Using cheap RTK and IMU in direct geo-referencing of the UAV imager

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Abstract: Aerial photogrammetry is one of the most appropriate ways of data acquisition in producing large-scale topographical maps. Geo-referencing technique for Traditional aerial photogrammetry, called aerial triangulation “AT”, is depending mainly on Ground Control Points “GCPs”. Unlike AT, Direct geo-referencing is the direct position and orientation measurements of the camera during capturing. Each pixel can be geo-referenced to the Earth coordinate system without any needing for ground information. In This study, RTK positioning data from the UAV are then used for direct geo-referencing, and its results are evaluated. Using statistical significance, more than 500 photos taken by UAV were used. Direct geo-referencing was performed using Flight Controller and RTK GNSS system using position information at the time of camera capturing. In direct geo-referencing supported by POS (Position and Orientation System) and exterior orientation elements of each photo. We compared the accuracy of UAV's Exterior Orientation (X, Y, Z, Yaw, Roll and Pitch) by RTK and IMU with EO after AT processing with GCP method.

Keywords: UAV, RTK, IMU, Aerial Triangulation, Direct Geo-referencing