STREAMLINING PRECISION IRRIGATION: DEVELOPING A DECISION SUPPORT TOOL FOR SENSOR DATA PROCESSING

Boaz B. Tulu[1]*, Haimanote K. Bayabil*[1]*, Yiannis Ampatzidis*[2]

[1]University of Florida, Agricultural and Biological Engineering Department, Tropical Research and Education Center, Homestead, FL

[2]University of Florida, Agricultural and Biological Engineering Department, Southwest Florida Research and Education Center, Immokalee, FL

In the era of digital agriculture, precision irrigation has become important, especially in area facing water scarcity. However, data collection, storage, and processing needed for precision irrigation are challenging. The objective of this research was to develop a user-friendly web-based decision support tool that can be used to streamline canopy temperature data used to assess plant water stress. Above canopy temperature, drone-based thermal and RGB images were collected from 32 research plots at the Tropical Research and Education Center. A DJI Matrice 210 v2 UAV drone equipped with the DJI Zenmuse XT2 thermal camera was used for the data collection. Different image processing techniques were employed, including OpenCV, a renowned open-source computer vision software library for real-time image processing, Microsoft's Image Composite Editor (ICE), a tool for creating panoramic images, and OpenDroneMap (ODM). Designed for aerial drone image processing, ODM proved to be better at maintaining georeferenced information from stitched images, ensuring each pixel accurately reflected its actual location. Crop water stress level is computed using temperature readings of pixels with plant canopy. The canopy temperature dataset is used to develop a web-based machine-learning model optimized as an irrigation decision support tool. This presentation will highlight advanced image processing tools, canopy temperature-based machine-learning algorithms, and the challenges of using such data to implement precision irrigation at plot and field scales.

PRESENTER BIO: Boaz B Tulu: is a graduate student in Agricultural and Biological Engineering at the University of Florida. With a background in Computer Engineering, Boaz specializes in integrating AI based technologies to address agricultural challenges. He was the 2022 Mandela Washington fellow at Purdue University.