Quality Assessment of Orthomosaic Images Calculated on Photogrammetric software

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Thesis submitted for the degree of
Master in science of Geodesy and Geoinformatics

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Leibniz University Hannover
SoSe 2020

Abstract

Structure-from-Motion (SfM) is defined as a photogrammetric multi-image technique used for high-resolution three-dimensional (3D) modelling, where the 3D information is obtained from sequences of overlapping two-dimensional (2D) optical images captured from unmanned aerial vehicles (UAV). In the practical application of geoscience, this effective technique is considered as a reforming technique for surface modelling because it positively has advantages such as high effectiveness, low-cost and user-friendly approach. In the present time, the world has witnessed an extensive popularization of SfM photogrammetry concerning geoscience, and several published studies have been followed for various applications. This thesis has utilized the advantage of UAV as devices to collect information about terrain data and eagerly discuss the quality of derived photogrammetric products. One of the desire products is Digital surface Model (DSM) which indicates the model surface including high elevation objects. In our path to obtain DSM, we should also get the dense cloud model data. There are in the market several software packages that can drive DSMs and orthoimages from images. In the thesis practical workflow, I have used Agisoft Metashape software professional package.

One other product of SfM is Digital Ortho-Image (DOI) which is merely defined as an aerial photograph that has been geometrically corrected " Ortho-rectified". This ortho-image has the ability to accurately measure the true distance of distinctive features within images. An ortho-image is equally considered as an accurate representation of Earth's surface with a high comprehensive map including uniform scale and true geometry. The thesis workflow initiates with image acquisition by a drone flying over an area in Hannover, Germany. The photogrammetric flight has fulfilled the drone specification, law regulation and objective of the survey. To obtain highly accurate reliable results, it is necessary to design carefully the flight plan and the georeferencing process. During the successful flight, 45 images have been captured in RGB format. The total processing time to derive these 45 images into sufficient quality Ortho-photo by Agisoft Metashape is approximately two hours including Ground Control Points (GCPs) tagging, which motivated me to think if I decrease the number of input images, how far the quality of DSMs and Ortho-image will be influenced. At this point, the idea of this thesis came to carefully examine the quality of DOIs generated from four tests with a varying number of input images (45, 35, 25 and 15 frames). The goal is to evaluate the quality of orthoimages for the four tests with respect to processing time. Besides, an investigation is implemented to display the consequence of bad quality tie points on the final photogrammetric products.