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AN ACCURACY ASSESSMENT OF GEOREFERENCED POINT CLOUDS PRODUCED VIA MULTI-VIEW STEREO TECHNIQUES APPLIED TO IMAGERY ACQUIRED VIA UNMANNED AERIAL VEHICLE

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Abstract. Low-cost Unmanned Aerial Vehicles (UAVs) are becoming viable environmental remote sensing tools. Sensor and battery technology is expanding the data capture opportunities. The UAV, as a close range remote sensing platform, can capture high resolution photography on-demand. This imagery can be used to produce dense point clouds using multi-view stereopsis techniques (MVS) combining computer vision and photogrammetry. This study examines point clouds produced using MVS techniques applied to UAV and terrestrial photography. A multi-rotor micro UAV acquired aerial imagery from a altitude of approximately 30 – 40 m. The point clouds produced are extremely dense (< 1 – 3 cm point spacing) and provide a detailed record of the surface in the study area, a 70 m section of sheltered coastline in southeast Tasmania. Areas with little surface texture were not well captured, similarly, areas with complex geometry such as grass tussocks and woody scrub were not well mapped. The process fails to penetrate vegetation, but extracts very detailed terrain in unvegetated areas. Initially the point clouds are in an arbitrary coordinate system and need to be georeferenced. A Helmert transformation is applied based on matching ground control points (GCPs) identified in the point clouds to GCPs surveying with differential GPS. These point clouds can be used, alongside laser scanning and more traditional techniques, to provide very detailed and precise representations of a range of landscapes at key moments. There are many potential applications for the UAV-MVS technique, including coastal erosion and accretion monitoring, mine surveying and other environmental monitoring applications. For the generated point clouds to be used in spatial applications they need to be converted to surface models that reduce dataset size without loosing too much detail. Triangulated meshes are one option, another is Poisson Surface Reconstruction. This latter option makes use of point normal data and produces a surface representation at greater detail than previously obtainable. This study will visualise and compare the two surface representations by comparing clouds created from terrestrial MVS (T-MVS) and UAV-MVS.

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