Study on Quality Standards for Crowd-sourced Drone Image Data: Analyzing the Radiometric Quality Based on Alterations in Geometric Quality

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Modern technologies such as digital twins and autonomous driving systems rely heavily on precise spatial information, and the importance of building and updating precise spatial information is increasing. Traditionally, data created through satellites or aircraft has been used for image-based spatial information construction, which requires significant human resources and incurs substantial economic costs. Additionally, considering factors such as spatial resolution and update cycle, there are limitations in accurately reflecting changes in the real world. To address these problems, the approach of gathering drone imagery through crowdsourcing is increasingly being recognized. Drones can achieve significant improvements in precision due to their ability to capture high-resolution images compared to satellites and aircraft. If this is collected through crowdsourcing, spatial information can be updated more efficiently. However, crowdsourced data collected from various sources makes it challenging to guarantee quality and consistency. Quality factors of drone image data include geometric factors such as location and attitude information, and radiological factors such as clarity, contrast, and obstructed areas. If the quality of any of these factors deteriorates or consistency drops, it affects the quality of the final orthoimage, Digital Surface Model (DSM), etc. Therefore, a standard to judge this is necessary for utilizing crowdsourced data for spatial information construction and updating. However, current image-based spatial information construction standards, such as the ISO spatial information standard and aerial survey regulations, are primarily based on data shot from satellites or manned aircraft, so they cannot be directly applied to drone images. This study aimed to analyze the impact on the quality of orthoimages due to variations in attitude information of drone images to establish a basis for setting standards for crowdsourced drone data. For this, drone image datasets consistently shot through automated flight, considering factors such as altitude, overlap, and angle, and drone image datasets shot through manual flight with inconsistent factors, were acquired. The acquired datasets were made into ortho mosaic images using Agisoft's Metashape, and the BBA (Bundle Block Adjustment) results derived in the ortho mosaic image production process, the number of Tie Points matched with adjacent images, and extraction of individual orthophotos before mosaic work were carried out to conduct quality analysis based on variations in geometric factors of individual images. As a result, the two datasets showed significant differences in prediction errors of location and attitude in BBA, the number of Tie Points with adjacent images, and the clarity of individual orthoimages. Based on this, it is expected that if more specific usage standards are set through additional experiments, it will contribute to building and updating spatial information that reflects the rapidly and accurately changing real world more effectively by utilizing data based on crowdsourcing.

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