Iowa State University
Electrical and Computer Engineering

MicroCART
sdmay20-50

Summary

MicroCART is a drone platform designed for graduate students to perform research on embedded and control systems and as a department demonstration tool. Currently, the MicroCART quadcopter platform is functional with two operational drones.

System Design

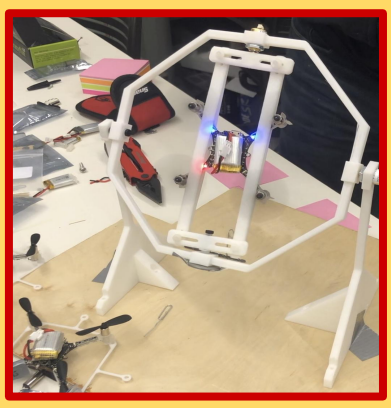
The system is composed of three major components: the groundstation, the backend, and the drone itself. Commands are sent by the groundstation, relayed through the backend, and given to the drone. The drone uses the commands and camera array data to navigate its position within a set field of motion.

Requirements

- Functional
  - GCS adaptor for Crazyflies and MAVLink
  - Second functional drone
  - Tuning stand for testing axis rotation
- Non-functional
  - GUI features should be ergonomic
  - Improved documentation for future teams
  - Maintenance of current system latency and flight accuracy

Areas of Development

- **A second drone**
  - A second fully functional drone was built and tested.
- **Crazyflies**
  - Many Crazyflies were built and flight was achieved using a smartphone as a bluetooth controller
- **Tuning table**
  - Designed and 3-D printed a tuning table to test Crazyflie axis rotation
  - Single axis stand
- **GUI widget development**
  - Draw to flight
  - PID value controller
  - Log data visualizer
- **MAVLink**
  - Made a software Adapter to control Mavlink vehicles



Testing and Evaluation

- Fine-tuning GUI by adding PID sliders for more drone control.
- Flight Scripts to test similar routes
- Tested battery limits using current draw voltage from the lithium ion battery on the drone.
- Evaluated drone flight errors using flight log data and the Matlab data tool.
- QTCreator IDE allows us to set breakpoints and debug segfault errors for testing and evaluation.
- Hardware testing on the circuit boards using oscilloscopes traces helps resolve complex issues.

Project Vision

The plan was to create multi drone flight with the two larger quads as well as integrate the crazyflie drones into the demonstration. Included with this integration was development on the control system including control scheme swap with PID, state-space, etc. to test implementation of various control schemes on the platform.

Other developments included turning tables for crazyflie drone control system calibration, booting linux on the second core to increase capabilities for future team development, improvements to the GUI interface, and a full build up of a second drone.

With this changes, graduate students and future senior design teams would have higher capabilities for research and system development.

Client / Faculty Advisor
Dr. Phillip Jones

Team Members
Evan Blough Shubham Sharma
Kynara Fernandes Joseph Gamble
Jacob Brown Aaron Szeto

Acknowledgements
James Talbert
Matthew Cauwels