USING READY-to-USE DRONE IMAGES in FORESTRY ACTIVITIES: CASE STUDY of ÇINARPINAR in KAHRAMANMARAS, TURKEY

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ABSTRACT:

This short paper aims to present pros and cons of current usage of ready-to-use drone images in the field of forestry also considering flight planning and photogrammetric processes. The capabilities of DJI Phantom 4, which is the low cost drone producing by Dji company, was evaluated through sample flights in Cinarpinar Forest Enterprise Chief in Kahramanmaras in Turkey. In addition, the photogrammetric workflow of obtained images and automated flight were presented with respect to capabilities of available software. The flight plans were created by using Pix4DCapture software with android based cell phone. The results indicated that high-resolution imagery obtained by drone can provide significant data for assessment of forest resources, forest roads, and stream channels.

1. INTRODUCTION

Drones, aerial platforms with mounted sensors, have great potentials to support scientific researches and practitioners in the field of forestry by providing quick and cost effective remotely sensed data. Recent developments in hardware and advanced photogrammetric algorithms such as structure from motion (SfM) add extra advantages to drone based remote sensing applications. Implementation of enhanced methods integrated with remote sensing and drone technologies has dramatically increased in many forestry activities such as forest management, preservation and conservation of forest resources, and forest planning.

2. MATERIAL AND METHODS

2.1. Study Area

The study was performed in Cinarpinar Forest Enterprise Chief (FEC) of Kahramanmaraş Forest Enterprise Directorate in the city of Kahramanmaras in Turkey (Figure 1). The total area of Cinarpinar FEC is 30591.7 ha in which %59.19 is forested land. The geographical location of the study area was 37º44’47”-37º32’38”N latitudes and 36º31’50”-36º52’21” longitudes.

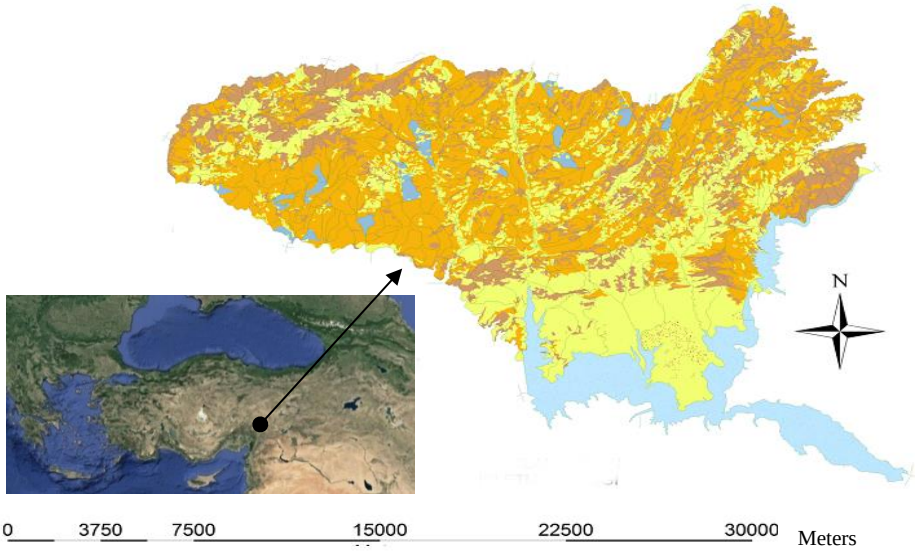

Figure1. The study area

2.2. Field Study

DJI Phantom 4, which is the low cost drone producing by Dji company (Table 1; Figure 2) (Dji, 2016), was used in the field studies. The flight altitude was defined as 120 m, and the ratio of side and forward overlaps were planned as 60% (forward) and 60% (side), respectively. Total of 45 geotagged images were taken in nadir perspective.

Model	DJI Phantom 4
Camera	PhantomVisionFC 2000
Resolution	12.4 MP
Sensor width & height (mm)	1/2.3" CMOS
Image width & height (pixels)	4000×3000
Geolocation	On-board GPS/GLONASS
Flight time (min)	28
Photo	JPEG, DNG (RAW)

Table 1. Specification of DJI Phantom 4

2.3. Image Process

The photogrammetric workflow of obtained images and automated flight were presented with respect to capabilities of available software. The flight plans were created by using Pix4DCapture software with android based cell phone (Figure 3) (Pix4D, 2016).

Image processing steps executed by PhotoScan can be listed as 1) identification of common points and creation of photo plane for block (alignment of photo), 2) point cloud generation, 3) image meshing, and 4) image texture (Agisoft, 2016). After image processing, several remote sensing data and digital layers can be produced such as orthophotos, contour maps, point clouds, and digital surface models (DSM).

Figure 2. DJI Phantom 4

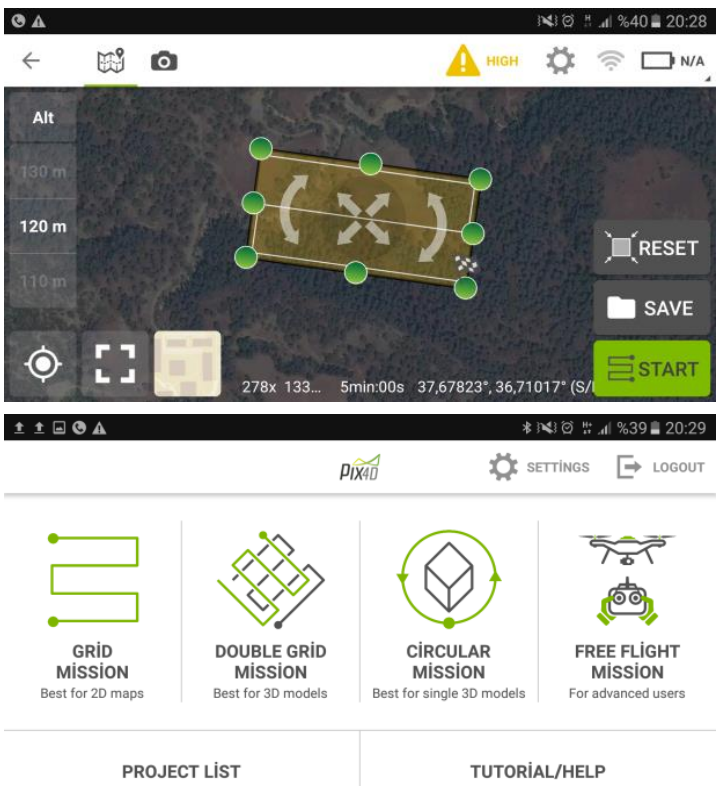

Figure 3. Interface overview of Pix4D Capture in the field (above) and planned flight path (below)

3. RESULTS AND DISCUSSION

In the study, photo alignment was completed by considering 34,654 tie points. Then, analysis of dense cloud point generation was carried out by totally 12,747,742 points (107.534 points/m^2). In the field, the estimated image acquisition height was about 136 meters. As a result, DSM with the resolution of 9.64 cm and orthophoto of 4.82 cm/pix resolution were generated as end products (Figure 4).

The results indicated that even low-level overlapping block, high-resolution imagery obtained by drone can provide significant data for assessment of forest stands, forest openings, stream channels and road, riparian buffer zones, biomass potential etc. in the study area. These results can be used to generate 3D modelling of forest structure and to delineate individual tree parameters. Drones, as very effective surveying tool, enable low-cost mapping opportunity for medium and large forested areas, and promise further evaluations and analysis, according to the specific research objectives.

REFERENCES

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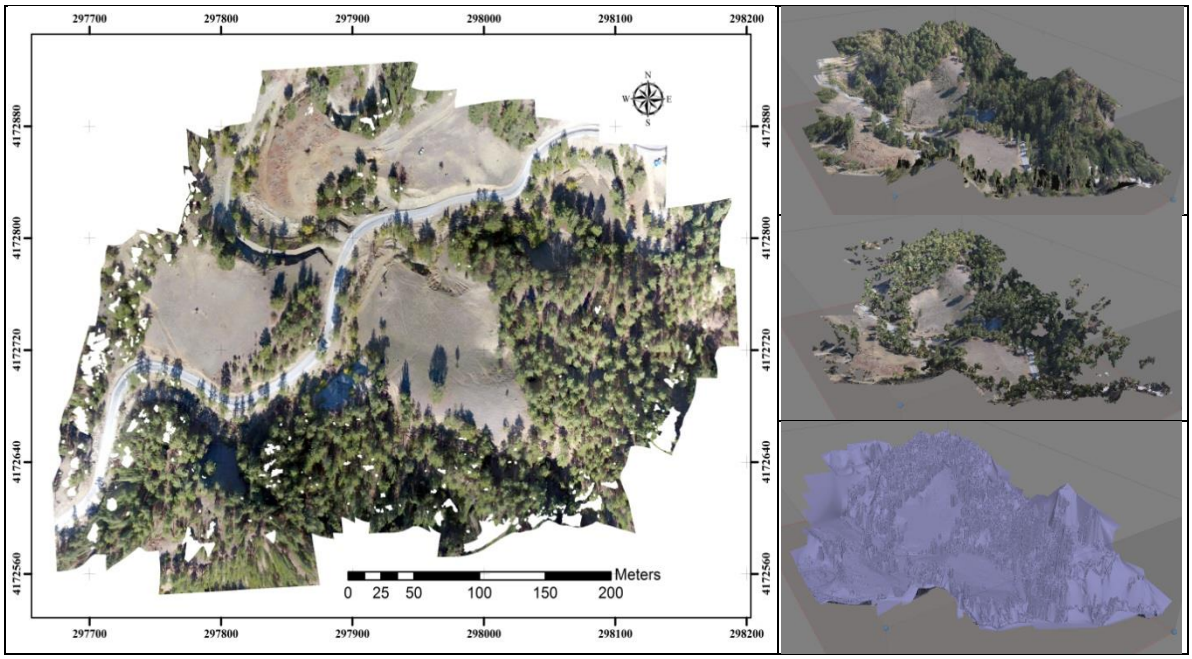

Figure 4. Generated point cloud data by using PhotoScan in forestland