

UAVs and machine learning for classification of *Parkinsonia aculeata* L., and planning for integration into weed management activities

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Abstract *Parkinsonia aculeata* L. is a Weed of National Significance and a declared pest in Western Australia. Roy Hill Iron Ore manage a population of parkinsonia in the Pilbara region of Western Australia through survey, mapping, control and monitoring activities.

In 2015 Roy Hill and Astron collaborated to use a machine learning algorithm to automatically classify and map individual parkinsonia plants amongst other vegetation using multispectral imagery captured by an unmanned aerial vehicle (UAV). The project objective was to more efficiently and effectively locate parkinsonia plants across large areas in comparison to conventional foot searches, and to provide a map to efficiently direct weed control technicians.

UAV imagery was captured over a 173 hectare area within a known parkinsonia population and used to segregate vegetation entities into uniquely identified

objects. A subset of these objects were sampled in a ground survey using electronic annotation. The data from the ground survey were used to train a machine learning algorithm in an attempt to classify parkinsonia, and other species at the trial site.

An accuracy assessment of the classification recorded that 74% of the ground-truthed parkinsonia samples were correctly identified by the classifier.

In future the classifier could be applied to much larger areas and used to direct operational weed control activities, which could simultaneously ground-truth classification accuracy and provide a dataset suitable for refining the classifier if warranted. The trial outcomes and planning how to integrate UAV based weed identification techniques into full scale weed control programs will be presented.

Keywords UAV, weed detection, parkinsonia, Weed of National Significance, surveillance, efficiency.