Poppy crop height estimation from a single UAS flight

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Abstract:

The objective of this study was to estimate poppy plant height and capsule volume with remote sensing using an Unmanned Aircraft System (UAS). Data was obtained from field measurements and UAS flights over a poppy field at Cambridge, Tasmania along two transects. Biophysical measurements of plants were taken from each sample plot. Imagery acquired from the UAS was used to produce dense point clouds using Agisoft Photoscan. Dense point clouds were used to generate a digital surface model (DSM) and orthophoto mosaic. RGB indices were derived from the orthophoto to extract the bare ground spaces. This bare ground spaces mask was used to filter the points on the ground, and a digital terrain model (DTM) was interpolated from these points. Plant height values were estimated by subtracting the DSM and DTM to generate a Crop Height Model (CHM). UAS-derived plant height (PH) and field measured PH were strongly correlated with R^2 values ranging from 0.93 to 0.97 for transect one and transect two, respectively. The proposed method can be considered as an important step towards crop surface model (CSM) generation from a single UAS flight in situations where a bare ground DTM is unavailable. Results illustrate that plant height can be reliably estimated for poppy crops based on a single UAS flight.

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