

# Investigations on the Geometric Quality of Commercially Available Cameras for Uav Applications

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## SUMMARY

Meanwhile UAV based image recording is an established geodetic/photogrammetric data acquisition method, used in many fields of application with different demands on the quality of the results. Users are normally interested in high sophisticated actual UAV-platforms and hereby often do not think much about the quality of the integrated camera, although the choice and quality of the camera is the most important factor influencing the outcoming results (e.g. 3D pointclouds, orthophotos etc.). In the meantime there is a variety of cameras used in UAV based scenarios. However, very often new cameras appear in the market, so that existing systems quickly become obsolete.

This paper presents a geometrical investigation of two actual DJI cameras Zenmuse X4S (20Mpix) and X5S (20,8 Mpix) and a Phaseone IXU 1000 (100Mpix). While the proprietary DJI cameras are used in conjunction with the Phantom4Pro and Inspire2 series, the Phaseone system is a high performance middle-format camera system, typically used on classical aerial platforms. In this case a powerful UAV with maximum weight of 10 kg is necessary (e.g. DJI Matrice 600 or equivalent) to carry the camera over a period of about 20 minutes.

The present studies took place at the high quality aerial UAV-testfield (point accuracy < 3mm) at the industrial museum "Zeche Zollern" in Dortmund, Germany. The configuration layout of the testfield will be introduced first. Subsequently a unified testbed for all cameras under test will be presented. This includes the overall workflow with diverse parameters affecting the results, like flight- and ground control as well as the image format used (RAW, TIF, JPG with different compression factors). Moreover, differences in the results using different software (Agisoft PhotoScan and Pix4Dmapper) are shown.

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Finally, recommendations are given for the systems and workflow parameters, depending on the applications.

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