Ariel Mapping Using UAV

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Abstract: Surveying is the most essential part has to taken before taking any action on the earth-objects. It helps in recognizing the object with all its physical and chemical properties. The surveying object was to make a site map and locate the different positions of the objects on the earth surface. The map can be drawn with suitable scale to compare. This can show the natural recourses and its uses of a different country like towns, villages, roads, railways, rivers, etc. Maps also include details of different engineering works, such as roads, railways, irrigation canals, etc. Starting from civil to geology all are undergoing surveying and mapping to make their effective.

Keywords: Ariel, Control, Mapping, Resolution, UAV, Unmanned.

I. Introduction

Sometime it becomes more challenging to map large surface areas when it exceeds more than a kilometer. Basically in small areas the surveyor use to take the snap of the surface from different coordinates, different angles or different geographic locations with proper GCPs. When the issue comes in larger areas then aerial survey term comes. Aerial survey is a technique by which the geometrics data can be collected by using using aero planes, or UAVs, balloons or other aerial methods. Typical types of data collected are aerial photography, LiDAR, remote sensing (using various visible and invisible bands of the electromagnetic spectrum, such as infrared, gamma, or ultraviolet) and also Geophysica data (such as aeromagnetic surveys and gravity. It can also refer to the chart or map made by analyzing a region from the air. Aerial survey technique provides better resolution compare to the satellite image. Using this technique the quality of image will be good and atmospheric conditions can be detected, whereas these parameters cannot be found using satellite image. So this technique is very useful compare to the satellite image. In the aerial survey photograph was taken from high resolution camera using UAV or any other flying device from higher altitude. This image can be analysed and result can be obtained for different parameter.

A. Surveying May be Used for the Following Various Applications:

- To make map for topographical area. This will the different part of earth surface like hills, valleys, rivers, villages, towns, forests.
- To prepare a map which can detect the boundaries of houses and fields.
- To prepare engineering map. This engineering map can show the details of construction of roads, railways line, irrigation or canals project, etc.
- To make a military map. Using this map the road and railway communications and other communication can be find out.
- To measure the capacity of a reservoir.
- To locate the map, which can show the different areas including underground resources.

B. Survey through UAVs

To do the survey we may required any flying device which can take the photograph from a higher altitude. It is better if this flying object can move in low speed and even can capable of to take the photograph with standstill. For this purpose an airplane, helicopter of balloon can be used. This is the era where the bigger aircrafts and helicopters can be replaced by small flying robots. Here the issue comes in carrying a camera only, so flying a small machine much better here. A drone mapping platform for easy, fast and accurate aerial data acquisition that will enable you to take informed and targeted action. The UAV is less costly. This can fly in low altitude. It also capable of taking photograph with stand still position. To operate this we do not required more manpower as well as big operating fields.

C. Objective

- Use the UAV as Ariel survey.
- To find out the relationship between the focal length, coverage angle. To understand specific focal length for spe-

cific condition.

- To calibrate the high resolution camera by using UAV. Photograph was captured from UAV at flying condition. Due to vibration there may be error on photograph.
- Capture two dimensional photograph and process using the software. The dimension obtained from the analysis should be compare with the manual result.
- Compare the three dimensional analysis result with manually obtained results.
- After well comparison of the result obtained from Ariel survey and manual, many different objects can be consider to measure the volume, and other dimensions.
- Determine the combined effect of tilt, vertical horizontal photography.
- Verify the speed of UAV does not impact on taking photography. Also taking photograph at different altitude with above condition.

II. Procedure

- UAV was designed according the proper weight estimation and other aerodynamic design configuration.
- Camera was fitted vertically down to the vertical axis, with vibration isolation system.
- Good atmosphere was chosen over the survey field with least of fug and water vapor.
- Flight path was planned over the UAV control system for self pilot system (auto pilot).
- Camera photos was taken having minimum 70% overlapping with other images.
- All the photos taken were geo tagged with proper latitude, longitude and altitude.
- Then images were processed in software for further analysis.

UAV Details

Type – quad rotor

Configuration – x-type

Flight communication frequency – 2.4 GHz

Telementary communication frequency - 915 MHZ

FCS - APM 2.6 AUTO PILOT

Total weight - 1.5 KG

Range - 2 KM

Endurance – 20 MIN

Camera Details

Model name - GO PRO HERO 5

Pixels - 12 MP

Resolution - 4000 * 1000

Stabilization

2 axis brushless gimbals

Software Used

PIX4D

AGISOFT

GOOGLE EARTH

ARC GFS

AUTOCAD

CATIA

III. Result and Discussion

Experiment 1: (Site mapping for one dimension)

Place: Patrapada, Bhubaneswar Date: 2nd/Dec/2016

Time: 7:24:50AM Software: Pix 4D

Fig. 1: Site Picture for Survey (One Diemensional)

Experiment 2: (Site mapping for three dimension)

Fig. 2: 3-D Picture for Survey

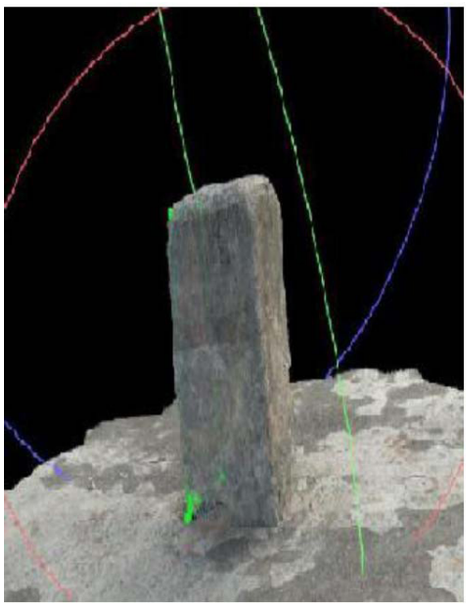

Fig. 3: Capture from UAV

Fig. 4: Capture from UAV

Above two experiment are done by taking picture from UAV. Initially the ground survey was done by manually at ground. And the obtained data from UAV was analysed and compared with manual data. It was observed that the measurement done using UAV and manual are well compared to each other. The difference are less than 1%.

IV. Conclusion

It was noticed that the results obtained by the UAV survey are well compared with the manual measurement and the difference between these two results are less than 1%. Using ariel mapping through the UAV following are the advantages:

- Up-to-date map as compare to Google map.
- Can provide high image resolution map.
- No need to convert to any scale, because drone satellite gives the full scale map.
- In one click all the measurement (all dimension and volume) can be obtained.
- More precise data can be obtained compare to satellite images.
- It is less time consuming and less costly.

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