University of Washington
Department of Electrical Engineering
BEE 425, Winter 2019

Arduino ESC:
5/12 - 5/18 Weekly Report

Recap

Recap of Last Week

- Worked on PCB design
- Worked on software to get it running
- Mark is in contact with someone familiar to high power PCB design to help us

Tasks Calendar

Task	Priority	Who	Due Date*
Complete Circuit Schematic	1	Evan, Landon, Garrett	4/10
Complete PCB layout	1	Garrett, Landon	4/11
Check PCB design	2	All	4/12
Order PCB	2	Minh, Landon	4/13
Order external parts	2	Garrett	4/13
Organize Parts List	3	Garrett, Minh	4/12
Solder parts	2	Mark	4/28
Finished High Power PCB design V1		Garrett, Landon	
Finish Code	1	Landon, Garrett, Evan	5/17
Create high current design	1	Minh	5/16
Order 2nd PCB	2	Minh	5/16
Order 2nd BOM	2	Minh	5/16
Perform tests	2	Landon, Garrett, Evan	5/16
Review final report sent by Randy	4	All	
2nd PCB and parts arrive ETA	N/A		5/26
Hopefully high power PCB’s soldered		Mark	6/2
Have final report ready to be reviewed	2	All	5/31

Perform high power tests	1	All	6/5
Poster board	1	All	6/13
PowerPoint Slides	1	All	6/13
Final Report Finished	1	All	6/13

Green = Complete
Yellow = In progress
Red = Behind
* Due date means if we don't meet this date, chances this project doesn't complete this quarter rises.

Information for This Week

Goals to Work on This Week

High Priority	Finish code to debug Finish design for high power PCB Have Mark look over PCB design Order High Power PCB
Mid Priority	Update BOM for high power ● Battery power supply + charger ● High power motor ● High gauge wire + connectors + lugs Add our current work to the final report ● While it's still fresh in our minds
Low Priority	Sleep

Updates and New Information This Week

- Mark made some recommendations for the PCB design
    - Use high gauge copper wire to act as a bus for our circuit
    - Use lugs as connectors from the wire to our PCB
- We are considering whether to program our board to work with or without Hall Effect sensors.
- We should consider removing the buck regulator.
    - It would be introducing high power and current to the driver which might burn it out.
    - We can include it on one of our PCB's and not have it on another

Thing to Think About This Week

- How many PCB's are we planning to assemble?
    - 3 would be a safe option
        - 2 in case one fails
        - The third would be with the buck regulator
    - Order parts for 3.5
- Think of a way to hold our Arduino and PCB that wouldn't **kill** us or anyone during the presentation
- Think of how our sensors will be attached to the board
    - Should we have them dangle off to the side?
    - We need female connections at the top of the headers on the PCB

Tasks Worked on

Minh	• Worked on the high power PCB
	  ○ Been in contact with Mark and his friend who specializes in high power design
	  ○ Took his design ideas for the copper wire connections
	  ○ Talked to him about our ideas on how we want our boards soldered
	  ○ Made a parts library for the lugs
	  ■ Board is going to extend out quite a bit
	  ○ Not going to add a comparator
	  ○ Made a version for without the buck regulator
	  ○ Made corrections and updates to schematic
	  ■ Pass the final design after Mark's approval to Landon/Garrett to change connections to header pins.

Landon	• Assisted Garrett in setting up the low power board for testing and programming
	  ○ Built the test circuit for the 6 mosfets on a breadboard
	  ○ Helped on reading and writing to the registers for applying settings and reading faults
	  ○ Debugged test code for SPI communication and for motor driving
	  ○ Relocated and soldered test point wires on the low power board

Garrett	• Finished code for low power PCB with landon
	  ○ Finished SPI code. This was one of the hardest parts of the programming. The communication between the arduino and driver was very picky but we were able to get the desired results after hrs of testing.
	  ○ Finished PWM code. This was pretty easy as we only had to supply one PWM signal and the arduino has specific PWM pins
	  ○ Programmed driver. After the SPI was configured, programming the driver was simple and we were able to read back the desired configurations from the driver.
	• Debugged low power PCB hardware design with landon
	  ○ We found several HArdware design problems such as the grounds on the PCB and arduino weren't connected and several other simple trace connection errors. We were able to overcome these errors by cutting traces and wiring these connections to the correct pins with jumper cables.
	• Completed low power PCB tests with landon
	  ○ We were able to successfully drive the low power motor. We took videos to document our success.
	  ○ This also means that 95% of our code for the high power PCB is complete.

Evan	• Worked on the final report
	  ○ Add software design section
	  ○ Organized hardware design section
	  ○ Designed block diagrams

	● Debugging code ○ Find any errors in command line on the SPI section (MISO and MOSI)..

Assignments

	Assignments
Anyone	• Work on final report • Think about how we want to display the project safely
Min	• Finish high power PCB • Give to Mark for final approval • Order PCB • Work with Mark on BOM ○ Order parts • Order batteries + charger
Landon	• Put in work completed in final report • Check PCB to Arduino connections • Work on incorporating sensors • Work on version with Hall Effect sensors if needed
Garrett	• Put in work completed in final report • Check PCB to Arduino connections • Work on incorporating sensors • Work on version with Hall Effect sensors if needed
Evan	• Put in work completed in final report • Work on incorporating sensors • Work on version with Hall Effect sensors if needed

Challenges

Risk	**Countermeasure**
High power PCB might not work	Be safe and try not to die. Order multiple PCB's Present what we have with low power working
Power supply for different motors we're testing	Use PWM to control voltage and current levels
Time is short	Can't believe we might actual finish

Updated Project Milestones

Phase	Action or Deliverable	Planned		Updated Actual Date
		Start Date	End Date	
Prototyping	Finish PCB Design	4/1	4/22	4/22
	Generate a BOM for Prototypes	4/10	4/22	4/22
	Order parts	4/23	4/23	4/23
	Finish software/firmware development	4/20	4/29	5/18
	PCB's arrive	4/29	4/29	4/29
	Solder components	4/30	5/1	5/6
	Finish tests	5/1	5/3	5/19
2nd Version	Finish 2nd PCB Design	4/22	5/3	5/16
	Order 2nd PCB	5/3	5/3	5/16
	Solder 2nd PCB	5/23	5/27	6/2
	Test 2nd PCB	5/29	5/31	6/5
Presentation	Final Report	5/10	6/2	
	Powerpoint Slides	5/27	6/11	6/13
	Practice Presentation	6/8	6/13	6/13

Agenda for next week

- Work on report while PCB comes
- Get sensors working with low power
- Create a way to present the project safely
- Start on Posterboard

Questions and Comments for Randy, Joe or Mark