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High-Accuracy Satellite Image Analysis and Rapid DSM Extraction for Urban Environment Evaluations (Tripoli-Libya)

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Abstract : The modeling of the earth's surface and evaluation of urban environment, with 3D models, is an important research topic. New stereo capabilities of high-resolution optical satellites images, such as the tri-stereo mode of Pleiades, combined with new image matching algorithms, are now available and can be applied in urban area analysis. In addition, photogrammetry software packages gained new, more efficient matching algorithms, such as SGM, as well as improved filters to deal with shadow areas, can achieve denser and more precise results. This paper describes a comparison between 3D data extracted from tri-stereo and dual stereo satellite images, combined with pixel based matching and Wallis filter. The aim was to improve the accuracy of 3D models especially in urban areas, in order to assess if satellite images are appropriate for a rapid evaluation of urban environments. The results showed that 3D models achieved by Pleiades tri-stereo outperformed, both in terms of accuracy and detail, the result obtained from a Geo-eye pair. The assessment was made with reference digital surface models derived from high-resolution aerial photography. This could mean that tri-stereo images can be successfully used for the proposed urban change analyses.

Keywords : 3D models, environment, matching, pleiades
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