

Calculation of the Normalized Difference Vegetation Index and the Spectral Signature of Coffee Crops: Benefits of Image Filtering on Mixed Crops

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Abstract : Crop monitoring has shown to reduce vulnerability to spreading plagues and pathologies in crops. Remote sensing with Unmanned Aerial Vehicles (UAVs) has made crop monitoring more precise, cost-efficient and accessible. Nowadays, remote monitoring involves calculating maps of vegetation indices by using different software that takes either Truecolor (RGB) or multispectral images as an input. These maps are then used to segment the crop into management zones. Finally, knowing the spectral signature of a crop (the reflected radiation as a function of wavelength) can be used as an input for decision-making and crop characterization. The calculation of vegetation indices using software such as Pix4D has high precision for monoculture plantations. However, this paper shows that using this software on mixed crops may lead to errors resulting in an incorrect segmentation of the field. Within this work, authors propose to filter all the elements different from the main crop before the calculation of vegetation indices and the spectral signature. A filter based on the Sobel method for border detection is used for filtering a coffee crop. Results show that segmentation into management zones changes with respect to the traditional situation in which a filter is not applied. In particular, it is shown how the values of the spectral signature change in up to 17% per spectral band. Future work will quantify the benefits of filtering through the comparison between in situ measurements and the calculated vegetation indices obtained through remote sensing.

Keywords : coffee, filtering, mixed crop, precision agriculture, remote sensing, spectral signature

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