BENCHMARK ON HIGH DENSITY AERIAL IMAGE MATCHING

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ABSTRACT:

Benchmarks have proven to be extremely useful to document the progress of software tools for image based 3D data capture. Well known examples which measure the performance of state-of-the-art matching algorithms are the Middlebury Stereo Vision Page or the benchmark on Multi-view Stereo Reconstruction. Similarly, the joint EuroSDR/ISPRS initiative Benchmark on High Density Image Matching for DSM Computation investigates the potential of photogrammetric 3D data capture. Basic scope is the evaluation of 3D point clouds and DSM produced from aerial images with different software systems. A first version of this benchmark already started in the year 2013, meanwhile it has been extended as a joint project between EuroSDR and ISPRS.
The first part of the paper will summarize the preliminary results of the benchmark. These investigations are based on two subsets of aerial image flights captured by standard photogrammetric camera systems with different block geometries at a semi-rural and urban area, respectively. For these data, various test participants generated DSM raster in a predefined size and resolution using more than 10 different photogrammetric software systems. As it will be discussed within the first part of the paper, a number of software systems can generate DSM at vertical accuracies close to the sub-pixel level. However, some solutions show decreasing accuracies at cast shadows especially for steep surfaces and at fine object structures close to the resolution of the available images.
While these investigations were based on standard nadir imagery, the second part of the paper will concentrate on the third test scenario, which consists of an oblique aerial image block captured in a built-up area. This recent extension of the benchmark was motivated by the increasing number of oblique systems as triggered by the rapidly growing market for this type of data. Furthermore, oblique data sets feature occlusions, depth jumps and varying image scale, which put additional challenges to the matching algorithms. Finally, oblique images can be used to capture 3D point clouds at building facades. For this type of objects, point clouds from terrestrial laser scanning provide suitable reference data at superior accuracy.
The oblique test data set consists of Leica RCD30 Oblique Penta imagery for an area in the west of Zürich. In the nadir view it features an image overlap of 70%/50% with a GSD of 6 cm. First tests using matching results from different software packages will be used to demonstrate and discuss the evaluation procedure, which is mainly based on 3D point clouds for selected buildings as provided from terrestrial laser scanning.

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