MicroCART Mini

Prototyping

sdmay25-32

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Client & Faculty Advisor: Dr. Phillip Jones

Project Overview

MicroCART: Microprocessor Controlled Aerial Robotics Team

- Design a code-based mini quadcopter platform to be used in CPRE 488 and for Controls & Embedded Systems researchers
- Develop mini quadcopter printed circuit board (PCB), containing a Microcontroller, RF, IMU, and Wi-fi chip
- Develop software to stabilize and communicate movements
- Develop base-station to communicate with quadcopter
- Create and improve documentation and video tutorials for future teams

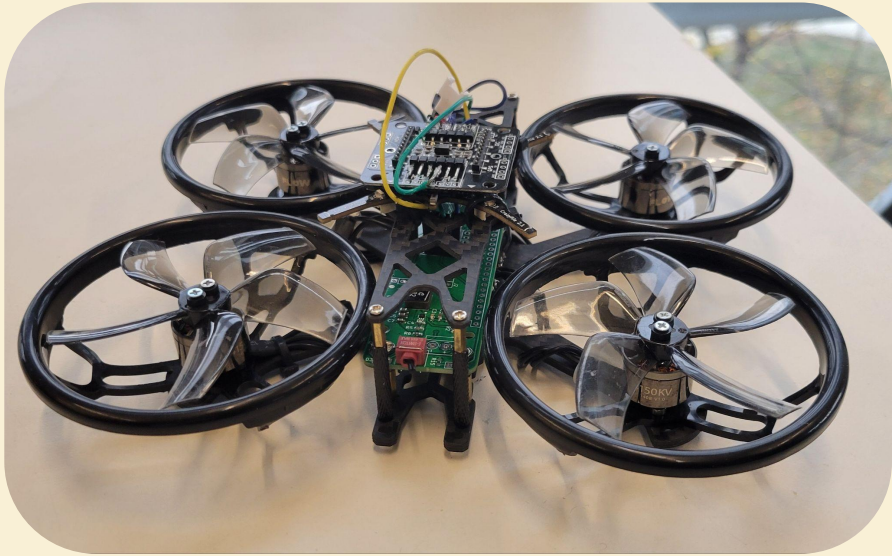
CrazyFlie micro-quadcopter

Our Project Goals

- Design/Improve a code-based quadcopter platform integrating both hardware and software to be used for hands-on learning in CPRE 488's lab.
- Ensure both remote accessibility and usability for future users through documentation and tutorials

Project History

- Project began in: 1998 - Now
- Student designed test-stand
- Project YouTube channel
- Sizeable code repository
- Bitcraze CrazyFlie
- Fully student-designed Drone



Users

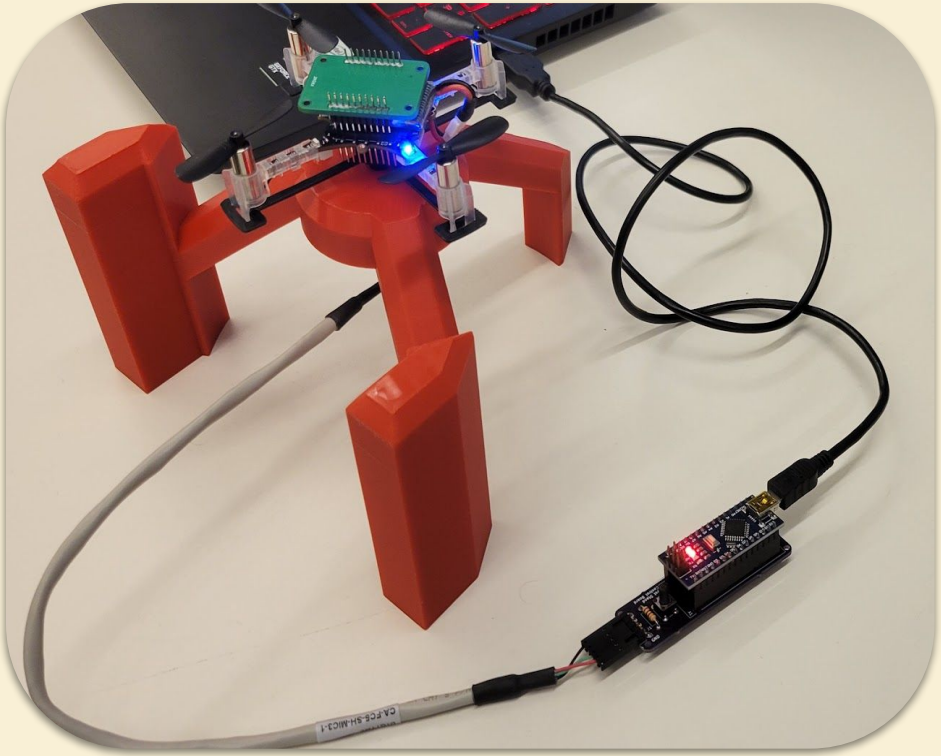
- CPRE 488 Students
  - Lab 4
- Successor Project Team
  - Next years MicroCART team
- Project Advisor/TAs
  - Dr. Jones, TAs assisting with Lab 4
- Prospective ISU students
  - People observing our demonstrations

What we are doing for this presentation

- ~~**Title Slide** with Team ID, Client and Faculty Advisor information~~
- ~~**Project Overview**~~
- **Prototype(s)**: Review of one or more prototypes your team has developed
    - Set the stage: What is the purpose of the prototype? Where does it fit in your design story? What are you trying to learn from it?
    - Demonstrate: Show your prototype “in action.” This could be presenting a physical object, a short video of something working/operating, a code run-through, a UI with user interaction, etc.
    - Reflect: What did you learn from the prototype? What worked? What didn’t?
- **Implications and next steps** based on what you've learned from your prototypes

Lab Equipment and Prototype

CrazyFlie micro-quadcopter



Test Stand

Our Prototype

- Our ‘prototype’ is proof that we have managed to learn how to work with the previous project groups’ materials by updating the CPRE 488 GUI
- CrazyFlie quadcopter
  - Firmware prototype: optimizing and improving connectivity from backend to frontend
- Test stand
  - Implementing a test stand tracker that sends quadcopter movement data to the front end

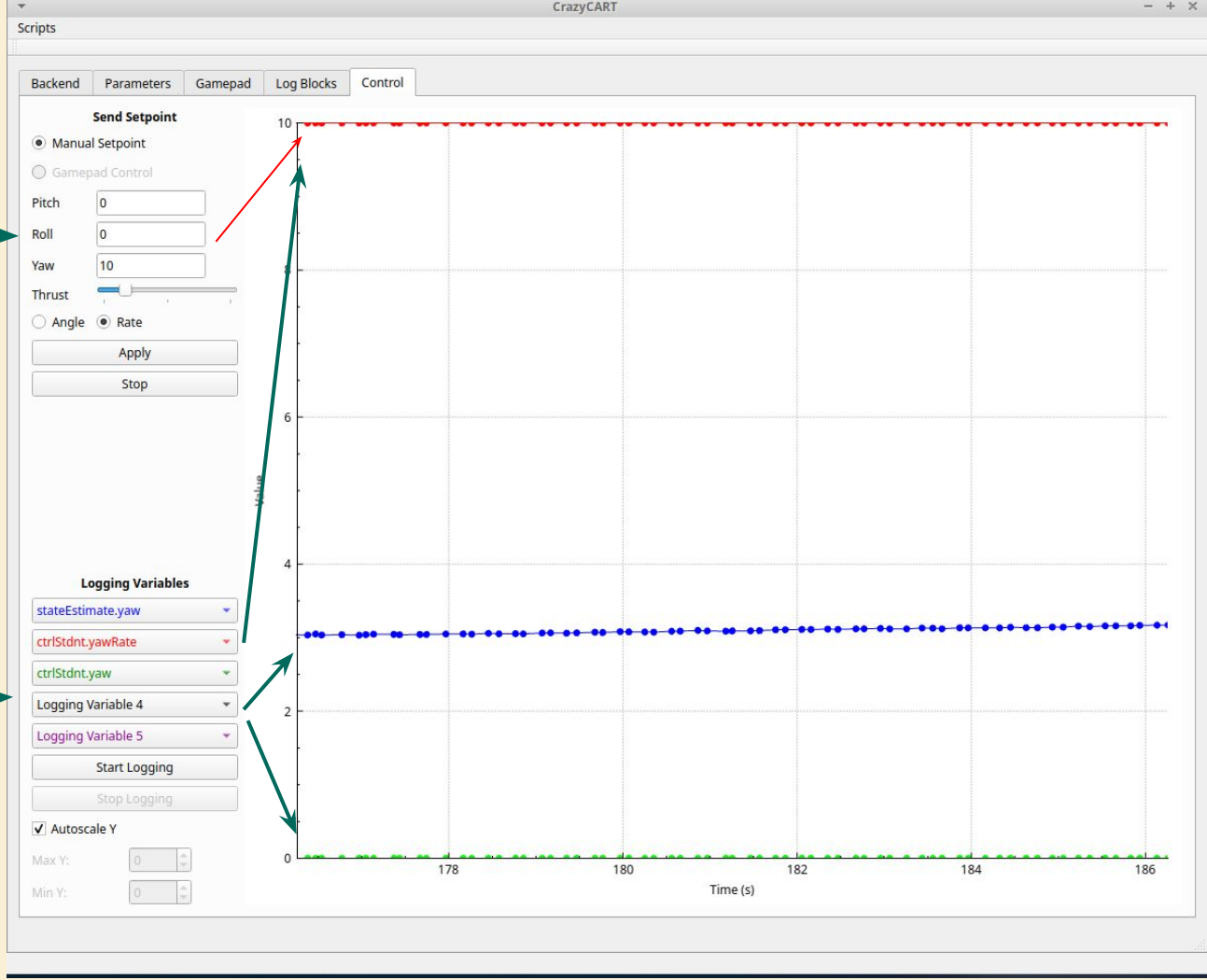
Prototype Success Equation

- To still be in working condition
  - We are appending to or editing parts of an existing code base for our project; the goal is to keep it in working condition
- Enable Test Stand functionality
  - Have the microcontroller able to read the sensor within the Arduino IDE
- Fix bugs or issues that hinder packet readability

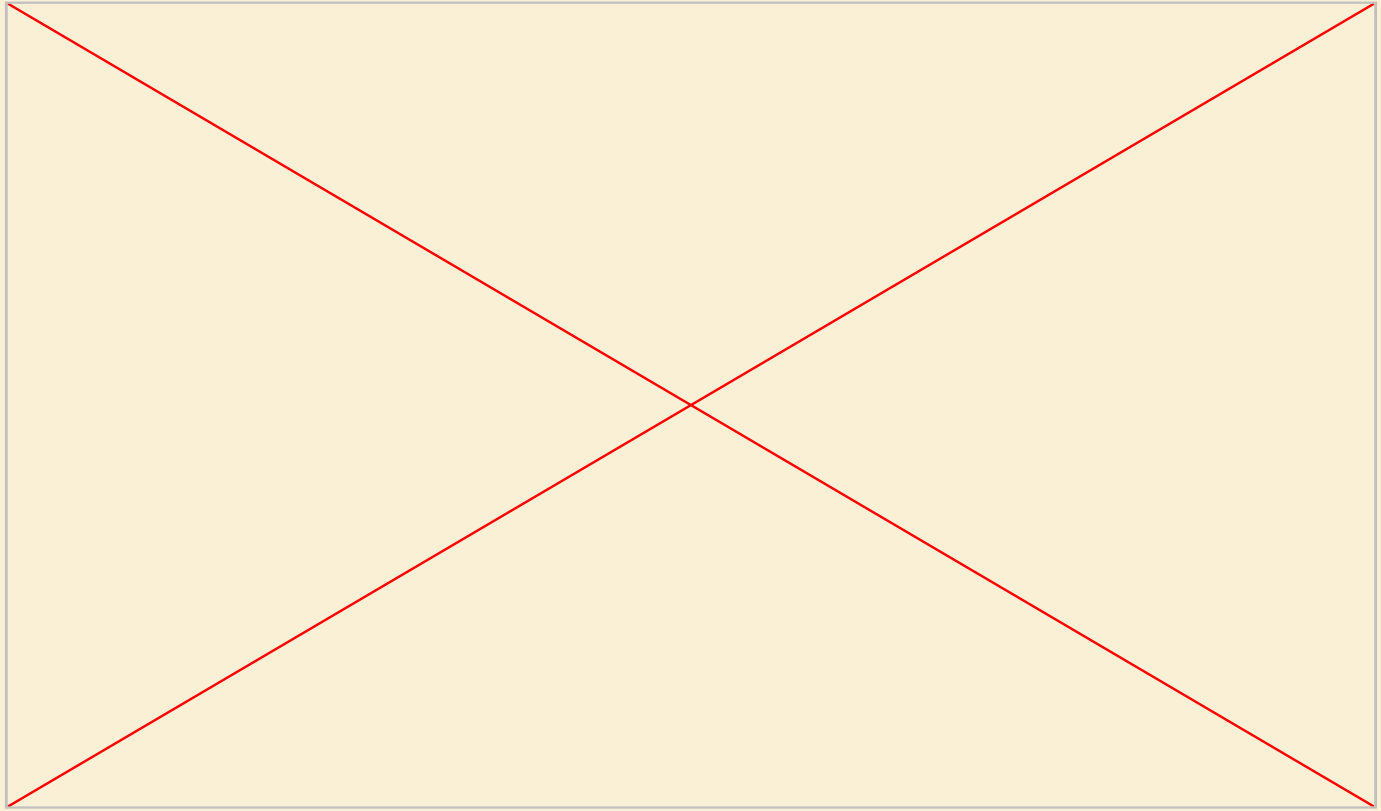
Prototype Still

Setpoints to see result of adjustments

Selectable Variables for Graph



Demo of our prototype



What we learned

- What worked
  - Quadcopter backend: Combining adapter and ground station into one component works, which is capable of reducing the overall communication overhead.
- What didn’t
  - Quadcopter backend: Combining adapter and ground station into one component introduced a lot more packet loss which will affect our frontend graph logging.

Implications and Next Steps

- Backend prototype is working, but we still need to improve it more
  - Debug and solve packet loss issue for backend
- Test stand prototype does not function as intended
  - Debug and solve connectivity issue to backend
  - Attempt to send and receive packets from test stand to backend

Works Cited

- Jones. “CprE 488 - Embedded Systems Design.” Iowa State University, https://class.ece.iastate.edu/cpre488/schedule.asp