

Reviewer Report

Title: Technical workflows for hyperspectral plant image assessment and processing on the greenhouse and laboratory scale

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Reviewer Comments to Author:

The submitted manuscript reviewed relevant literature and summarized a general workflow for the analysis of plant hyperspectral images collected in controlled environments. This review could have a great impact to the research community: The general workflow could guide researchers to standardize the data acquisition and processing of plant hyperspectral images for controlled environment studies, help accumulate global research efforts, promote the data sharing, and ultimately advance big data analysis for plant spectral responses and therefore biological understanding. Therefore, the manuscript fits well with the journal's scope and could be of great interest to readers. There are some parts need to be further improved or explained.

1. In my opinion, a unique feature of spectral imaging is the combination of spatial and spectral information for objects rather than the combination of spatial and temporal information, which has been stated by the authors in the first paragraph in Background section.
2. Details and explanations are needed for the data acquisition section. While line-scan (pushbroom) systems are widely used, many researchers also used area scanning mode (rarely point scanning, aka whiskbroom, mode) for studying plant spectral responses. To the best comprehensiveness, it would be better to briefly introduce all three scanning modes including basic system setup and pros and cons of using each mode. A figure may be added for the best illustration of the system setups.
3. Data pre-processing (e.g., reflectance calibration or flat field correction)/meta-data information is utmost important for sharing plant hyperspectral images. Authors may consider to emphasize this importance and provide more information on how to select reference targets. For example, Spectralon targets are generally in good quality with known spectral characteristics, so data collected using this type of reference targets could be directly shared as long as the target model number and manufacturer are provided. In case Spectralon targets cannot be used (due to either cost consideration or spatial limitation), inexpensive alternative references can be used but the reference spectral characteristics should be provided as meta-data to ensure the reusability and comparableness of shared datasets.
4. Authors may consider use "flat field correction" as the name for the section of "reflectance calibration /normalizing ...". An important feature of applying Eq.1. to images is to reduce nonuniformity caused by either the imaging chip, illumination, or both.
5. In the section of "preparation for ML", please consider adjusting the description order as "training", "validation", and "testing", which is logically natural and widely used by research communities. Authors may also consider cite a technical-driven review paper on feature selection. This will help readers to further the understanding and knowledge of the techniques can be potentially used.
6. It would be very interesting and useful if authors could provide a table to list some publicly

available datasets that were collected by following the general workflow. This will in turn help the technical community to obtain domain datasets for the development of new tools in the future.

7. There are some repeated words and typos to be carefully checked by the authors. For example: "publications" in the abstract and "bedefined" to "be defined" in the Data acquisition and processing section.

Methods

Are the methods appropriate to the aims of the study, are they well described, and are necessary controls included? Choose an item.

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