8%
[15,18)	10	14.08%
[18,21)	6	2.27%

Ensure the integrity and comprehensiveness of the contents of Surveying and mapping drawings. With the continuous expansion of the mineral industry, higher requirements are put forward for the drawing. The implementation of the legend of mine geological survey supplementary stipulates the standardization and rationality of the drawing of symbols and notes. Therefore, while ensuring the integrity and comprehensiveness of its contents, the drawings should be drawn in strict accordance with relevant regulations, which helps employees to clearly and thoroughly understand and understand the survey project, and also comprehensively show the current situation of mining production.

4.2 Good at computer application

Combine the calculation form of elevation and control survey. The important steps of construction are elevation and control survey. Generally, the two parts of ground control and underground control are carried out at the same time, which forms a control network with the same coordinate and elevation system. In order to make the work easier, it is necessary to use effective equipment such as leveling network suppression or electromagnetic wave for multi angle control in elevation survey. The calculation method combining through survey and directional setting out is adopted. The calculation to be completed underground is the combination of through survey and directional setting out. Survey the control points outside the roadway excavated in the opposite direction and the traverse control points close to the through face in the roadway are through survey; On the basis of determining the coordinate direction of the control point, the distance and direction between the unknown point and the survey station are calculated, so as to determine the position of the setting out point is directional setting out, which is adjusted to each other before each other.

5. Conclusion

In the process of renovating the geological environment, the traditional technology can not keep up with the development of the times. The development and application of UAV aerial survey technology provides a new idea for the efficient development of geological environment treatment around the mining area. The wide application of UAV aerial survey technology can provide more accurate and comprehensive data information for relevant staff, so as to ensure the smooth implementation of the remediation scheme. The UAV low altitude aerial survey technology has the characteristics of "three high and one low", that is, high mobility, high resolution, high integration and low cost, which can make up for the deficiency of the former. This example has been successfully verified. Therefore, it is suggested to vigorously promote the UAV low altitude aerial survey technology in the future environmental geological survey.

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