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Accuracy Assessment of UAV Mapping Based on Pattern and Density of Ground Control Points

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Unmanned aerial vehicles (UAVs) are very important for surveying purposes of the modern-day construction industry when considering the time and cost allocated for the surveys. The surveyors could use the images taken from high altitudes to obtain orthoimages, digital surface models, and digital terrain models in high temporal and spatial resolutions using the photogrammetric processing software. This study aims to analyze the effect of ground control points that govern the accuracy of the 3D surface model. Thus, the study focused on observing the effective distribution of ground control points. Hence, six different GCP combinations laid in four different laying patterns were examined. Data used for the study were collected using both field surveys and photogrammetric surveys. In the field survey, the X, Y coordinates of the ground control points were examined using a total station and Z coordinates with the automatic level instrument which is considered as the most prominent surveying technique in Sri Lanka. The edge layout and star layout illustrate the maximum accuracy among the four laying patterns in both planimetry and altimetry perspectives. Root Mean Square Error is the method used for error calculation. Based on the study conducted, it is concluded that commercial drones could be used to determine the terrain features with reasonable accuracy.

Keywords: *Unmanned Aerial Vehicles (UAV), Ground Control Points (GCP), Root Mean Square Error (RMSE), Digital Terrain Models (DTM), orthoimages*