

EE/CprE/SE 492 - Spring Break Status Report

March 14th - April 2nd, 2025

Group number: may25-32

Project title: MicroCART mini: Microprocessor Controlled Aerial Robotics Team

Client &/Advisor: Dr. Phillip Jones

Team Members/Role:

- Daniel Zaucha: Client interaction, Communications Lead
- Jonah Upah: Hardware Lead, Team Secretary
- Ryan Lowe: Technical Advisor
- Yi Hang Ang: Software Lead

Weekly Summary

This week is crunch time for the team, Dr. Jones gave us an additional week to prepare but there is still plenty that needs to be done. Last week some priorities were adjusted to ensure the team meets the deadline. Jonah and Yi's sub group continued with the final implementation of the Test Stand and have been doing final testing. Daniel and Ryan have shifted their focus to work digging into the firmware to be able to explain some unexpected behaviour.

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Parameters  Gamepad
Title  bitrcize@ubuntu:~
Top: 18:46:42 up 48:44mg, 1 user, load average: 1.21, 1.15, 1.14
Tasks: 152 total, 1 running, 151 sleeping, 0 stopped, 0 zombie
Uptime: 36.0 us, 7.3 sy, 0.0 ni, 56.6 id, 0.0 wa, 0.0 hi, 0.0 si, 0.0 st
Mem Mem: 7862.2 total, 6645.4 free, 729.0 used, 1196.7 buff/cache
Mem Swap: 1360.0 total, 1360.0 free, 0.0 used, 6913.5 avail Mem

PID USER PR NI VIRT RES SHR S %CPU %MEM TIME+ COMMAND
111
2010 bitrcize 20 0 1512128 268792 96020 S 77.0 3.3 19:40.38 ./GroundStation
1978 bitrcize 20 0 7151180 24056 15212 S 0.0 0.4 2:40:10 python3 main.py
995 root 20 0 1848760 170960 7176 S 5.3 2.1 1:58.25 /usr/lib/xorg/...
2089 bitrcize 20 0 6284 1884 1726 S 1.0 0.0 0:22:20 ./lockfd
1483 bitrcize 20 0 971840 96656 62684 S 0.7 1.2 0:20:15 xfsmd --replace
1733 bitrcize 20 0 462888 48240 38860 S 0.7 0.5 0:19:52 /usr/bin/xfce...
2028 bitrcize 20 0 649554 23584 4576 S 0.3 0.3 0:07:71 python3 main.py
3120 root 20 0 0 0 0 0 0.0 0.0 0:00.04 [kworker/u4:0-...
1 root 20 0 101900 11280 8272 S 0.0 0.1 0:01:39 /sbin/init spl...
2 root 20 0 0 0 0 0 0.0 0.0 0:00.00 [kthread]
3 root 0 -20 0 0 0 0 0.0 0.0 0:00.00 [rcu_gp]
4 root 0 -20 0 0 0 0 0.0 0.0 0:00.00 [rcu_par_gp]
6 root 0 -20 0 0 0 0 0.0 0.0 0:00.00 [kworker/0:0H-k...
8 root 0 -20 0 0 0 0 0.0 0.0 0:00.00 [kworker/0:0H-k...
9 root 20 0 0 0 0 0 0.5 0.0 0:00.00 [ksoftirq/0]
10 root 20 0 0 0 0 0 0.1 0.0 0:00.00 [rcu_sched]
11 root 15 0 0 0 0 0 0.5 0.0 0:00.00 [migration/0]
12 root -51 0 0 0 0 0 0.5 0.0 0:00.00 [idle_inject/0]
14 root 20 0 0 0 0 0 0.5 0.0 0:00.00 [cpuhp/0]
15 root 20 0 0 0 0 0 0.5 0.0 0:00.00 [cpuhp/1]
16 root -51 0 0 0 0 0 0.5 0.0 0:00.00 [idle_inject/1]
17 root 15 0 0 0 0 0 0.5 0.0 0:00.00 [migration/1]
18 root 20 0 0 0 0 0 0.5 0.0 0:00.00 [ksoftirq/1]
20 root 0 -20 0 0 0 0 0.1 0.0 0:00.00 [kworker/1:0H-k...
21 root 20 0 0 0 0 0 0.5 0.0 0:00.00 [kworker/1]
22 root 0 -20 0 0 0 0 0.1 0.0 0:00.00 [netns]
23 root 20 0 0 0 0 0 0.5 0.0 0:00.00 [rcu_tasks_Ath...
24 root 20 0 0 0 0 0 0.5 0.0 0:00.00 [kauditd]
26 root 20 0 0 0 0 0 0.5 0.0 0:00.00 [khubd]
27 root 20 0 0 0 0 0 0.5 0.0 0:00.00 [kworker/0:0]
28 root 0 -20 0 0 0 0 0.1 0.0 0:00.00 [writeback]
29 root 20 0 0 0 0 0 0.5 0.0 0:00.00 [kconnectd]
30 root 25 5 0 0 0 0 0.5 0.0 0:00.00 [ksmd]
31 root 39 19 0 0 0 0 0.5 0.0 0:00.00 [kswappd]
33 root 0 -20 0 0 0 0 0.1 0.0 0:00.00 [kworker/1:0]
77 root 0 -20 0 0 0 0 0.1 0.0 0:00.00 [kblockd]
78 root 0 -20 0 0 0 0 0.1 0.0 0:00.00 [kblockd]
79 root 0 -20 0 0 0 0 0.1 0.0 0:00.00 [blkcg_pant_biol...
80 root 0 -20 0 0 0 0 0.1 0.0 0:00.00 [tm_dev_wq]
81 root 0 -20 0 0 0 0 0.1 0.0 0:00.00 [ata_sff]
85 root 0 -20 0 0 0 0 0.1 0.0 0:00.00 [rcu]
2010 bitrcize 20 0 1512128 268792 96020 R 30.9 3.3 7:50.91 llvmpipe-1
2015 bitrcize 20 0 1512128 268792 96020 R 30.6 3.3 7:47.25 llvmpipe-0
2010 bitrcize 20 0 1512128 268792 96020 S 10.3 3.3 3:11.13 GroundStation
2011 bitrcize 20 0 1512128 268792 96020 S 0.0 3.3 0:00.00 GroundStation
2012 bitrcize 20 0 1512128 268792 96020 S 0.0 3.3 0:00.00 gmain
2013 bitrcize 20 0 1512128 268792 96020 S 0.0 3.3 0:00.00 gdm
2014 bitrcize 20 0 1512128 268792 96020 S 0.0 3.3 0:00.00 GDMConnection
2017 bitrcize 20 0 1512128 268792 96020 S 0.0 3.3 0:00.00 GroundStation
2018 bitrcize 20 0 1512128 268792 96020 S 0.0 3.3 0:00.00 GroundStation
2019 bitrcize 39 19 1512128 268792 96020 S 0.0 3.3 0:00.00 Group5-disk48
2020 bitrcize 39 19 1512128 268792 96020 S 0.0 3.3 0:00.00 Group5-disk41
2021 bitrcize 39 19 1512128 268792 96020 S 0.0 3.3 0:00.00 Group5-disk42
2022 bitrcize 39 19 1512128 268792 96020 S 0.0 3.3 0:00.00 Group5-disk43
2023 bitrcize 20 0 1512128 268792 96020 S 0.0 3.3 0:00.00 ofxread
2024 bitrcize 20 0 1512128 268792 96020 S 0.0 3.3 0:00.00 ofxread
2025 bitrcize 20 0 1512128 268792 96020 S 0.0 3.3 0:01.11 ofxread

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Past week accomplishments

- Daniel Zaucha
 - Crazyflie firmware logging investigation
 - GUI shows set-points going to 0 on occasion / periodically (For this)
 - Investigating where the setpoints and values of the Crazyflie are sent from
 - master/crazyflie_software/crazyflie-firmware-2021.06/src/modules/src/...
 - Deciphering why some setpoints are recorded differently from expected
- Jonah Upham
 - Test Stand Testing
 - Tried to break what we have
 - Known issues Continued.
 - Serial connection is not properly closed.
 - Still an issue, not told it is acceptable with good communication to students
 - Logging both test stand data and quad data leads to logblock misalignment.
 - Fixed in log file handler, appending to “reorganize” instead of “line”
 - The logging now only works if a test stand is connected.

- Fixed by adding a conditional to not block for receiving serial data if no serial connection is present. Instead append “nan” values
 - New issue
 - If the Test stand is not connected and you try to plot the test stand data it causes weird behaviour with the logger, causing you to restart the client.
 - Not that big of a deal.
 - Thrust set to Zero issue
 - Some further testing has shown that it is directly related to cpu utilization
 - There is a pattern of the suspected dropped packets.
- Ryan Lowe
 - Looking into the framework to get a better understanding of the packets and what the drone does with the setpoints once they are received.
 - The crtp.c file seems to be the main file involved with receiving the packets and interpreting the packets. The commander.c and the crtp_commander_high_level.c file are the main files that deal with setting setpoints and using the setpoints to perform drone maneuvers, such as taking off, landing, going to a position, etc. The stabilizer.c file contains state estimation and uses the sensor data to ensure stable flight with the new setpoints and the power_distribution_stock.c file is responsible for actually applying the setpoints to the drones motors.
 - Working on getting the Swarm demo to work.
 - Was able to successfully demo with one crazyflie, then tried to do it with two crazyflies at the same time
 - When doing the swarm crazyflie demo with 2 drones, there would always be one that just decides to flip over and the other would fly out of the lighthouse area.
 - Working on the Vive controller grab demo
 - Having issues with setting up the SteamVR application to recognize the controller, so when running the program it doesn't detect it.

- Want to be able to figure this demo out and create documentation and videos on how to do it because these do not exist on the MicroCart page yet.
- Yi Hang Ang
 - Solved multiple known issues with Jonah
 - Can connect to GUI without Test Stand connection now
 - GUI incorrect mapping of variables in firmware
 - ctrlStdnt.yaw was mapped to stateEstimate.yaw which is why we are getting mixed up values in log file and GUI
 - MP4 Part 1 code updated with Part 2 code minus the source files
 - Properly initialized Log Blocks in Part 2 code and not cache folder
 - Log Blocks Desync fixed by reorganizing the code

Pending Issues/tasks

- Logging

Individual contributions

NAME	Individual Contributions	Hours this week	HOURS cumulative
Daniel Zaucha	<ul style="list-style-type: none"> ● Crazyflie Firmware Investigation 	13	138
Jonah Upah	<ul style="list-style-type: none"> ● Test Stand testing ● Test Stand bug fixes 	18	134
Ryan Lowe	<ul style="list-style-type: none"> ● Crazyflie Firmware ● Swarm Demo ● Vive Controller Grab Demo 	12	111
Yi Hang Ang	<ul style="list-style-type: none"> ● Test stand testing 	18	118

	<ul style="list-style-type: none">• Test Stand bug fixes		
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Plans for the upcoming week

- Daniel
 - Task: GUI shows set-points going to 0 on occasion / periodically
 - Test out MP4
- Yi
 - Deployment
 - Serial.readline() causing high CPU utilization (or not), look for a fix
 - Apparently a known issue on forums
 - Look into “actual reason” of setpoints randomly gets set to 0 on graph
- Ryan
 - MP4 Deployment
 - Test out MP4
 - Help with getting the VM instance ready and set up in 2041
- Jonah
 - Start getting a VM instance ready to be used for students
 - Removing all personal data.
 - Removing all answers, or hiding them in the repo.
 - Final testing.
 - Immutable.
 - Firmware depending on if Ryan and Daniel need help.
- Group Plan:
 - Need everyone to start looking at firmware.

Summary of weekly advisor meeting

04/2/2025

Both of these meetings were a week before we are actively deploying the VM for CPRE 488, due to a delay in CPRE 488 pushing the release back a week. We have gone over the final issues that we will be working on before deployment officially occurs next week (See below).

Website:

<https://sdmay25-32.sd.ece.iastate.edu/#teammembers>

Tasks / Issues:

1. **Test-stand**: Desync message issue (**fixed**)
2. **Test-stand**: GUI cannot plot if the test-stand is not connected (**fixed**)
3. **GUI shows set-points going to 0 on occasion / periodically**. If this happens quickly then does not appear to impact the quadcopter behavior. If it occurs for a long time it causes the quad to shudder periodically. Gathering more info if this is an issue on the Coover 2041 computers, and gathering information on if there is a relationship between high CPU Utilization and how long/often the set-points get set to 0. (**High Priority**)
4. **Test-stand**: VM crashes if Ctl-C is used to shutdown MP-4, while the Test-stand is plugged in. (**Annoying, but medium to low priority**)
5. **New Batteries**: Something appears to be different with the new batteries, making it a bit of a pain to plug them into the quadcopters (**medium-low priority**)
6. **Create and deploy clean MP4 VM image**: Create a clean MP4 VM image that ETG can clone and deploy to all of the computers in Coover 2041 (**High-priority**)
 - a. Make sure none of the PID values are given
 - b. Make sure you do not have any personal information on the VM image (i.e. being logged in to your Gmail, or person bank account)
 - c. **Make sure the VM image is Immutable!!!!** This is so when a team starts a VM a prior team's work is not on the VM. (**High-priority**)
7. **Test MP4 at scale**: Make sure to test MP-4 running on at least 5 machines in Coover 2041 at the same time. Perform tests with at least five stations that are communicating with quads the are running on test-stands. (**High-priority**)
8. **Updated MP4 writeup and student resources**: Make a pass over the MP4 assignment write-up, and any documents/video created/updated to act as resources for students to use during MP4. (**High-priority**)