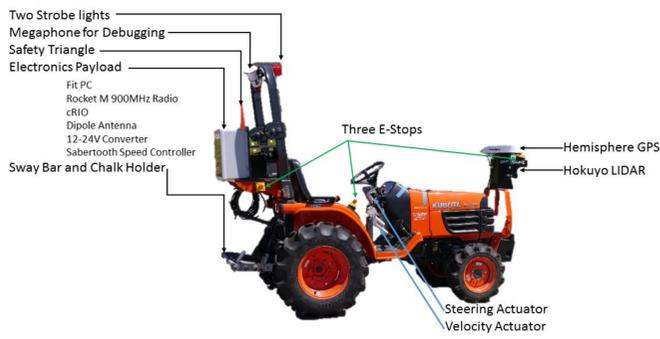# 21st Century Farming

Building a foundation for automated precision agriculture systems
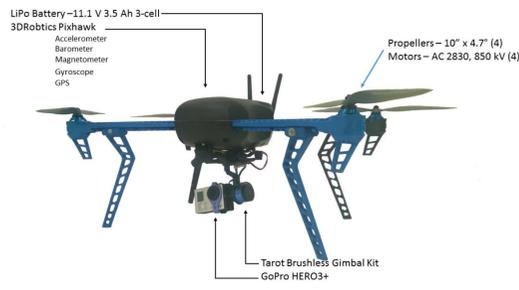
This year's team is working to develop high-level autonomy software that integrates multiple autonomous air and ground vehicles to monitor and treat fields of crops.
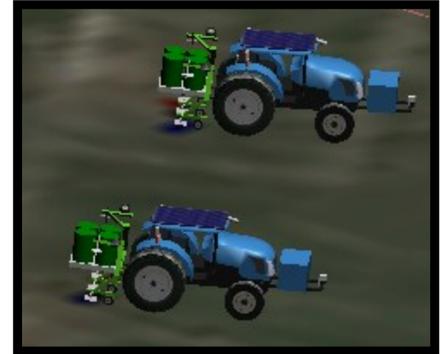
The Fleet

Two Strobe lights
Megaphone for Debugging
Safety Triangle
Electronics Payload
Fit PC
Rocket M 900MHz Radio
cRIO
Dipole Antenna
12-24V Converter
Sabertooth Speed Controller
Sway Bar and Chalk Holder
Three E-Stops
Hemisphere GPS
Hokuyo LIDAR
Steering Actuator
Velocity Actuator

Unmanned Ground Vehicle (UGV)

LiPo Battery ~11.1 V 3.5 Ah 3-cell
3DRobtics Pixhawk
Accelerometer
Barometer
Magnetometer
Gyroscope
GPS
Propellers – 10" x 4.7" (4)
Motors – AC 2830, 850 kV (4)
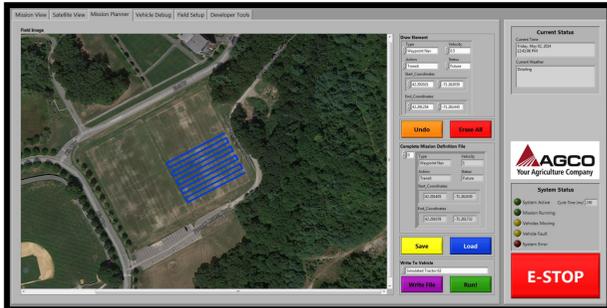Tarot Brushless Gimbal Kit
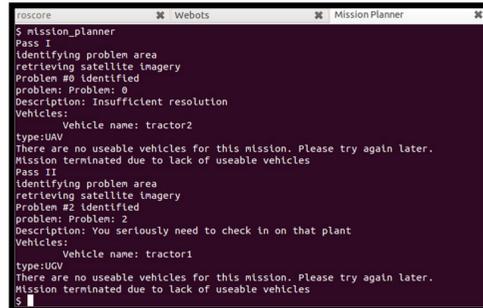GoPro HERO3+

Unmanned Air Vehicle (UAV)

Simulation Vehicles
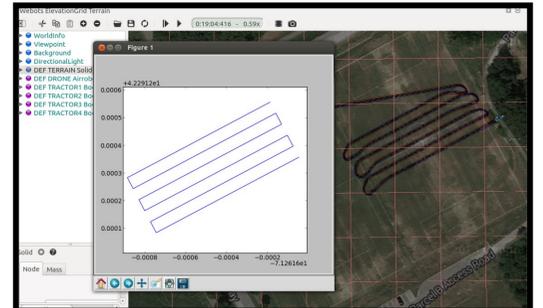
The Software

LabVIEW Frontend

- View problems in field
- Monitor vehicle status
- Plan missions for vehicles
- Dispatch vehicles

Python Backend

- Manage data sources
- Route communication between vehicles
- Automatically plan missions

Simulation Environment

- Test operations on full fleets of vehicles
- Allow quick testing of new algorithms

In the end, we created a system that coordinates a fleet of vehicles to effectively detect and treat problematic areas. Our software is able to successfully command multiple UGVs and UAVs to execute a computer-generated mission. The three software components include a Python back-end, LabVIEW front-end, and UAV control software. The user interface allows an operator to override the auto-generated path from the Python software. The off-the-shelf UAV control software communicates between the base station and the UAV to provide UAV status updates via a GUI.

Autonomous waypoint testing in Olin Parking Lot A

Faculty Advisor: Drew Bennett

Team (top row): Ben Kroop, Shivam Desai

Team (bottom row): Adela Wee, Kevin McClure, Berit Johnson

AGCO Liaison: Jeff Zimmerman

Thanks also to David Barrett, Garland O'Connell, Aaron Hoover, Jason Tong, Russell Zacharias, and the Ariens SCOPE Team

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