Weekly Progress Report

Authors:

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Week 1 and 2

Date:01/06- 01/19

Summary:

The team established consistent meeting times for Monday and Friday at 6 pm at EB93 at PSU. We also created a project schedule and set a draft of milestones. We decided to go ahead and make a proposal for ordering a drone kit, which we will use to port and test Cleanflight; initially using Arm and then RISC-V.

We have been working on mapping the makefile, establish a good understanding of how SPI works and document it, understand the process of operation for RISC-V, JTAG, startup file, SDK, IDE and porting to the particular architecture. We also have drafted the Project Design Specifications and we decided to track our project using the "GitHub Project". Our sponsors will receive a weekly email with our progress that is updated at the end of each calendar week on Sunday at 10 pm.

Bliss Summary :

- Figured out how to install and run Freedom Studio, reading its documentation.
- Tested example code on the HiFive board and hooked it up successfully.
- General learning of the HiFive boards' characteristics (onboard J-Tag device for example).
- Investigating if/where a Startup.s file (or equivalent) may be for the HiFive board.

Eric Summary :

- Created the "Makefile Manual" document (located in the root directory under Makefile itself) which gives a high-level overview of the Makefile's functionality. AKA what gets built and how for a particular target.

To do: - come up with a comprehensive list of drivers that are included in the Flight Controller's final .hex executable. Specifically, Galois has tasked us with emulating the SPRacing F3 FC (F3 6DOF). I want to come up with a comprehensive list of drivers for that FC, so we have an idea of which files we need to port exactly.

Nikolay Summary :

- Primarily worked on PDS, Project Schedule and Project Planning, meeting notes (documentation), formatting documentation and email Roy with updates, reviewed makefile To Do:
- Finish PDS

Ruben Summary :

- Reviewed Cleanflight code to get code structure understanding
- Researched IMU sensors and focused on current sensors already implemented in Cleanflight
- Researched RISC-V ISA
- Researched HiFive1 RevB board and it's specs and manual
- Researched tools and processes for developing on HiFive boards
- Setup Linux environment
- Built Cleanflight for target board F3
- Researched and found drone kit with an F3 board

Done:

- Watched the videos that Eric has uploaded that describe the building and porting a drone
- Establish meeting times
- Project Design Specifications draft and template
- Schedule
- Email to Roy and Michal
- Makefile high-level map
- Research RISC-V tools
- Weekly Progress Report
- Set Milestones
- Install Freedom Studio
- Build Cleanflight
- Emailed Roy who emailed Michal proposal of drone kit purchase

TODO:

- Finish PDS
- Make a small presentation for Feb 7th
- mpu_9050.c -> How it works

- Flowchart for Cleanflight
- Flowchart for porting
- Flowchart for makefile
- Use a sensor with the HiFive board

Challenges:

The repo is huge and it takes time to navigate

Notes:

Proposed Milestones

- A sensor is working with HiFive board and breadboard
- Drone Kit is built, tested and reverse engineered
- Makefile modified for the correct SDK
- Makefile ported for RISC-V
- SPI working with HiFive
- All necessary drivers have been modified for HiFive
- The drone is responding to basic commands
- Project is presented to sponsor

Proposed Schedule for the next 10 weeks

Week	Goals and Tasks
Week 1	Confirm availability, meet sponsor, schedule meeting times
Week 2	Research RISC-V,Makefile,IMU
Week 3	PDS(draft), Weekly Report, F3 Drivers, Freedom Studio, RISC-V Assembly, SPI, Weekly Report
Week 4	PDS(final review), Weekly Report, get one sensor working with the board, ECE 412 class check-in
Week 5	Use Cleanflight to a drone Kit, weekly report, ECE 412 team project review
Week 6	Begin porting the makefile, weekly report
Week 7	Continue porting makefile and SDK, begin unit testing, weekly report
Week 8	Port I/O, unit testing, weekly report
Week 9	Port Drivers, unit testing, weekly report
Week 10	Port Drivers, IMU, Cleanflight, integration testing

Week	Goals and Tasks
Week 11	Acceptance testing, review with sponsor and advisor, deliver the project; the drone is using accelerometer and gyroscope and responds to basic commands such as up/down, left/right, forward and backward

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Week 3

Date:01/20- 01/26

Summary:

In week 3 the team was able to create a high-level reference for SPI in RISC-V available in directory `cleanflight/docs/capstone2019/SPI_HiFive`. The document describes where to look in the manual for the SPI instances and how do you attach sensors. In addition, the team internalized the feedback from Roy and Michal. Last, we focus on finalizing our PDS and getting ready to discuss our progress with our sponsor.

Bliss Summary :

- Looked into the SPI interface and driver support.
- Still investigating if/where a Startup.s file (or equivalent) may be for the HiFive board.

Eric Summary :

- Still trying to come up with a list of drivers included in SPRacing F3 .hex executable (the FC Galois wants us to emulate). To Do:
- Flowchart for Cleanflight, Flowchart for porting, Flowchart for makefile

Nikolay Summary :

- Primarily worked on PDS, Project Schedule and Project Planning, meeting notes (documentation) To Do:
- Compile LaTeX for PDS, implement the project planning using Kanban and Git Project, support the team with research and meetings

Ruben Summary :

- Review of Cleanflight code to get code structure understanding
- Found 2 possible sensors already implemented in Cleanflight (MPU6500 for acc and gyro, MPU9250 for acc, gyro, and compass)
- Research SPI connection on the HiFive1 RevB board
- Compiled doc for SPI overview on HiFive1 RevB board
- Continue researching RISC-V ISA
- Continue researching HiFive1 RevB board and it's specs and manual
- Continue researching tools and processes for developing on HiFive boards

Done:

- High-level SPI overview Weekly Report
- PDS draft and email to Roy

TODO:

- Finish PDS
- Make a small presentation for Feb 7th
- mpu_9050.c -> How it works
- Flowchart for Cleanflight
- Flowchart for porting
- Flowchart for makefile
- Use a sensor with the HiFive board
- Research PWM connection and implementation
- Bring up a drone with a compatible board - F3 but waiting for the purchase of kit

Challenges:

- How to divide and assign Cleanflight code for the development of RISC-V porting 1st purchased kit - will the HiFive board fit the chassis

Notes:

- Meeting with Roy this week
- Niko is leaving April 21 with National Guard
- Goals are similar/same from last week

Weekly Progress Report

Week 4

Date:01/26- 02/02

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Summary:

During week 4 the team met with Roy Kravitz and made fundamental changes in how the project is implemented. First, the team will begin with the minimum port. Second, we decided that our main point of communication with our sponsors (Roy and Michal) is Ruben. Further, we are going to be working on understanding the "Minimum Port" aspect that was talked about in today's meeting. Ruben will cover more. We are going to do four modular ports (minimum bringup, Acc/Gyro, Receiver, and ESCs/motors) and unit and integration testing as we slowly bring up aspects of CleanFlight.

The process to port for each module:

1. Review and understand which files are dependent on each other and which are required to change
2. Update code
3. Update Makefile and have successful flash Test Unit and Integration

Moreover, we will continue refining our project schedule and track the project closely as we navigate through it.

Bliss Summary :

To Do:

Done:

Eric Summary :

- Created list of source files needed to create SPRacingF3 executable
- Reorganized project schedule into a Gantt chart, based on Roy's recommendation

To Do :

- Finalize PDS document and schedule
- Begin working on "Minimum Port" (Building a simple RISC-V executable using a version of Cleanflight's Makefile). This will be our team's first attempt at building and flashing a custom program using Cleanflight's Makefile.

Done :

Nikolay Summary :

To Do :

- Weekly progress report
- Minimum Port
- Modify

In progress :

- Review GNU MCU Eclipse
- Minimum Port

Done :

- Reviewed the PDS and made changes
- Weekly progress report

Ruben Summary :

To Do :

- Update PDS
- Work on minimum porting

Done :

- Compile and ran sample code on Freedom E Metal SDK
- SDK readme file
- Email Roy and Michal and informed I am team contact
- Emailed Roy amazon cart link for purchase of mpu9250 hardware sensor, drone kit, battery and transmitter
- Emailed Roy to get input of schedule meetings with him and with sponsor Michal

TODO:

- Need to research how the receiver will communicate with board ie UART?

Challenges:

Notes:

We can approach port with bare metal code but since Freedom has implemented metal API then we will attempt to port using their metal API. We need to understand which files and what needs to be changed and used for porting.

Idea - if we approach minimum porting with just updating the makefile and have all files required inside Cleanflight directory, will the makefile compile and will the main file run to sample code on RISCV? What directory (in the bsd in freedom e metal sdk) is considered the minimum and required to make any port succeed?

Weekly Progress Report

Week 5

Date:02/02- 02/09

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Summary:

During week 5 our team finalized the Capstone Proposal and had a meeting with Roy Kravitz to discuss it. We are in the process of refining our proposal in order for our sponsor and advisor to approve it. Further, we had an update meeting with professor Faust and professor Greenberg presenting our proposal.

Updates for the Capstone Proposal

From the presentation with Mark and Andrew

- Hardware block diagram (not sure of how many levels)
- Inform of what program language cleanflight uses
- Licensing

Bliss Summary :

TO DO:

- Research makefile and understand the implementation
- Hardware code implementation
- Research pros and con of using hardware level implementation
- postpone- bring up of spi example on HiFive

Done:

Updated PDS

Eric Summary :

TODO :

- Create Project Management Plan
- Incorporate final edits to PDS
- Begin researching hardware interfacing between HiFive board and drone kit
- Metal API code implementation
- Research pros and con of using metal API implementation
- Email Michal about new HiFive boards, the status of the order, propose meetings and propose project presentation meeting

Done :

Nikolay Summary :

TODO :

- Copyrights research
- Look for alternative boards
- Add licencing to PDS
- Min port

Doing :

- Review copyright
- Minimum port

Done :

- PDS
- Weekly report

Ruben Summary :

TODO :

- Metal API code implementation
- research pros and con of using metal API implementation
- email Roy our phone numbers
- Email Michal about new HiFive boards, the status of the order, propose meetings and propose project presentation meeting

Done :

- Compile and run sample code on Freedom E Metal SDK
- SDK readme file
- Email Roy and Michal and informed I am team contact
- Emailed Roy amazon cart link for purchase of mpu9250 hardware sensor, drone kit, battery and transmitter
- Emailed Roy to get the input of schedule meetings with him and with sponsor Michal

TODO:

- Need to research how the receiver will communicate with board ie UART?

Challenges:

- Midterms and job interviews made some members less available last week.

Notes:

- Eric has midterm Thursday of next week (will be focusing on that Tuesday, Wednesday of next week).
- Met with Roy
- Potentially we need to find an alternative board
- Wednesday we need to complete the PDS
- Friday we are making a demo presentation with Roy
- Today we implemented a new method to conduct our meetings using an agenda

Weekly Progress Report

Week 6

Date:02/09- 02/18

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Summary:

During week 6 we met twice with our advisor Roy Kravitz. He was present to our Monday meeting and shared insights. During the Friday meeting, we demoed our presentation. We also set a date to meet with our sponsor on Friday 21st of February. We are continuing into working on the minimum port.

Bliss Summary :

Had midterm

Doing:

TODO:

- Continue Minimum Port
- Build an example for the HiFive Board using the freedom SDK
- Look into Zephyr
- Google Bare Metal programming
- Re-Read GNU Make manual
- Look into CleanFlight Makefiles structure
- Continue to look into CleanFlights board/chip connections

Done:

- Talked with Mark to clarify with the project
- Met with Roy to discuss new project ideas about whether to peruse integration from the Metal libraries provided by SiFive and up or go down from CleanFlight code and build in register connections that way

Eric Summary :

Doing :

- Working on the minimum port

TODO :

- Begin designing hardware shield
- Create custom Makefile based on Minimum Port strategy (see PDS)
- Get the Makefile to build for the HiFive as a Target
- Continue with minimum port

Done :

- Project Proposal
- PDS presentation slides
- Looked proto shield
- Created PDS presentation slides
- Began research options for hardware shield
- Updated PDS based on Roy's suggestions

Nikolay Summary :

Doing:

- Min port

TODO :

- Min port
- Build an example for the HiFive Board
- And traceback using the Freedom SDK
- Contact Cleanflight maintainers
- Prep for the presentation
- How to port in bare-metal
- Research freedom metal API

Done :

- License
- Weekly Progress report
- Start adding the docs in the shared drive
- Modified ppt for Proposal
- Contacted a maintainer in Cleanflight repo

Ruben Summary :

- Emailed Roy with contact info

- Emailed Michal about an update on HiFive boards and Amazon status, proposed regular meetings with Galois
- Metal API presentation on the slides
- Minimum port
- Created new directories in cleanflight
- Made changes to files in cleanflight

Done :

- Sent the required emails
- Started min port with the metal API provided by Freedom

TODO :

- Receipts and shopping with Michal
- Email Michal for the Friday meeting
- Continue with min port (goal with compiling sample program)

Challenges:

- Midterms
-

Notes:

-

- Giving Project Proposal presentation at Galois Inc. Friday, Feb. 21
- Update from Michal - amazon cart with drone kit and other items arrive 2/18. Also, the sifive boards should be available by 2/21

Weekly Progress Report

Week 7

Date:02/18- 02/25

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Summary:

During week 7

Updates for the Capstone Proposal

Bliss Summary :

Doing:

Finishing up Min Port.

TODO:

Prep for the presentation Continue Minimum Port Look into Zephyr

Done:

Re-read GNU Make Manual Looked into CleanFlight Make files structure

Eric Summary :

Doing :

- Create EAGLE schematic and layout for custom HiFive hardware shield.

TODO :

- Prep for the presentation
- Create EAGLE schematic and layout for custom HiFive hardware shield.

Done :

- Completed Minimum Port (modified Cleanflight's Makefile to compile a demo program for the HiFive1 Rev. B, while maintaining its original - functionality). Created Minimum Port wiki document outlining steps on how to modify Cleanflight's Makefile.

Nikolay Summary :

Doing:

- Prep for the presentation
- Min port

TODO :

- Make a fresh Weekly Meetings template
- Continue communicating with Cleanflight maintainers

Done :

- Research freedom metal API
- Weekly Progress report
- Contacted a maintainer in Cleanflight repo
- Min port
- Build an example for the HiFive Board
- And traceback using the Freedom SDK
- Contact Cleanflight maintainers

Ruben Summary :

Doing:

- Prep for the presentation

Done :

- Sent the required emails

- Email Michal for the Friday meeting - he proposed new schedule 2/27 5PM. Need to confirm with Roy
- Continue with min port (goal with compiling sample program) - didn't finish since Eric did complete the minimum port
- Completed my presentation slides

TODO :

- Receipts and shopping with Michal - will ask Michal next week in person
- Comparing SiFive's Bare Metal API with the direct hardware approach in Cleanflights code.

Challenges:

- Makefile complexities
- Github branching/forking/merging complexities

Notes:

General Notes:

- Giving Project Proposal presentation at Galois Inc. Friday, Feb. 27
- Update from Michal - amazon cart with drone kit and other items arrive 2/18. Also, the sifive boards should be available by 2/21
- Got Amazon parts but waiting to meetup with Roy to receive them.
- Discussed feedback from Cleanflight developers/maintainers who were suggesting Betaflight is what we should focus on and questions to ask Galois about it.

Questions for Galois:

- For the final deliverable "pull request" does Galois intend for us to merge with CleanFlight proper or Galois fork of Cleanflight and what are the constraints for a "accepted" pull request?
- Ask Michal about keeping receipts for purchased products to speed up item acquisition.
- Ask about meeting up with Galois more often.
- Bring up findings about Betaflight.
- When did Galois create their fork of Cleanflight.