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Performance Validation of High Resolution Digital Surface Models Generated by Dense Image Matching with the Aerial Images

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Abstract. The digital surface models (DSM) are the most popular products to determine visible surface of Earth which includes all non-terrain objects such as vegetation, forest, and man-made constructions. The airborne light detection and ranging (LiDAR) is the preferred technique for high resolution DSM generation in local coverage. The automatic generation of the high resolution DSM is also possible with stereo image matching using the aerial images. The image matching algorithms usually rely on the feature based matching for DSM generation. First, feature points are extracted and then corresponding features are searched in the overlapping images. These image matching algorithms face with the problems in the areas which have repetitive pattern such as urban structure and forest.

The recent innovation in camera technology and image matching algorithm enabled the automatic dense DSM generation for large scale city and environment modelling. The new pixel-wise matching approaches are generates very high resolution DSMs which corresponds to the ground sample distance (GSD) of the original images. The numbers of the research institutes and photogrammetric software vendors are currently developed software tools for dense DSM generation using the aerial images. This new approach can be used high resolution DSM generation for the larger cities, rural areas and forest even Nation-wide applications. In this study, the performance validation of high resolution DSM generated by pixel-wise dense image matching in part of Istanbul was aimed. The study area in Istanbul is including different land classes such as open areas, forest and built-up areas to test performance of dense image matching in different land classes. The obtained result from this performance validation in Istanbul test area showed that, high resolution DSM which corresponds to the ground sample distance (GSD) of original aerial image can be generated successfully by pixel-wise dense image matching using commercial and research institution ' s software.

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