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Methodology of improvement of radiometric quality of images acquired from low altitudes

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Abstract:

Low-altitude photogrammetry studies have been more and more popular in the mapping of small areas (up to 10 thousand hectares). UAV flights can be consider as an attractive low-cost alternative solution for the photogrammetric studies. However, in this type of platforms images are frequently captured by digital compact cameras. Despite high resolution, the images taken with these cameras have a relatively low radiometric quality. While photogrammetric software for processing images obtained via sensors mounted on UAVs and the possible applications of the GPS RTK system for determining projection centres are constantly developing, the majority of studies nowadays still require digital aerial triangulation based on transferring and measuring tie points on subsequent images of the same surface fragment. A method for improving the quality of low-altitude image data is presented in this article. In order to improve the image radiometry, filtration in frequency domain was applied. This solution made it possible to enhance the reflection from objects in the images andat the same time reduce the impact of poor lighting on local contrast. The proposed method comprises two variants of radiometric correction, each of thesedepending on the quality of the pictures. The effectiveness of the method has been proven by adjusting three image blocks with different levels of radiometric quality before and after filtration, as well as a comparative analysis of the aerial triangulation results.

Keywords: Low altitude photogrammetry; Unmanned aerial vehicle; Image filtering; Radiometric quality

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1. Introduction

The use of unmanned aerial vehicles for obtaining photogrammetric data involves several different problems, which is not presented in traditional aerial photogrammetry. These aspects concern mainly on the types of UAVs and the imaging sensors mounted. Furthermore, solutions for the registration of approximate elements of exterior orientation are also taken into account (single or dual-frequency GPS receivers and Inertial Navigation Systems). However, the most important aspect is the algorithms and software used for image data processing. The significant potential of UAVs for photogrammetry was observed more than three decades ago Methods and technologies for obtaining and processing low-altitude image