AN APPROACH TO OPTIMIZE REFERENCE GROUND CONTROL REQUIREMENTS FOR ESTIMATING LIDAR/IMU BORESIGHT MISALIGNMENT

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LiDAR systems are complex multi-sensory systems and include at least three main sensors: GPS, IMU navigation sensors, and the laser-scanning device. High-performance integrated GPS/IMU systems provide the navigation solution for the LiDAR data acquisition platform, and therefore, the proper calibration, including individual and inter-sensor calibration, is a must to achieve the highest accuracy of the output data. Specifically regarding the boresight misalignment, the spatial relationship between the IMU body frame and the LiDAR body frame is of high importance as it could be the largest source of systematic errors in airborne MMS, and thus must be determined before the system can be effectively utilized. In this research, the feasibility of using urban areas for boresight misalignment is investigated. In particular, the impact of the building shape, size, distribution, etc. on the performance of the boresight misalignment process, is of interest. In this study, photogrammetrically restituted buildings were used as the reference surfaces, called 'building-positions' or 'reference-positions'. The influence of the number of 'building-positions' and their distribution on the boresight's misalignment parameter estimation is investigated and evaluated through QA/QC statistical tests.