Abstract

Mapping of invasive weeds is very important around the globe due to their negative consequences on the habitat. Remote sensing, particularly by using an Unmanned aerial vehicle (UAV), can be utilized to map invasive weeds in crops at different stages of their growth with great accuracy. In a changing environment due to climate change, vegetation monitoring over time is critical. Remote sensing, especially when using unmanned aerial vehicles (UAVs), can be used to accurately track vegetation on a flexible scale. The relatively recent remote sensing systems that are UAVs, however, suggest the need to learn how to reliably track vegetation best with the system in mind. The purpose of this study is to test a method for the calibration of six band images captured by a multi-spectral camera to derive reflectance images, and implementation of machine learning techniques to differentiate Parthenium weed from other crops at different stages of their growth. Multi-spectral remote sensing imaging research is known as a potentially cost-effective technique for weed and crop plant discrimination. High-resolution multi spectral data for parthenium is collected by using a customized multispectral sensor HAWKPI. During various experiments, the technical properties of the camera were checked to determine what variables propagate to the efficient reflectance images that can be used to extract vegetation indices. The extracted NDVI mosaics from the UAV in the field are calibrated and used in the classification algorithm. By means of radiometric calibration and the pre-processing technique used, the technical characteristics and thus the deficiencies of the camera can be corrected to a certain extent.

The NDVI data is analyzed by using a VGG-like convolutional neural network to classify parthenium weed at different stages of its growth in different crop fields. For NDVI imagery, the average precision for all weeds was more than 80 percent. For effectiveness in discrimination, these findings are considered high and moderate, respectively. The results of this study are limited by the weed species that developed at Koont research farm, Chakwal, Pakistan, the imaging spectral resolution, and the methods of image analysis in the crop fields. Methods discussed in this study need to be checked on other crops in various locations to ensure the broader applicability of the procedures.