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PHOTOGRAMMETRIC MEASUREMENTS IN FIXED WING UAV IMAGERY

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Abstract. Several flights have been undertaken with PAMS (Photogrammetric Aerial Mapping System) by Germap, Germany, which is briefly introduced. This system is based on the SmartPlane fixed-wing UAV and a CANON IXUS camera system. The plane is equipped with GPS and has an infrared sensor system to estimate attitude values. A software has been developed to link the PAMS output to a standard photogrammetric processing chain built on Trimble INPHO. The linking of the image files and image IDs and the handling of different cases with partly corrupted output have to be solved to generate an INPHO project file. Based on this project file the software packages MATCH-AT, MATCH-T DSM, OrthoMaster and OrthoVista for digital aerial triangulation, DTM/DSM generation and finally digital orthomosaik generation are applied.

The focus has been on investigations on how to adapt the "usual" parameters for the digital aerial triangulation and other software to the UAV flight conditions, which are showing high overlaps, large kappa angles and a certain image blur in case of turbulences. It was found, that the selected parameter setup shows a quite stable behaviour and can be applied to other flights. A comparison is made to results from other open source multi-ray matching software to handle the issue of the described flight conditions.

Flights over the same area at different times have been compared to each other. The major objective was here to see, on how far differences occur relative to each other, without having access to ground control data, which would have a potential for applications with low requirements on the absolute accuracy. The results show, that there are influences of weather and illumination visible. The "unusual" flight pattern, which shows big time differences for neighbouring strips has an influence on the AT and DTM/DSM generation. The results obtained so far do indicate problems in the stability of the camera calibration. This clearly requests a usage of GCPs for all projects, independent on the application. The effort is estimated to be even higher as expected, as also self-calibration will be an issue to handle a possibly instable camera calibration.

To overcome some of the encountered problems with the very specific features of UAV flights a software UAVision was developed based on Open Source libraries to produce input data for bundle adjustment of UAV images by PAMS. The

empirical test results show a considerable improvement in the matching of tie points. The results do, however, show that the Open Source bundle adjustment was not applicable to this type of imagery. This still leaves the possibility to use the improved tie point correspondences in the commercial AT package.

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