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Aspects of Quality Control for UAV Applications in Photogrammetry

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UAV Quality Control – Motivation

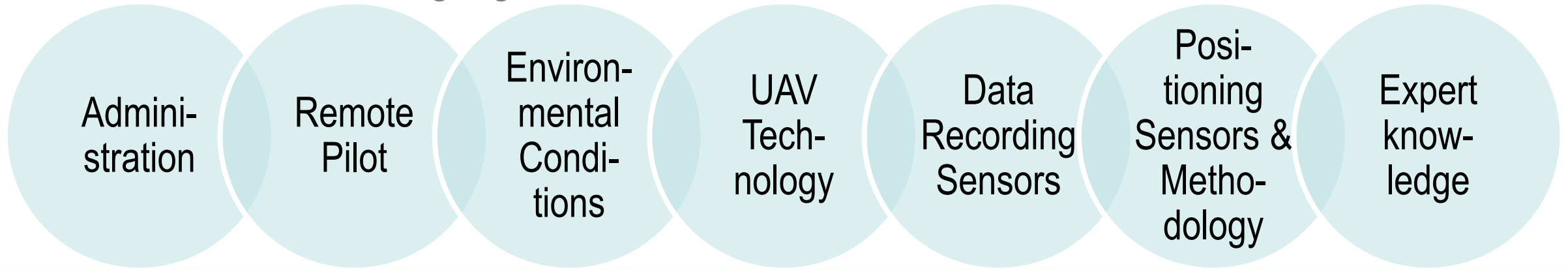
- The choice of components utilised in UAV-based surveying projects is critical for its successful outcome.
- To facilitate these decisions, our paper
 - not only highlights various features which need to be taken into account for a surveying project using UAVs,
 - but also demonstrates analyses of their influence on the quality of results.

Quality Assurance In UAV Applications

- Quality assurance activities take place in all areas of data production and service, usually on the basis of national (DIN) or international (ISO) standards, as well as practice-oriented guidelines or framework conditions for a process defined by a professionally qualified person/organization.
- Standards in the field of photogrammetric products in Germany are processed by the DIN-committee "Photogrammetry and Remote Sensing".
- While there are already discussions considering a normative treatment for quality assurance of UAVs to date, no corresponding proposals have been elaborated.

Components Of The UAV Process Chain

- Our paper is an attempt to summarise the process chain and components involved in a surveying project using UAV, including recommendations concerning this process.
- To ensure the quality of a successful UAV mission, several interrelated aspects need to be considered as highlighted below:



UAV – A Multi-sensor System

- In essence, an UAV can be considered as a multi-sensor system.
 - This includes basic sensors for stabilising the flight platform, for orientation and positioning in space, for collision avoidance as well as
 - corresponding recording sensors for the targeted recording of selected objects and their properties.

UAV – System Investigations

- In the light of geodetic and photogrammetric applications, the measuring sensors (camera, laser scanner, GNSS), the resulting measurement data and their processing using appropriate software solutions is of highest importance.
- An essential element for testing and calibration of aerial photogrammetric systems is given by test fields, which have a long tradition in manned aerial photogrammetry.
- Test fields to investigate UAV systems meanwhile exist for several years (e.g. Zollern Colliery in Dortmund, Germany; The Inseipark in Hamburg-Wilhelmsburg, Germany) and are getting more and more important.

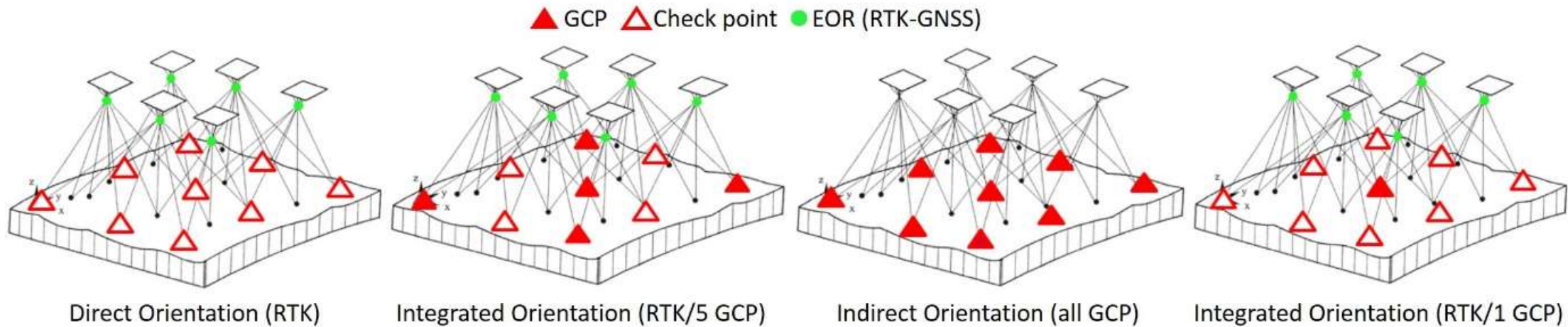
UAV – Test Fields

- Structurally, photogrammetric test fields consist of a group of spatially distributed and signalised points, the latter serving as ground control points (GCP) or check points (CP).
- Depending on the task, the test field must have a suitable geometric quality, which, for assessments of UAV systems, is in the range of a few millimetres 3D accuracy of the GCP within the geodetic network.



UAV – System Investigations

- The investigations in our two UAV test fields focus on possible influences of camera sensors, the direct determination of image positions with RTK-GNSS and the use of ground control points for the georeferencing of image blocks.

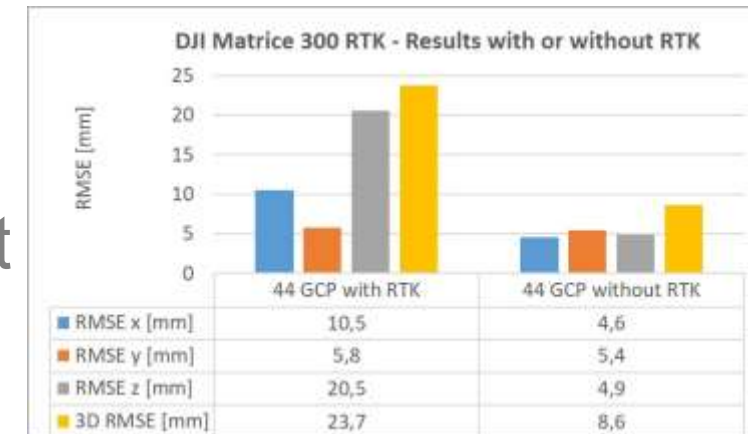
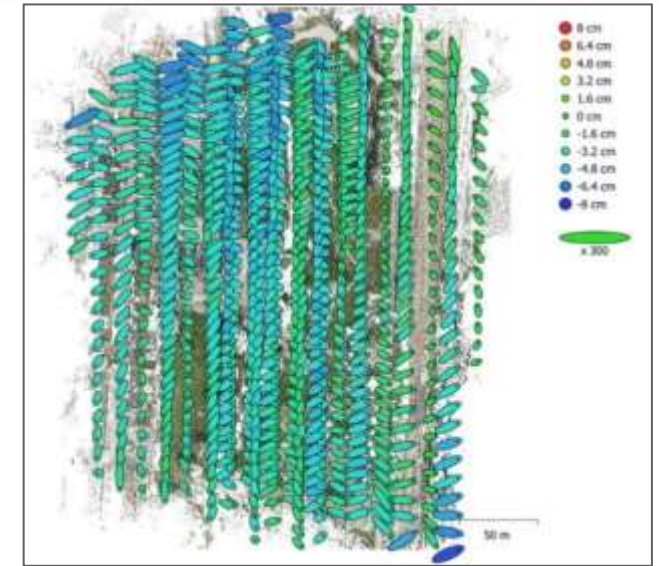


UAV – System Investigations

- DJI Phantom 4 RTK and Matrice 300 RTK/Zenmuse P1



- "Smart Oblique Capture" image flight of the Matrice 300 RTK: Camera positions and residuals (ERROR) from Agisoft Metashape (top). RMSE values of 44 GCP with RTK-GNSS (bottom left) and without RTK-GNSS (bottom right).



Thank You For Watching Our Presentation!

- Please find our full paper in the congress proceedings on FIG-Website:
https://fig.net/fig2022/technical_program.htm

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