

ISPRS Scientific Initiative

Summaries of projects funded for 2014

Benchmark on High Density Image Matching for DSM Computation

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Stereo-matching for the automatic generation of elevation data from aerial images was originally introduced more than two decades ago. These approaches used feature based matching algorithms to avoid problems at regions with very limited texture. Meanwhile, state-of-the-art digital airborne cameras provide imagery of good dynamic and signal-to-noise-ratio, which supports pixel-wise matching especially for low-texture areas. Furthermore, recent matching approaches cope with the general ambiguity of such a per-pixel measurement by introducing additional constraints. So-called global algorithms explicitly formulate the matching problem under the assumption of smooth surfaces. This global optimization problem can be implemented very efficiently using recursive algorithms like scanline optimization. A very popular and well performing stereo method frequently applied for the processing of aerial images is semi-global matching (SGM). Also triggered by these developments, software tools for image based generation of 3D point clouds and dense Digital Surface Models (DSM) are currently developed by a number of research institutes and photogrammetric software vendors.

In order to document the progress also in photogrammetric data processing benchmarks have proven to be extremely useful. Well known examples which measure the performance of state-of-the-art matching algorithms are the Middlebury Stereo Vision Page (Scharstein, & Szeliski 2002) or the benchmark on multi-view stereo reconstruction (Seitz et.al. 2006). These benchmarks provide general purpose datasets through a platform, where results can be uploaded to automatically yield quality metrics of the respective approach. While these projects emerged from the Computer Vision community, the test on the performance of photogrammetric digital airborne camera systems (Cramer, 2010) was organized by the German society of Photogrammetry, Remote Sensing and Geoinformation (DGPF).

Also in view of the ongoing software developments, the proposed initiative aims to evaluate the potential of photogrammetric 3D data capture from automatic image matching. Basic scope is the evaluation of 3D point clouds and DSM produced from aerial images with different software systems. Such a comparative evaluation should provide a platform for software developers to demonstrate the state-of-the-art of their ongoing developments. Furthermore, it should help potential users like National Mapping and Cadastral agencies (NMCAs), which consider a state-wide-generation of high quality DSMs to understand the applicability of such tools while triggering further developments based on their needs.