DroneBloom: Enhancing Orchard Efficiency through Agricultural Robotics

1st Cody Goss
Georgia Institute of Technology
College of Computing
Atlanta, Georgia
cgoss32@gatech.edu

***Abstract*—This paper presents a research initiative focused on the integration of drones, machine learning, artificial intelligence, and robotic technologies into apple orchards to enhance operational efficiency and promote sustainable agricultural practices.**

We introduce a suite of technological concepts, culminating in a drone-based system capable of generating geospatial maps of orchard tree locations.

The system is designed to support two distinct pathways: (1) retrofitting existing farms with advanced technologies, and (2) establishing new farms with automation and data-driven practices as a foundational framework.

The overarching objective is to demonstrate how current technologies can improve the efficiency, sustainability, and economic viability of modern orchard management.

***Index Terms*—Drones, Robotics, Precision Agriculture, Orchard Mapping, Geospatial Analysis, Sustainability, Apple Orchards**

I. Introduction

There are always opportunities to improve the way we cultivate food. Today, farms across the United States use the pesticide Sevin to thin their apple orchards. Apple thinning is the practice of reducing the number of blooms on a stem to ensure larger, higher-quality fruit. As the cost of hiring labor has become increasingly high, farmers have turned to alternative methods—most commonly, spraying chemicals to promote thinning. The purpose of this research is to explore whether there is a cost-effective and sustainable alternative that reduces reliance on pesticides in apple orchards across the United States.

II. Related Work

III. Motivation and Goals

A. Motivation

- Reduce reliance on chemical thinners (e.g., Sevin)
- Improve data collection and yield prediction
- Enable automation in orchard management

B. Project Goals

- Build a drone-based system to map orchard tree locations
- Develop a robotic blossom thinning prototype
- Design orchard architecture optimized for automation (e.g., espalier systems)
- Establish industry partnerships to support research and deployment

IV. Drone-Based Orchard Mapping Demo

A. System Design

B. Methodology

C. Preliminary Results

V. Future Work

VI. Conclusion

Acknowledgments

Thanks to Tim Mercier (Mercier Orchards), Dante Ciolfi (Georgia Tech Advisor) for their guidance and support.

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