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Author: Prof. Avid Roman-Gonzalez
Business on Engineering and Technology S.A.C. (BE Tech), Peru, avid.roman-gonzalez@ieee.org

Mr. Victor Romero-Alva
Image Processing Research Laboratory (INTI-Lab). Universidad de Ciencias y Humanidades - UCH, Peru,
nielsrom93@gmail.com

Ms. Natalia Indira Vargas-Cuentas
Image Processing Research Laboratory (INTI-Lab). Universidad de Ciencias y Humanidades - UCH, Peru,
nvargas@uch.edu.pe

A SMALL SATELLITE PLATFORM PROPOSAL FOR STUDIES ON THE ASPARAGUS FARMING

Abstract

Remote sensing is the science of obtaining information about an object through the analysis of data acquired by a device that is not in contact with the object. The information of different properties of vegetation (such as growth, vigour, health, etc.) acquired through these techniques can provide valuable data for environmental monitoring, biodiversity conservation, agriculture, forestry and other related fields. Usually, the colour of the plants in a cropping area changes from green to brown depending on their level of health and different stress factors. The observation of these changes at initial phases dramatically impacts the potential yield, productivity and quality of the crops (asparagus in the case of this work, due to the importance of this vegetable in Peru, one of the largest exporters in the world). The use of hyperspectral technology onboard a satellite will permit obtaining a set of parameters (vegetation indices, VI) able to detect extreme climate changes, weeds, pests and diseases, improper irrigation, inconsistent application of fertilizers, etc. The typical form of VIs is a simple ratio of reflectance measured in two bands or their algebraic combination. Numerous VIs have been developed to characterize vegetation canopies, but one of the most important is the Normalized Difference Vegetation Index (NDVI). In this sense, it is recommendable the use hyperspectral sensors versus multispectral sensors due to the large number of bands (more than 100 bands) and hence the possibility of calculating diverse combinations depending on the properties to measure. Some satellite platforms can present data from which VIs can be extracted. They consist of onboard extraordinarily sophisticated and expensive instrumentation; hence, the cost of accessing these data could be prohibitive. Furthermore, the orbit period (in some cases 16 days) could be impractical for monitoring particular scenarios, such as the appearance of a plague, or others, such as water and nutrient management. The development of a low-cost remote sensing platform, such as the one presented in this proposal, will permit the acquisition of these data at an affordable price and with a good trade-off of spatial, spectral and temporal resolution. Alternatively, if needed, the data obtained from a nanosatellite can be correlated with data obtained from a drone equipped with the same hyperspectral camera to have better spatial resolution due to its proximity to the cropping area.