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Robotic photosieving from low-cost sUAS: A proof-of-concept

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Measurement of riverbed material grainsizes is now a routine part of fieldwork in fluvial geomorphology and lotic ecology. In the last decade, several authors have proposed remote sensing approaches of grain size measurements based on terrestrial and aerial imagery. Given the current rise of small Unmanned Aerial System (sUAS) applications in geomorphology, there is now increasing interest in the application of these remotely sensed grain size mapping methods to sUAS imagery. However, success in this area has been limited due to two fundamental problems: lack of constraint of image scale for sUAS imagery and blurring effects in sUAS images and resulting orthomosaics. We solve the former by showing that SfM-photogrammetry can be used in a direct georeferencing (DG) workflow (i.e. with no ground validation) in order to predict image scale within margins of 3%. We then propose a novel approach of robotic photosieving that relies on near-ground images processed with BASEGRAIN gravelometry software and acquired from a low-cost sUAS and which does not require the presence of ground control points or visible scale objects. We demonstrate that this absence of scale objects does not affect photosieving outputs thus resulting in a low-cost and efficient sampling method for surficial grains.