In recent years, technological advances have shown a strive for more automated processes in agriculture, as seen with the use of unmanned aerial vehicles (UAVs) with onboard sensors in many applications, including disease detection and yield prediction. In this thesis, an octorotor UAV is presented that was designed, built, and flight tested, with features that are custom-designed for strawberry orchard disease detection. To further automate the disease scouting operation, geolocation, or the process of determining global position coordinates of identified diseased regions based on images taken, is investigated. A Kalman filter is designed, based on a linear measurement model derived from an orthographic projection method, to estimate the target position. Simulation is performed to compare this filter to the Extended Kalman Filter, which is based on the commonly used perspective projection method. The filter is embedded onto a CPU board for real-time use aboard the octorotor UAV, and the algorithm structure for this process is presented. In the later part of the thesis, a probabilistic data association method is used to analyze measurements of different target sources and is incorporated into the Kalman filter. Ad-hoc experiments are performed, using video acquired aboard the octorotor UAV with a gimballed camera in hover flight, to demonstrate the effectiveness of the algorithm and the UAV platform.

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The public is welcome to attend.