

Smart Tree Crop Sprayer Utilizing Sensor Fusion and Artificial Intelligence

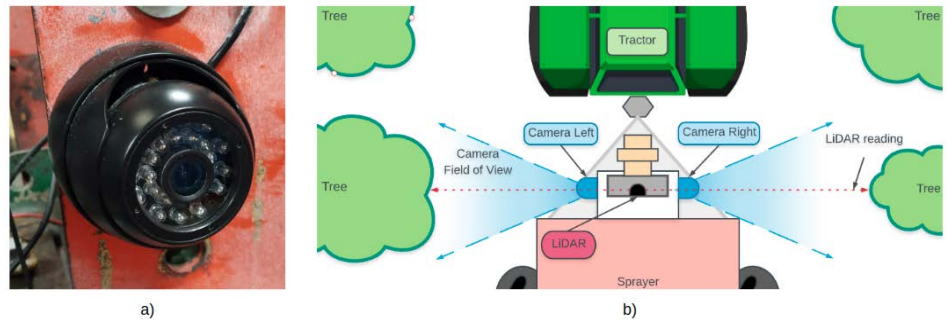


Figure 1. SmartSense for variable rate sprayers: a) RGB camera installed on the sprayer; b) top view of the schematic of the positioning of cameras and Lidar on the sprayer.

Researcher: Yiannis Ampatzidis

Contact: i.ampatzidis@ufl.edu

UF/IFAS SWFREC

Smart agricultural machinery can provide variable-rate technologies using artificial intelligence (AI) and machine vision to optimize spraying applications. In this project, a smart tree crop sprayer was developed that utilizes a low-cost and novel SmartSense sensor (a combination of Lidar and two RGB cameras; Figures a and b) and AI-based data fusion to optimize agrochemical (e.g., pesticide, foliar fertilizers) applications. This SmartSense sensor and variable rate spraying technology (patent pending) detects tree canopy, estimates tree height and leaf density, and based on this

information, controls liquid flow and nozzle zones (or individual nozzles). The Lidar estimates tree height and canopy size, and the cameras and AI verify if the detected “object” is a citrus tree. It will not spray if another object, human, other constructions, other trees, etc., are detected. Together, the Lidar and cameras are also used to estimate tree leaf density with an AI-based data fusion algorithm and vary the amount of agrochemicals (based on tree height and canopy leaf density) applied. This SmartSense technology can detect “at-risk” trees and does not spray on dead

trees or gaps (i.e. places with no trees). While spraying, it detects and counts fruits and estimates their size (video demo: www.youtube.com/watch?v=qRd4g44b2lk&feature=youtu.be). It can also “read” fertility maps (e.g., developed by Agroview) and vary the amount of the foliar fertilizer based on the management zones. At the end of each application, it develops spraying and fruit heat-maps. Chemical Containers, Inc. licensed this smart sprayer technology from UF to commercialize it.

Funding



Agricultural Marketing
Service (AMS)