

Application of UAV Aerial Photogrammetry in Land Acquisition and Demolition Project

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Abstract: The application of UAV aerial photogrammetry reduces the error of manual measurement and statistics, improves the accuracy of measurement data, and is of great significance to improve the data processing efficiency of land acquisition and demolition project. In view of this, this paper analyzes the overview of UAV aerial photogrammetry, the application of control point measurement and the application of measurement data analysis, and obtains the conclusion that UAV aerial photogrammetry mainly includes site investigation, measurement data acquisition, photo control point measurement and so on, hoping to help improve the application of UAV aerial photogrammetry in land acquisition and demolition project.

1. Introduction

UAV aerial photogrammetry shows the relevant information of land acquisition and demolition in the form of three-dimensional modeling renderings, which is simple and clear. It can clearly grasp the actual situation of the land acquisition and demolition project. At the same time, it uses GIS technology to achieve positioning and measurement, which provides quantifiable data support for land acquisition and demolition project. Due to the low cost, accurate measurement data of UAV aerial photogrammetry and less problems in the follow-up, it can provide satisfactory measurement service for Party A, so it is widely used in the measurement of land acquisition and demolition project.

2. Overview of UAV Aerial Photogrammetry

With the acceleration of urbanization process, urban land use, demolition, planning and other work also followed. The efficient completion of these work is of great significance to build a livable urban living environment, but the traditional urban land acquisition and demolition project work efficiency is low, mainly using manual statistics, measurement means to complete the analysis of land acquisition. The work process is cumbersome and efficiency is low. There also will be disputes with householders, affecting the process of land acquisition and demolition. The emergence of UAV aerial photogrammetry technology has changed the disadvantages of the traditional land acquisition and demolition engineering measurement methods, completing aerial photography in pilotless way. In this process, UAV can not only effectively remove flight obstacles, but also widely collect valuable information to realize the survey of various land acquisition terrain. Because the current visual navigation system of UAV is realized through the combination of computer and camera, so it can recognize and calculate the position, obstacle and road condition of the captured image through the computer system, which makes the UAV aerial photogrammetry have the characteristics of high accuracy, high efficiency, flexibility and multi terrain applicability. In addition, due to its low labor cost, it can carry out flexible operation under the cloud, so it is widely used in geological disaster survey, water conservancy project construction, urban construction and other surveying operations.

3. Measurement and Control Point Application of UAV Aerial Photogrammetry in Land Acquisition and Demolition Project

In the process of UAV aerial photogrammetry, it is necessary to do a good job in terrain survey, analyze the surface morphology of terrain, such as house layout, infrastructure, site leveling, and collect effective measurement points to achieve data measurement and analysis, so as to provide accurate data support for land acquisition and demolition project.

3.1 Site Analysis of UAV Aerial Photography

The aerial view of UAV under remote sensing image is generally divided into three-dimensional view and plane view. The pixels of these two views are low, which can only roughly see the general distribution of houses, roads, rivers, etc., and it is difficult to analyze the specific site conditions. Therefore, in this case, the aerial photography technology of low altitude UAV should be used to complete the site survey, and PhotoScan software should be used to do the image processing work. We can see that under the application of UAV aerial photogrammetry technology, the identification rate of the formed site analysis map is higher. The site conditions of land acquisition and demolition projects are clear at a glance, and the distribution of houses, roads, buildings, etc. can be clearly seen, which has an important guiding role in the design and planning of construction projects. Moreover, UAV aerial photography technology also has positioning function. Through the introduction of UAV GPS technology, it can not only realize the positioning of specific survey objects, but also realize the accurate measurement of specific objects. Therefore, it can realize the effective control of land acquisition and demolition project on the whole, which provides reference for the formulation of scientific demolition strategy.

3.2 Acquisition of UAV Measurement Data

The acquisition of UAV measurement data must first determine the image acquisition area. On the one hand, the selection of the image acquisition area is limited by the terrain, and the appropriate location needs to be selected according to the requirements of the terrain. On the other hand, due to the requirements of Party A's measurement, the data measurement needs to be completed according to the area formulated by Party A. In addition, in order to ensure the comprehensiveness of the measurement, the measurement range should be slightly larger than the specified measurement range, so as to ensure the integrity and validity of the data. Moreover, the UAV aerial photogrammetry needs to do the preparatory work, such as adjusting the UAV camera frame, photographing baseline, and navigation related routes^[1]. In the process of image data acquisition, the images are taken according to different displacement positions, so as to obtain effective measurement data. In the data measurement of land acquisition and demolition project, we should also pay attention to the angle of image data acquisition, such as setting the angle less than 6 degrees to complete the data acquisition work. After the measurement, it is necessary to sort out the measured data, mainly including UAV operation time, dimension, longitude, navigation height, yaw angle, pitch angle, roll angle and other data, so as to ensure the order of data and facilitate the use and processing of subsequent data.

3.3 UAV Photo-Control-Point Measurement

Through the previous analysis, it can be seen that before the UAV aerial photogrammetry, it is necessary to set the corresponding navigation route according to the requirements, and complete the navigation parameters matching with the navigation route. On this basis, the UAV photo control points are set to make preparations for the subsequent UAV photo-control-point measurement. Generally, the photo control points are set as the overlapping area of the side direction and the heading, and the main control forms are object-control-point control and photo-control-point control. The object-control-point control mainly uses the known points on the graph to complete the control. The selection of the known points on the graph is very critical. Not any point can be used as the object control point to measure. In order to ensure the convenience of measurement, the objects that can be identified and easily located should be selected as the object control points of UAV. Photo-control-point control mainly uses eye-catching control means to complete the measurement of photo control points, such as by setting eye-catching signs or painting and coloring photo control points. After completing the setting of photo control points, UAV aerial photogrammetry is carried

out. There are many kinds of UAV aerial surveying tools, but the measurement of photo control points is mainly carried out by total station, receiver and GPS receiver. In the process of survey, multiple measurements are needed to find the corresponding coordinates, so as to ensure the accuracy of photo control point measurement data.

4. Data Analysis and Application of UAV Aerial Photogrammetry

After UAV aerial photogrammetry, it is necessary to do a good job of data analysis and processing to better apply the data to the land acquisition and demolition projects, and formulate scientific land acquisition and demolition strategies. Therefore, after the UAV aerial photogrammetry survey, it is necessary to do a good job in data processing, result output and result evaluation, so as to form a systematic UAV aerial photogrammetry data and provide accurate and effective data support for land acquisition and demolition.

4.1 Application of Data Processing

UAV aerial photogrammetry processing work needs to follow the *Low-altitude Digital Aerial Photogrammetry Industry Specification*. In this process, it is necessary to follow the following data processing procedures. First of all, we should do a good job in processing the impacted data, including the abnormal image processing, rotation adjustment of improper image position, and the related processing of the original images. Secondly, the processing of triangulation data needs to be done^[2]. Data processing is mainly completed with the help of Inpho software, and this process needs manual assistance, using adjustment and three adjustment to complete the data processing. Thirdly, image generation and production should be done. After the three-dimensional measurement of data is completed by iData software, the planning topographic map and orthophoto topographic map are made by Inpho software. Fourthly, it is necessary to organize, edit and review the topographic map design, and organize the second survey as soon as possible after finding the wrong information or survey loopholes, so as to ensure the integrity and accuracy of the survey data.

4.2 Application of Result Output

After the data processing of UAV aerial photogrammetry, the output of data results is carried out. This work requires a clear understanding of the data requirements for demolition and land acquisition projects, such as the building area, the number of houses, the total land area, the number of house floors and other information involved in the land acquisition and demolition of construction projects. The information should be output orderly and numbered to facilitate the application of data information. In addition, there are certain requirements and restrictions on the image output. On the one hand, it should meet the image data requirements provided by Party A, and output the image results according to the requirements. On the other hand, the output of image results should be completed according to the *Low-altitude Digital Aerial Photogrammetry Industry Specification*. The general image ratio should be set to 1: 1000 ratio. In addition, the output of the results should also show the new data of the survey, that is, the new buildings, public facilities, houses, etc.

4.3 Application of Result Evaluation

UAV aerial photogrammetry data needs to ensure the accuracy and availability of data, so after the output of data results, we should do a good job in the evaluation of the results, check whether these data are available, meet the data requirements of demolition and land acquisition. If not, or there are deficiencies, we should timely arrange the follow-up UAV aerial photogrammetry work. In addition, the labor cost of UAV photogrammetry for land requisition should be statistically reviewed, including the salary of personnel, the cost of food and accommodation, the cost of UAV operation, etc., so as to complete the overall evaluation of the survey results, reduce the occurrence of follow-up problems, and provide guarantee and support for providing Party A's high-quality survey services^[3].

5. Conclusion

UAV aerial photogrammetry technology has changed the disadvantages of manual measurement, which not only improves the measurement efficiency, but also reduces the conflicts and disputes between householders in the process of land acquisition and demolition. In the specific application, it is necessary to do a good job in aerial photography site analysis, acquisition of measurement data and measurement of UAV photo control points, and complete data processing, output and result evaluation on the basis of measurement work. Once the incomplete and wrong survey is found, the secondary UAV aerial design survey should be carried out in time to ensure the integrity and accuracy of the survey data, so as to provide high-quality photogrammetric services for land acquisition and demolition projects.

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References

- [1] Duan Mingxia, Guo Guangming. Application of UAV Aerial Photogrammetry in Land Acquisition and Demolition Project. *Engineering Investigation*, vol.49, no.01, pp.62-66, 2021.
- [2] Qiao Tianrong, Ma Peiguo, Xu Lianfeng, Liu Pingli. Key Technology and Application Analysis Based on UAV Tilt Photogrammetry. *Mineral Exploration*, vol.11, no.12, pp.2698-2704, 2020.
- [3] Hao Lijuan, Guo Rubao, Du Bin, Liu Yonghong. Application Analysis of UAV in Large-scale Topographic Mapping. *Surveying and Spatial Geographic Information*, vol.43, no.12, pp.168-171, 2020.