RESEARCH ARTICLE

Practice of Small and Medium UAV in Large Scale Topographic Map

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Abstract: as a basic surveying and mapping work, small uav has been widely used in large scale topographic mapping. According to the needs of production and construction, digital mapping methods and aerial photogrammetry are used to provide technical support for large scale topographic mapping in engineering construction surveying and mapping, urban planning and construction, cadastral surveying and other directions. In order to control the small uav in the terrain elevation information, mapping proportion accuracy and other aspects to get better improvement, the practice of small uav in large scale topographic map is deeply analyzed, in order to understand the practical application value of small uav in large scale topographic map.
Keywords: Scale; Topographic map; Unmanned aerial vehicle; Practical application

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1. Introduction

With the continuous development of surveying and mapping technology, small uav aerial photography surveying and mapping has been widely used in the practice of large scale topographic map surveying, providing important technical support for the acquisition of large geographical information and data. Different from the traditional GPS-RTK whole field acquisition method, small UAV aerial photography has significant advantages in data acquisition efficiency, labor cost and mapping cycle, and also provides technical support for the wide application of small UAV in surveying and mapping industry.

2.Small UAV application characteristics analysis

2.1 Structure and system characteristics of small uav

Small unmanned aerial vehicle (uav) based on aerial system of unmanned aerial vehicle (uav) flight platform, is the image sensor for mission equipment aviation remote sensing image acquisition system, combining the production practice is widely used in professional areas such as aerial, agricultural plant protection and equipment inspection, small unmanned aerial vehicle (uav) is driven by power, its structure by propeller, electronic governor, brushless motor, battery, charging device and the remote control. It has the characteristics of small size, low cost and not easy to cause casualties. It can be equipped with airborne radar system, guidance system, cameras and sensors [1].

2.2 Small uav data acquisition and processing

Small unmanned aircraft system with small civil uav dynamic database system running, small uav flight control and data acquisition is composed of multi-core function module, the obvious data dependencies between each function module, to provide unmanned aerial vehicle (uav) with the weather in the service of service, etc., for small unmanned aerial vehicle (uav) to collect data including: Real-time monitoring of position, altitude, speed and other operating information.

2.3 Application value in surveying and mapping large scale topographic map

In the traditional large scale topographic map surveying and mapping, commonly used to the big plane table and small plane-table mapping method and the theodolite with small plane-table mapping method, using the coordinate method and the analytic method to carry out survey-

ing and mapping work, in the process of surveying and mapping by artificial records, manual operation, artificial drawing and measuring coordinates and distance area etc., With the rapid development of computer technology, small UAV has gradually replaced traditional surveying and mapping methods in the development process of modern aerial photography [2].

3. Application of small UAV in large scale topographic map

3.1 Uav image control point layout scheme

According to the requirements of surveying and mapping terrain and UAV technical design, carry out route design and division of aerial photography area, formulate relevant data collection methods, collect and analyze the terrain conditions data of the survey area, and process the data collected from uav photogrammetry data. In the image control point layout scheme, it is arranged according to 10-15 basic risks. In the image control point layout, regional network points of 1:1000 and 1:2000 are set according to the plane height of topographic region. The plane heading baseline span is less than 7 baselines, the adjacent side span is less than 5 airline lines, and the elevation heading baseline span is less than 4 baselines. For the layout design scheme of adjacent air routes with a span of less than 3, to avoid loopholes in the connection area of the mapping section, the schematic diagram of the weekly layout of the image control points is set up and the drawing is started.

3.2 Analysis of uav aerial camera data

When uav is used to carry out large-scale topographic mapping, the average aerial photography scale is 1:23,533, the ground height is 1500, and the photographic mapping is required to be carried out under the condition of 1:2000. Under normal circumstances, the spacing and side overlap Angle of airline is between 30 and 40%. Heading Angle overlap between 60 to 70%, avoid camera hole, existing course is beyond the scope of surveying and mapping range of 2 ~ 5 baseline, the image photo Angle < 4 °, screw slant Angle < 8 °, from east to west and from south to north of flying quality standard requirements, drone aircraft camera multi-select when there is no cloud cover under the good weather, Thus, clear aerial photographic data can be obtained [3].

3.3 Image control point and elevation mapping

For large scale topographic map surveying and mapping work, usually adopt total field aerial mapping manner, to the data acquisition of different landforms, and its accuracy specification for the basic topographic map elevation must conform to the specified in table 1 (see table 1), like using total station such as device control point coordinates of surveying and mapping work, Carry out surveying and mapping according to the surveying requirements and progress according to the conventional image control point measurement specifications, use dual-frequency GPS receiver to collect the control points, and save them to the reference station after the surveying and mapping of the image control points, so as to improve the accuracy and reliability of the photo album point measurement results.

According to actual design need of surveying and mapping, mapping scale and the elevation note point relative to the adjacent control points in the elevation error is not more than + / - 0.15 m, and in the bare area and special geographical location using trigonometric elevation practices so as to realize the height marker position measurement, inspection process and distribution density of topographic map check and acceptance for amount.

4. Conclusion

Through the understanding of the unmanned aerial vehicle (uav) photography technology of surveying and mapping, the use of small unmanned aircraft to carry out large scale topographic map surveying and mapping can effectively implement efficient work efficiency, with the continuous innovation of modern flight platform technology, on the effect of data collection processing and camera system play a huge role in the field of surveying and mapping, effectively shorten the time limit for a project of surveying and mapping in the low Labour cost, Under the premise of permission of airspace control, small UAV model is optimized for large scale topographic map mapping.

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