Techniques for taking a capture of green plants from arbitrary directions with extra fast rotating polarizer

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The reflectance of the leaf can describe not only regarding its intensity but also in terms of its polarization and polarization techniques are generally used for separating specular reflectance from diffuse reflectance. Spectral reflectance’ s the internal diffuse component contains the details of the plant's biochemical properties, the amount of harvest, dry matter, and water. Specular reflectance of the leaf strongly depends on a combination of the angle of incidence of the light source and the angle of observation view both. The leaves look shiny at the shallow angle, most of this reflection is polarized from the surface of leaves. Although the leaf spectral reflectance which is a point of convergence for many types of research, the study of spectral measurement with polarization the single leaf is largely unexplored. This work aims to connect polarization techniques and directional relations of the leaf Bidirectional Reflectance Distribution Function (BRDF) by differentiating specular and diffuse reflectance. To do this, single leaves BRDF of Coffea canephora Pierre (Coffee), Epipremnum aureum (Pothos), and Fragaria ×ananassa (Strawberry) were captured by and Liquid Crystal Tunable Filter (LCTF) camera in the wavelength range of 460-780 nm with a linear polarizer. The advantage of using an image of the multispectral LCTF camera able to crop surface area of a leaf that means it can select an arbitrary size of the field of view and to identify leaf area. There are thousands of combinations of incident light and observation direction in single leaf BRDF measurement, due to this reason we have been building the automatic goniometer with LCTF camera in a laboratory. Measurement analysis shows unpolarized reflectance has a strong correlation with diffuse reflectance and it can be possible to separate these light reflections with a simple camera using a fast rotating polarizer. The simple RGB camera captured same plants with four linear output of extra fast rotating polarizer. The image analysis is mainly based on the Stock’ s parameters, and the result suggested that diffuse light scattering of leaves can be distinguished successfully within a millisecond from specular components. As a result, it is becoming to take the same color of pictures of plants that are independent of the directional variations. Earth observation satellites typically look straight down (nadir), although modern satellite became technically able to take an image from arbitrary directions using attitude determination control system. Satellite image able to cover more land area and vegetation indices of remote sensing can be more precisely defined using this separation technique.

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