**Title**

Quality of Photogrammetry in Oblique Aerial Imagery for 3D Reconstruction: Assessing the quality of photogrammetry on aerial image sets and incorporate the quality in geometric feature extraction

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**Abstract**

Photogrammetry is a well-established technique that has a significant impact on the use of images for mapping purposes. Employing feature extraction, matching, and the bundle adjustment, a large number of images can be automatically processed. Ingenieursbureau Geodelta developed an application for measurements in processed (oblique) aerial images. However, the quality of these measurements and the added value of oblique images on the adjustment's quality were unclear. This will be assessed by means of the theoretical standard deviation resulting from the bundle adjustment. Upon estimating this quality, an adapted RANSAC method is proposed that incorporates this quality as weights within its algorithm to extract geometric features. The objective is to evaluate whether this enhances the RANSAC results and could be applied to 3D reconstructions.

The results indicate three key factors that influence the theoretical standard deviation: high tie point availability, larger observation angles, and image viewing direction. With this, the theoretical standard deviation for tie points in both Nadir and Oblique image sets separately approximates 3 centimeters in the horizontal direction and about 10 in the height direction. Combining the two sets enhances the results by nearly a factor of three in all directions because the Nadir images connect the Oblique images, combining the strong characteristics of both sets. This demonstrates the value of both Nadir and Oblique imagery. For image exteriors, the improvement is even more pronounced, yielding an improvement factor of 4 or 5. However, propagating this quality metric through a dense matching algorithm in an adapted, weighted RANSAC algorithm does not show significant improvements in the number of planes found or the percentage of points classified as inliers of those planes. Furthermore, the RANSAC method does not converge to a better result in fewer iterations using the proposed method.