Plant Phenotyping on Mobile Devices

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ABSTRACT

Plants phenotyping is a fast and non-destructive method to obtain the physiological features of plants, compared with the expensive and time costing chemical analysis with plant sampling. Through plant phenotyping, scientists and farmers can tell plant health status more accurately compared to visual inspection, thus avoid the waste in time and resources and even to predict the productivity. However, the size and price of current plant phenotyping equipment restrict them from being widely applied at a farmer's household level. Everyday field operation is barely achieved because of the availability of easy-to-carry and cost-effective equipment such as hyper-spectrum cameras, infrared cameras and thermal cameras. A plant phenotyping tool on mobile devices will make plant phenotyping technology more accessible to ordinary farmers and researchers. This application incorporates the use of physical optics, plant science models, and image processing ability of smartphones. With our special optical design, multispectral instead of RGB (red, green and blue) images can be obtained from the smartphones with fairly low cost. Through quick image processing on the smartphones, the APP will provide accurate plant physiological features predictions such as water, chlorophyll, and nitrogen. The sophisticated prediction models are applied which are provided by the Purdue's plant phenotyping team. Once widely adopted, the information collected by the smartphones with the developed APP will be sent back to Purdue's plant health big-data database. The feedback will not only allow us to improve our models, but also provide farmers and agricultural researchers easy access to real-time crop plant health data.

KEYWORDS

Plant Phenotyping, Image Processing, Smart Phones