Investigation of GNSS Receiver's Accuracy Integrated on UAVs

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SUMMARY

UASs (Unmanned Aerial Vehicle) find today their ever growing application for military, commercial and personal purposes. The application of UAVs for creation of surveying products like Digital Ortho Photo (DOF), 3D models, Digital Surface Models (DSM), Digital Terrain Models (DTM) etc. is related to the accuracy attainable by GNSS receivers integrated on them. Manufacturers of the UAVs usually do not provide detailed information about GNSS receiver's accuracy and reliability what in turn has a direct impact on implementation of the UAVs in surveying. Therefore, a special testing platform for assessment of the UAV GNSS receiver's accuracy was designed at the Faculty of Geodesy and a testing procedure was developed accordingly. The platform design had to fulfill two fundamental requirements: the tested UAV GNSS receiver should move on a precisely determined trajectory (1) whose size must be significantly greater than the accuracy attainable by the GNSS receiver itself (2). The procedure implemented on designed testing platform involved two geodetic GNSS receivers Trimble R8 (Model 2), one in PPK (Post-Processed Kinematic) and the other in static observation mode, enabling the determination of UAV integrated GNSS receiver's position of controlled trajectory with cm-level accuracy. UAV GNSS receiver's accuracy was tested on platform in static and kinematic mode with 10 Hz frequency revealing the 1 m - level accuracy achieved by absolute positioning method. The accuracy of coordinates determined with the GNSS receiver integrated on DJI Phantom 3 Professional UAV was assessed and the results are presented in this paper. Although, the GNSS receiver used within testing procedure operated in absolute positioning mode, the presented testing platform and procedure is suitable for testing of GNSS receivers using RTK positioning method. The research activities presented herein have paved the road to the accuracy assessment procedure of other sensors integrated on UAVs like IMU (Inertial Measuring Unit).
