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The influence of the in situ camera calibration for direct georeferencing of aerial imagery

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Abstract. The direct determination of exterior orientation parameters (EOPs) of aerial images via GNSS/INS technologies is an essential prerequisite in photogrammetric mapping nowadays. Although direct sensor orientation technologies provide a high degree of automation in the process due to the GNSS/INS technologies, the accuracies of the obtained results depend on the quality of a group of parameters that models accurately the conditions of the system at the moment the job is performed. One sub-group of parameters (lever arm offsets and boresight misalignments) models the position and orientation of the sensors with respect to the IMU body frame due to the impossibility of having all sensors on the same position and orientation in the airborne platform. Another sub-group of parameters models the internal characteristics of the sensor (IOP). A system calibration procedure has been recommended by worldwide studies to obtain accurate parameters (mounting and sensor characteristics) for applications of the direct sensor orientation. Commonly, mounting and sensor characteristics are not stable; they can vary in different flight conditions. The system calibration requires a geometric arrangement of the flight and/or control points to decouple correlated parameters, which are not available in the conventional photogrammetric flight. Considering this difficulty, this study investigates the feasibility of the in situ camera calibration to improve the accuracy of the direct georeferencing of aerial images. The camera calibration uses a minimum image block, extracted from the conventional photogrammetric flight, and control point arrangement. A digital Vexcel UltraCam XP camera connected to POS AV TM system was used to get two photogrammetric image blocks. The blocks have different flight directions and opposite flight line. In situ calibration procedures to compute different sets of IOPs are performed and their results are analyzed and used in photogrammetric experiments. The IOPs from the in situ camera calibration improve significantly the accuracies of the direct georeferencing. The obtained results from the experiments are shown and discussed.

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