Abstract ACRS2013

UAV-based generation of a very high resolution DTM for hydrological studies along the Chiliwung river, Indonesia

Deni Suwardhi[1], Armin Gruen[2], Rongjun Qin[2], Budhy Soeksmantono[1], Agung Budi Harto[1]

[1]*3Dimension Modeling & Information System*
Remote Sensing & Geographic Information Science Research Group
Institute Technology of Bandung, Indonesia, deni_suwardhi@yahoo.com

[2]*Singapore-ETH Centre, Future Cities Laboratory, Singapore*

1 CREATE Way, #06-01 CREATE Tower, Singapore 138602,
agruen@geod.baug.ethz.ch,rqin@student.ethz.ch

Keywords: Flood modeling, UAV data acquisition, automatic triangulation, DTM generation

Abstract: The UAV technology has received much attention recently, both in terms of technological developments and new applications. The flexibility of these devices in terms of sensor design and implementation, data acquisition and flight pattern mode and on-line and real-time capabilities in data processing make them excellent choices for raw data acquisition in many traditional and novel application fields.

Our paper will report about a project, where very high accuracy DTMs (+- 10cm in height) are required. Neither aerial LiDAR nor regular aerial photogrammetry would give such high accuracy. This can only achieved with low flying UAVs, producing very high resolution images.

Our area of study extents roughly from Bogor along Chiliwung river all the way to Jakarta.

The area is around 2443 sqkm, ranging from -1 to 3000 meters in height. For hydrological and landscape studies DTMs of different resolutions and accuracies were required. The watershed model required a height accuracy of 5m, the corridor model 1m and three smaller areas (Kampung Melayu, Tanjung Barat, Ciawi) required a height accuracy of 10 cm.

The latter could only be achieved with UAV flights. For this purpose we used a model helicopter, equipped with GPS and a Sony NEX -7 camera with a 16 mm lens and 24 Mpixel image format. The flights were performed in fully automated mode in a multiple strips fashion with 85% foreward overlap and 60% side overlap. The three areas cover 9.6, 5, 12.8 sqkm, respectively. The average flying height is around 450 meters, with a GSD of approximate 10 cm. 540, 826, and 425 images in the three areas are used for the final triangulation with evenly distributed ground control points (GCP). The average resulting RMSEs are 0.05 m in planimetry and 0.1 m in height.

After a brief introduction into our modeling problem (flood modeling along the Chiliwung river, Indonesia) we will describe the concept and realization of image data acquisition. Then we will report about our procedures for data processing (geo-referencing/triangulation and DTM determination). We will critically assess the chosen procedures and the results.