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Automatic urban 3D building reconstruction from multi-ray photogrammetry

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Abstract. Over the last 20 years the use of, and demand for, three dimensional (3D) building models has meant there has been a vast amount of research conducted in automating the extraction and reconstruction of these models from airborne sensors. Whilst many different approaches have been suggested, full automation is yet to be achieved and research has suggested that the combination of data from multiple sources is required in order to achieve this. Developments in digital photogrammetry have delivered improvements in spatial resolution whilst higher image overlap to increase the number of pixel correspondents between images, giving the name multi-ray photogrammetry, has improved the resolution and quality of its by-products. In this paper the extraction of roof geometry from multiray photogrammetry will be covered, which underpins 3D building reconstruction. Using orthophotos, roof vertices are extracted using the Canny edge detector. Roof planes are detected from digital surface models (DSM) by extracting information from 2D cross sections and measuring height differences. To eliminate overhanging vegetation, the segmentation of trees is investigated by calculating the characteristics of a point within a local neighbourhood of the photogrammetric point cloud. The results highlight the complementary nature of these information sources, and a methodology for integration and reconstruction of roof geometry is proposed.

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