

# MicroCART

sdmay24-32

Justin Kenny, Steve Frana, Trevor Friedl, Travis Massner, Clayton Kramper, Will Maahs

Advisor: Dr. Phillip Jones

## Introduction

MicroCART is a multi-year project devoted to creating an infrastructure to teach and research control systems theory using Quadcopters. The two main projects of MicroCART are the MP4 lab, a lab designed to teach students in CPRE 488 control systems theory using quadcopters, and the FlyPi, a larger quadcopter used by researchers.



Figure 1: Crazyflie quadcopter

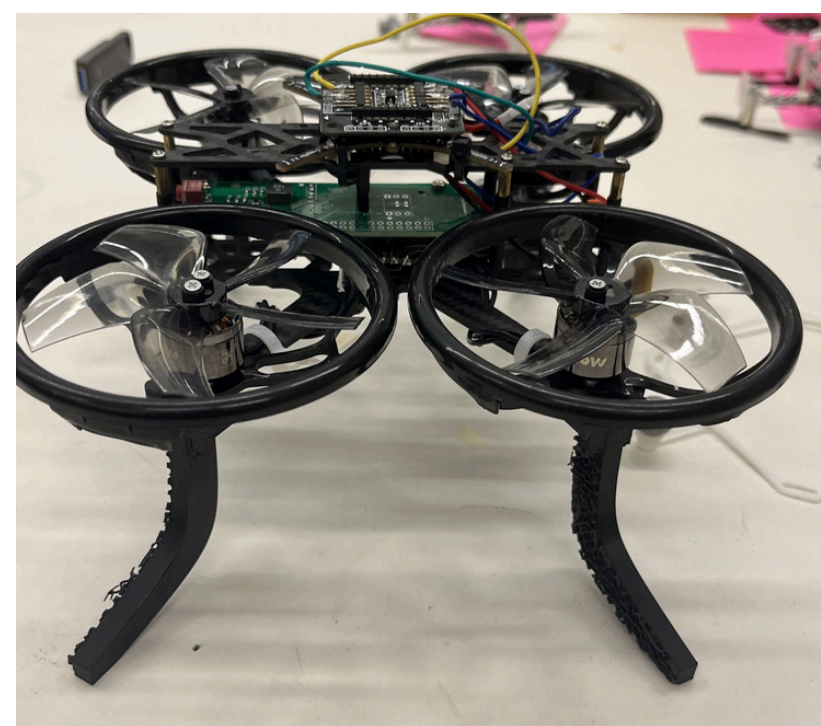


Figure 2: FlyPi Quadcopter

## Design Requirements

- Create a new crazyflie adapter using cflib.
- Reduce crashing and freezing in MP4 GUI.
- Partition cores of Raspberry Pi for FlyPi controls
- Improve video and wiki documentation

## Design Approach

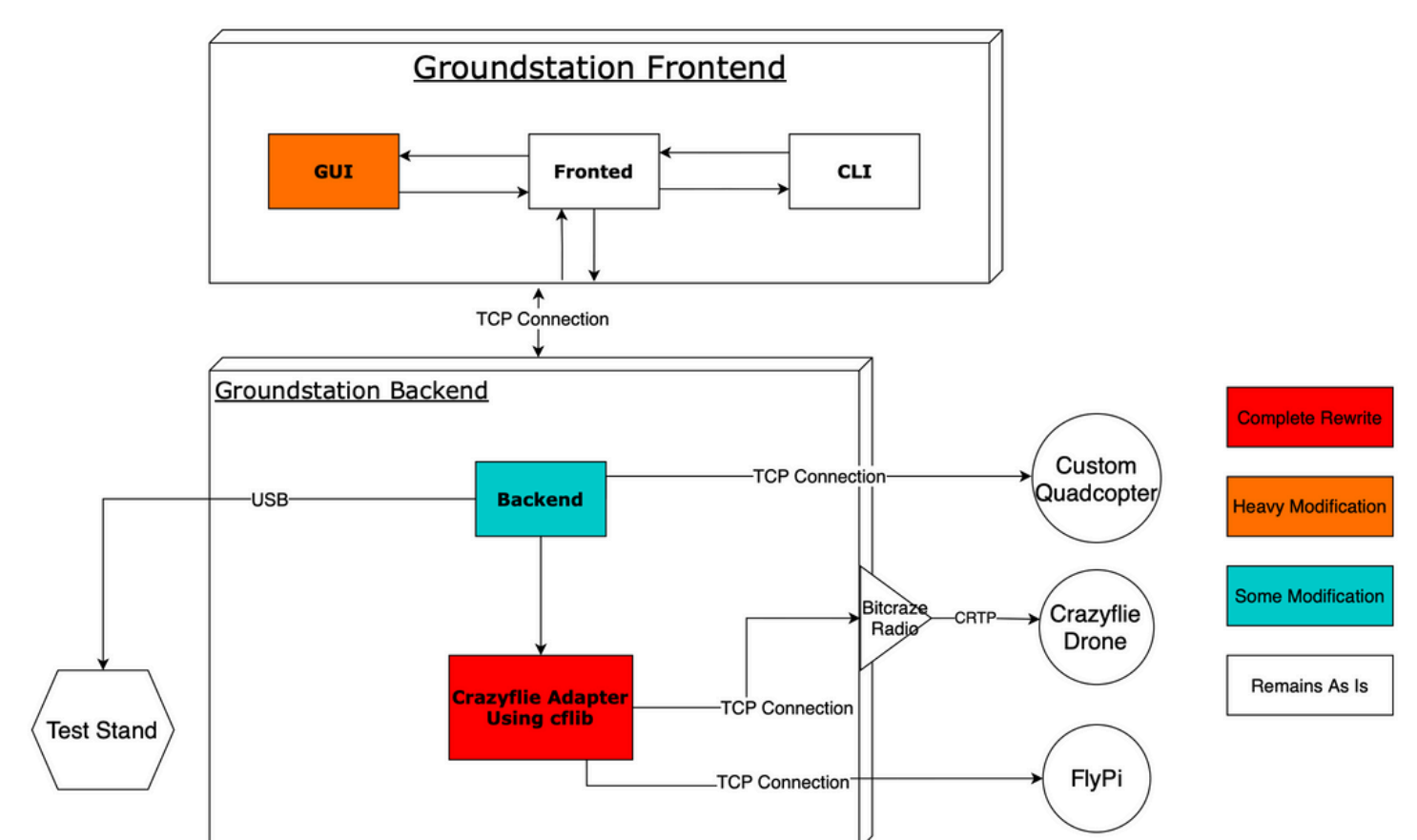


Figure 5: MP4 Infrastructure Design

## Context

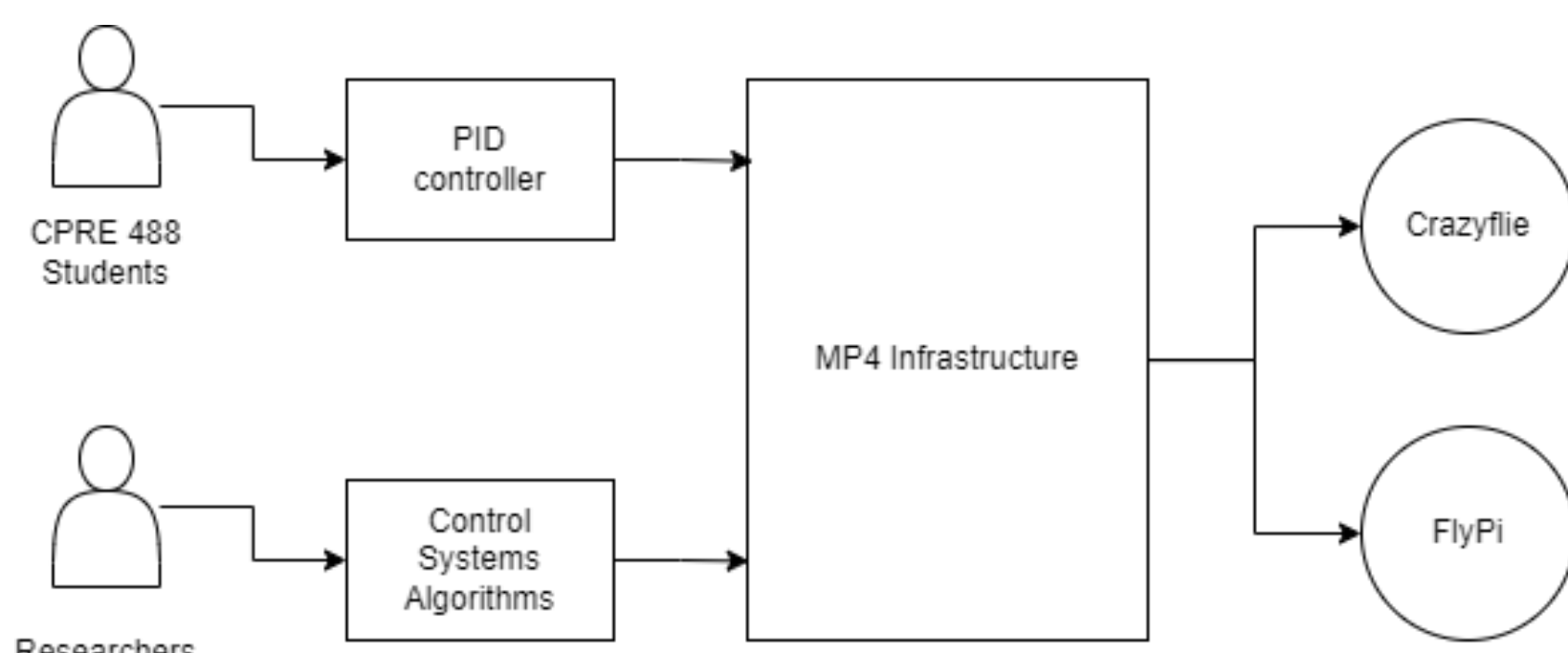


Figure 3: MicroCART use cases

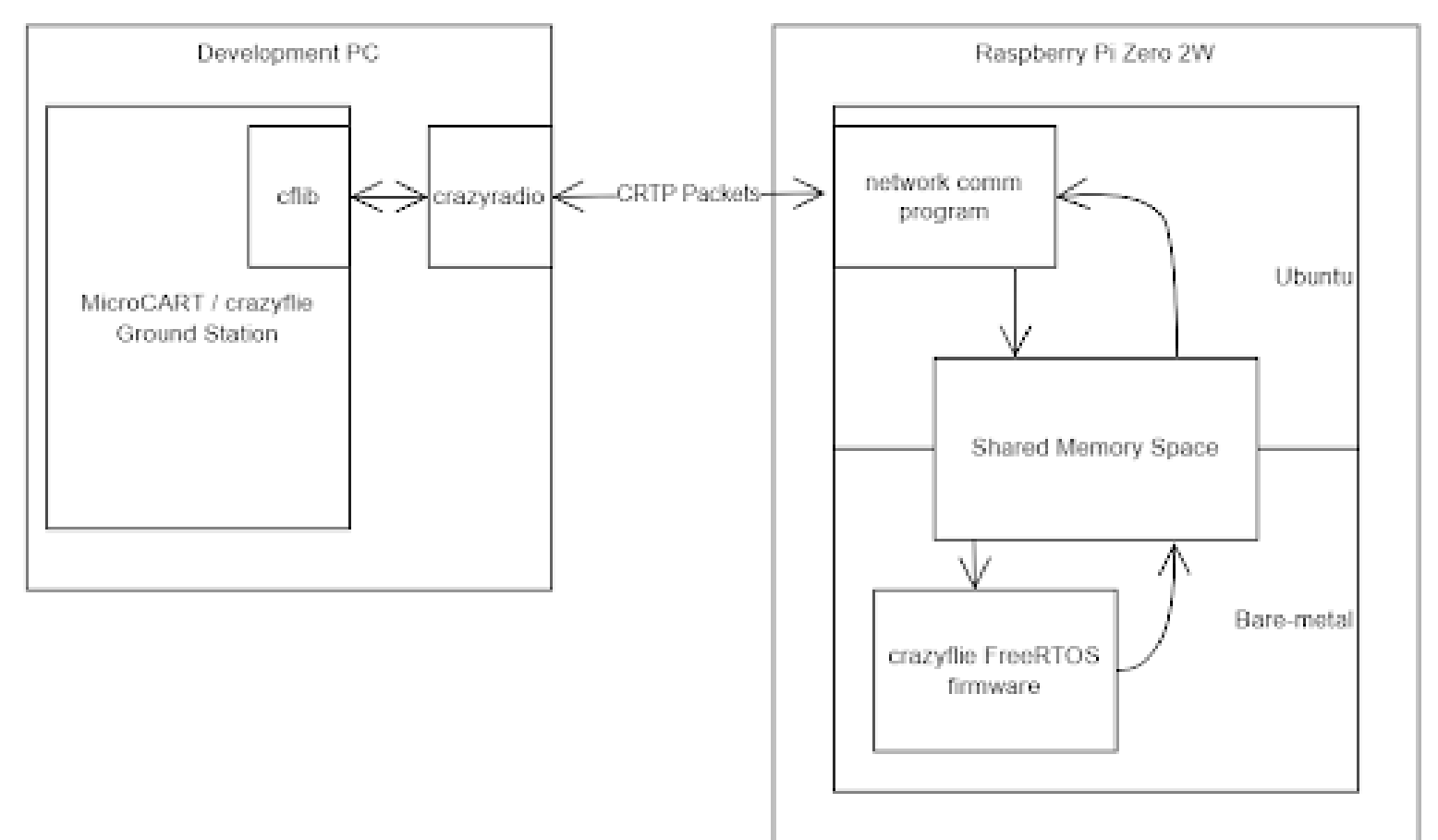


Figure 6: FlyPi Design

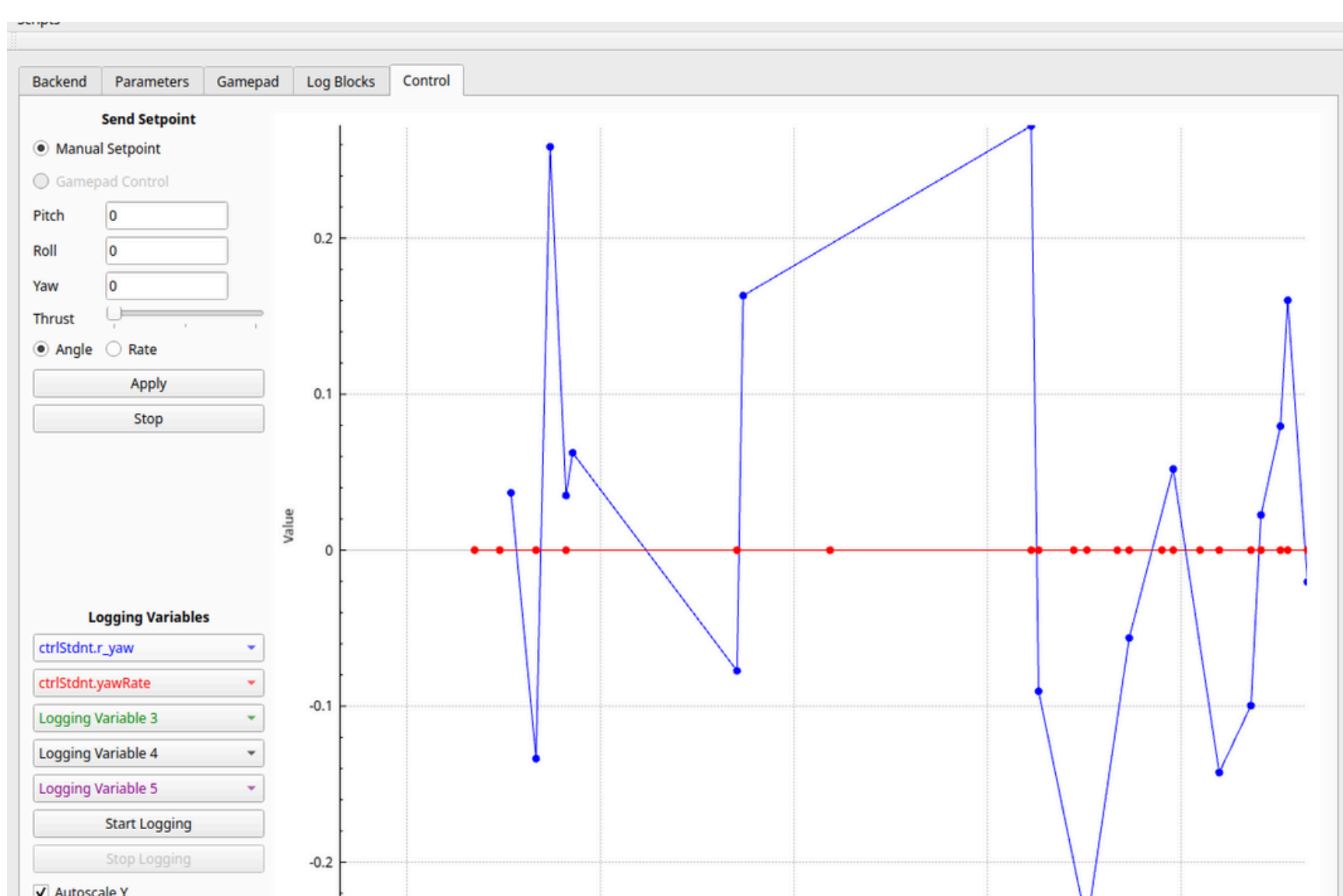


Figure 4: C++ GUI Logging Tab

## Testing

- Testing via performing MP4
- Using CLI to send commands
- Experiments to test packet latency and reliability
- Timing test of Crazyflie adapter

## Technical Details

- Bitcraze Crazyflie open-source firmware
- Bitcraze cflib python library.
- C++ GUI designed in QT.
- u-boot launches baremetal C on Raspberry Pi.

## Challenges

- No partitioned cores or shared memory applications exist for the Raspberry Pi 3/Zero 2W.
- Raspberry Pi 3 has no second UART for debugging.
- Cross compiling is difficult between two different platforms (Crazyflie and Raspberry Pi).