

Testing the radiometric performance of digital photogrammetric images: vicarious vs. laboratory results on the Leica ADS40 an experience in Spain

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Abstract

For the exploitation of quantitative information coming from images acquired with an aerial digital camera the knowledge of radiometric calibration parameters is mandatory, so that the digital levels acquired by the sensor can be transformed into physical values such as radiance and reflectance. This paper deals with the vicarious calibration of a linear array sensor, ADS40, and its comparison and analysis with the laboratory calibration provided by the manufacturer. To this end, a specific test field located in the city of Avila (Spain) was designed based on two different flights performed during the 8th and 9th of April, 2010 with a spatial resolution of 10cm and 25cm, respectively. In addition, a reflectance measurement campaign was performed during the flight using an ASD FieldSpec3 Hi-Res spectroradiometer, and testing a group of 44 samples which included natural and artificial surfaces. The reflectance method based on the Radiative Transference Model (6S) was applied in order to establish a relationship between the values measured at field and the values measured in the sensor, and taking into account the dispersion and absorption processes motivated by the presence of the atmosphere. The results of the vicarious calibration (with 1 and 2 parameters) were compared with those provided by the manufacturer providing a valid result. In particular, the Root Mean Square Error (RMSE) reached through the vicarious calibration in the different reference surfaces tested is lower than the laboratory calibration, considering always the same atmospheric model. Finally, with the aim of analyzing the stability of the calibration and its relation with the flight height, the calibration of the lower flight (10cm) was extrapolated to the 25cm flight, obtaining similar accuracies.

Keywords: ADS40, radiometric calibration, test field, aerial images.