EXPLORATION OF THE APPLICATION OF FLUORESCENCE LIDAR TO MONITOR VEGETATION

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In this study, a fluorescence lidar to remotely obtain the fluorescence spectral information from plants has been proposed. The Lidar system is to help potential applications such as plant species identification, disease detection, yield monitoring, vegetation mapping, etc. The fluorescence lidar system operates with a 401 nm diode laser mounted to a telescope in the Scheimpflug configuration [1]. The system is effective for examining phenomena involving elastic backscattering, inelastic⁄ fluorescence light, and particularly chlorophyll information while obtaining spectral, temporal, and range resolution at the same time.

By examining distinct properties in the wavelength spectrum of the fluorescence signal originating from different plant bodies, the fluorescence lidar will remotely sense processes and changes related to the biophysical and biochemical nature of plants to inform about the health [2], growth [3] and other status of importance for agriculture.

Currently, methods employed by plant researchers are very costly, time-consuming, require expertise, and are very laborious. Thus, employing this type of system will help overcome the aforementioned challenges whiles fostering greater benefits for modernizing agriculture.

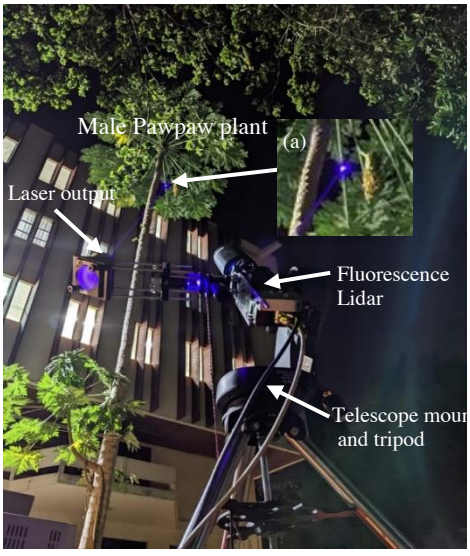

Figure 1: An overview of the experimental site and a photograph of a Fluorescence lidar system. (a) Targeted spot of a male pawpaw plant.

[1] Lin, H., Zhang, Y., and Mei, L. *Fluorescence Scheimpflug LiDAR developed for the three-dimension profiling of plants*. Optics Express, (2020).

[2] Al-Saddik, H., Simon, J. C., and Cointault, F. *Development of spectral disease indices for 'flavescence dorée' grapevine disease identification*. Switzerland: Sensors, (2017).

[3] El-Naggar, A. G., Jolly, B., Hedley, C. B., Horne, D., Roudier, P., and Clothier, B. E. *The use of terrestrial LiDAR to monitor crop growth and account for within-field variability of crop coefficients and water use*. Computers and Electronics in Agriculture, (2021).