Regularized Neural Networks Fusion and Genetic Algorithm Based On-Field Nitrogen Status Estimation of Wheat Plants

Publons ID	(not set)
Wos ID	WOS:000395874400011
Doi	10.1109/TII.2016.2628439
Title	Regularized Neural Networks Fusion and Genetic Algorithm Based On-Field Nitrogen Status Estimation of Wheat Plants
First Author	
Last Author	
Authors	Sulistyo, SB; Woo, WL; Dlay, SS;
Publish Date	FEB 2017
Journal Name	IEEE TRANSACTIONS ON INDUSTRIAL INFORMATICS
Citation	43
Abstract	The estimation of nutrient content of plants is considerably important in agricultural practices, especially in enabling the application of precision farming. A plethora of methods has been used to estimate nitrogen amount in plants, including the utilization of computer vision. However, most of the image-based nitrogen estimation methods are conducted in controlled environments. These methods are not so practical, time consuming, and require many equipment. Therefore, there is a crucial need to develop a method to estimate nitrogen content of plants based on leaves images captured on field. It is a very challenging task since the intensity of sunlight is always changing and this leads to an inconsistent image capturing problem. In this paper, we develop a low-cost, simple, and accurate approach image-based nitrogen amount estimation. Plant images are captured directly under sunlight by using a conventional digital camera and are subject to a variation in lighting conditions. We propose a color constancy method using neural networks fusion and a genetic algorithm to normalize various plant images due to different sunlight intensities. A Macbeth color checker is utilized as the reference to normalize the color of the images. We also develop a combination of neural networks using a committee machine to estimate the nitrogen content in wheat leaves. Twelve statistical RGB color features are used as the input parameters for the nutrient estimation. The obtained result shows considerable better performance than the conventional gray-world and scale-by-max approaches, as well as linear model and single neural network methods. Finally, we show that our nutrient estimation approach is superior to the commonly used soil-plant analysis development meter based prediction.
Publish Type	Journal
Publish Year	2017
Page Begin	103
Page End	114
Issn	1551-3203
Eissn	1941-0050
Url	https://www.webofscience.com/wos/woscc/full-record/WOS:000395874400011
Author	SUSANTO BUDI SULISTYO, S.TP, M.Si, PhD