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Using Structure from Motion (SfM) to capture high resolution geomorphic units within small ephemeral channels

Alissa Flatley and Ian Rutherfurd
School of Geography, Faculty of Science, University of Melbourne, Australia (aflatley@student.unimelb.edu.au)

Drones offer a means to survey river channels in high resolution, providing a unique perspective of the riverine network and an enhanced ability to survey in-channel features. Structure from Motion (SfM) is a photogrammetric range imaging technique which was implemented to capture the three-dimensional structure of geomorphic units within headwater ephemeral channels in the Pilbara, Western Australia. The SfM method is becoming more frequently used as a cost-effective surveying method in remote or difficult terrain. The precision of SfM relies on a high-density network of ground control points to validate measurements but can yield results within centimetre or even millimetre accuracy.

A series of headwater channels were examined within the semi-arid Pilbara to understand their diversity and associated geomorphic units. SfM surveys combined with traditional RTK methods were carried out to understand and identify the range of geomorphic units; bars, benches and anabranches within small remote river channels. The SfM approach yielded high resolution ground sampling of one point per centimetre and an average vertical accuracy of under 5cm.

Dense point clouds were created and then used to characterise the river channels using channel geometry measurements to distinguish ephemeral channel types and associated local variable controls. This technique enabled identification of geomorphic units and their boundary conditions, at a resolution which was not possible using other surveying methods.