

Senior Design May 24, 32

MicroCART Senior Design Team

Week 21 Report

February 16 - February 23, 2024

Faculty Advisor: Philip Jones

Members:

Justin Kenny - Scribe

Steve Frana - Technical Lead

Trevor Friedl - Project Manager

Travis Massner - UI/UX Designer

Clayton Kramper - Technical Lead

Will Maahs - Team Organization Lead

Links

- [Shared Google Drive Folder](#)
- [Tentative Project Gantt Chart](#)
- [MP4 Timing Data](#)
- [Microcart Packet Structure](#)

Summary of Progress this Week

We created a new VM for completing MP4 which runs the 'crazycart' script correctly and should contain all libraries necessary for operating MP4.

We were unable to get the shared memory library working, so we tried to get a custom program running to read from memory and get an LED blinking if the memory location was changed. However, we ran into some issues writing to memory from linux. Our initial research seemed to indicate we need special permissions on the kernel-level to write to physical memory. We also were still unable to get the multiple UARTs working since the software library sent relied on a Raspian library. We may be able to use the pigpio library to add more GPIO pins as UART.

We also began to work on getting the FlyPi back up in the air. There was a little bit of slowdown with getting the battery holder connected back on to the drone. So far everything in terms of power and connections seem to be working for the quadcopter. We're hoping that completion of this task should only take a couple more hours of effort.

We got the swarm demo running on two different drones at the same time. On our first test flight, the drones crashed into each other in the air. If the drones are far enough apart from each other to start it will work. We also need to triple check to make sure that the values that map the flight are updated with the current lighthouse configuration. We also need to make sure that we have two fully

charged batteries for each test otherwise the drones to not behave as expected.

Recordings for KiCAD tutorials also began this week. The plan is to break the video into two sections: highlighting the functions of KiCAD by looking over the FlyPi schematic and layout, and then creating a small example of changes to the PCB and seeing how to edit the design in the case things might need an update in the future.

Pending Issues

- Add documentation for PycroCart
- Unsure of the difficulty of porting drone firmware FreeRTOS.
- Crazyflie Radio seems to be disconnecting from the crazyflie somewhat frequently
- Test swarm demo a few more times before Scholars Day

Individual Contributions

Member	Contributions	Weekly Hours	Total Hours
Justin Kenny	<ul style="list-style-type: none">● Debugged issues with UART and shared memory programs● Built a new VM for completing MP4.	8	124
Steve Frana	<ul style="list-style-type: none">● Built shared memory program for raspberry pi's● Monitiered 2 UARTs on raspberry pi 4	6	114
Clayton Kramper	<ul style="list-style-type: none">● Prepped for scholars day● Figured out "Arming" and "auto-arming"● Got swarm_circles to work, and control 2 drones simultaneously	6	102
Travis Massner	<ul style="list-style-type: none">● Worked on creating a heartbeat bash script for the crazyflie setpoint● Tried to find why the timeout occurs during setpoint	6	87

Will Maahs	<ul style="list-style-type: none"> ● Got swarm demo working ● Started trying to boot the FlyPi ● Prepped for scholars day 	6	111
Trevor Friedl	<ul style="list-style-type: none"> ● Worked on getting FlyPi back up in the air using Austin's demo video ● Recorded KiCAD walkthrough using FlyPi PCB 	6	93

Comments and Extended Discussion

Broader Context

Our initial work in 491 didn't result in us identifying any major broader contexts that we needed to address. The only main broader contexts we identified were assisting students in completing MP4 and creating interesting demos to show to prospective students during scholar's day. At this time, we have identified no more broader context issues that need to be addressed.

As part of our project, we aim to inspire prospective Iowa State students through demos of our work in the control systems lab. To further this goal, we worked with our mentor, Dr. Jones to exhibit our work during scholars day 2/24/24. During this time, we demonstrated autonomous control of drones through three sessions.

Plans for coming Week

- Fly the FlyPi - **High Priority**
- Debug shared memory program issues on the RPi 3.
- Figure out how to use 2 UART ports on baremetal programs, possibly using pigpio.
- Document running LED blink program on raspberry pi Zero 2W.
- Package up MP4 into a clean VM ASAP for the TAs.
- Finish PycroCart documentation on the Wiki of the Git Repo
- Film a video on how to use both of the PycroCart GUIs
- Film a video fully explaining the current state of PycroCart
 - Suggestions for future teams
 - Motivations
 - Things to not do
- Post KiCAD tutorial to MicroCART YouTube
- Scholars Day