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AUTOMATIC BUILDING EXTRACTION FOR 3D TERRAIN RECONSTRUCTION USING IMAGE INTERPRETATION TECHNIQUES

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This thesis presents a number of components in the process of extraction of buildings from aerial images. They include the determination of a dense digital surface model (DSM) by stereo image matching, a multi-spectral image classification, and Normalised Difference Vegetation Index (NDVI) computation on the images to determination vegetation areas. A shape modelling algorithm, based on the level set formulation of curve and surface motion, has then been developed to precisely delineate the building boundaries. These processes have derived three types of information that describe the locations of buildings, namely, the DSM, areas determined by the classifications, and the building boundaries. The three sets of information were then combined by a data fusion approach using the Dempster-Shafer algorithm, to extract the most likely buildings in the images. The Dempster-Shafer algorithm is a statistical approach providing a theoretical basis for evaluating the reliability of the extracted buildings from the combination of the different data sources. The methods have been tested on a series of large scale colour aerial photographs in Australia. Because large scale images covering the infrared region were not available, the computation of the NDVI was replaced by the VVI (visible vegetation index), based on the colour images. The tests demonstrate an accuracy of extracting buildings of the order of 90% for a range of areas covered by the aerial images. Further refinements of the methods may lead to better results and overcome some of the deficiencies revealed in the tests.