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Assessment of invasive grasses using unmanned aerial vehicles: A machine learning approach

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Invasive weeds are responsible for irreversible environmental damage, millions of dollars in crop losses and management costs every year. In order to implement optimal site-specific treatments and reduce control costs, new methods to accurately monitor and assess weed and pest damage need to be investigated. In this paper, we explore the combination of unmanned aerial vehicles (UAV), remote sensing, sensors and machine learning techniques as a promising technology to address this challenge. The deployment of UAVs as a sensor platform is a rapidly growing field of study for biosecurity and precision agriculture applications. In this experiment, we use grass as a case study. A data collection campaign was performed at two different locations covered by Buffel grass and other vegetation (eg. Green Panic, Spinifex scarab). The first site is at cattle farm Chinchilla, QLD, Australia. The Second locations are two sites at Cape Range National Park, WA. In this study, we describe the UAV platform deployed to collect high-resolution RGB and hyperspectral imagery as well as the image processing pipeline implemented to create an ortho-image and machine which results in two or five classifications of the vegetation abundance maps. The aim of the approach is to simplify the image analysis step by minimizing user input requirements and avoiding the manual data labelling necessary in supervised learning approaches. The methodology presented in this paper represents a venue for further research towards automated invasive grass assessments and biosecurity surveillance.

Biography

Felipe Gonzalez is an Associate Professor in the Science and Engineering Faculty, Australia and Team Leader for Integrated Intelligent Airborne Sensing Laboratory at Queensland University of Technology, Australia. He holds a BE (Mech) and a PhD degree from the University of Sydney. His research explores bioinspired optimization, uncertainty based UAV path planning and UAVs for environmental monitoring. He leads the CRC plant biosecurity project evaluating unmanned aerial systems for deployment in plant biosecurity and the CRC PB 2135 optimizing surveillance protocols using unmanned aerial systems and developing pest risk models of buffel grass using unmanned aerial systems and statistical methods. He is a Chartered Professional Engineer and member of professional organizations including the RAeS, IEEE and AIAA.

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