EE/ CprE / SE 491 - sddec20-25

Supercapacitor Based Motor Regeneration

Week 1 Report
1/10/20 - 2/2/20
Client: Solar Car
Faculty Advisor: Nathan Neihart

Team Member Roles
- **Kyle Czubak:** Scribe
- **Ben Kenkel:** Meeting Facilitator
- **Joe DeFransisco:** Chief Engineer & Team Lead
- **Ryan Willman:** Safety Manager
- **Bryan Kalkhoff:** Report Manager
- **Connor Luedtke:** Test Engineer

Weekly Summary

The first week of the reporting period we met and discussed possible meeting times. We also discussed basic project specifications. The team mostly focused assigning roles and doing general research into project related topics. We met on Sunday (02/02/2020) to discuss and assign project roles. We also completed the Bi-Weekly report. We are still trying to understand the technical scope of the project before moving forward with any design work.

Past Week Team Accomplishments:

CAN logs - Ben
- Obtained CAN logs from Solar Car
  - Files are in .blf format
- Began working on finding an effective tool for analysing the data to characterise the motor controller's regenerative braking abilities.

Research - Connor, Joe, Bryan, Ryan, Kyle
- https://ieeexplore.ieee.org/document/7572053
  - Possible architecture, complex control circuitry required.
  - Might maximise efficiency
- https://www.digikey.com/product-detail/en/kemet/ALS70A163QS450/399-14382-ND/6928384
  - Super caps used in previous senior design project. Possible use in our project?

Pending Issues:
- The number of capacitors needed might be too heavy/expensive to achieve our goal of "pack voltage". We will need to look into other possible solutions.
- Characterizing the current system.
- Creating criteria to judge the performance of the design from a race strategy perspective.

Individual Contributions

Team Member	Contribution	Weekly Hours	Total Hours
Bryan Kalkhoff	Researched capacitors and started to understand the solar car battery pack	7.5	7.5
Kyle Czubak	Researched bootloader information for our microcontroller	8.5	8.5
Ben Kenkel	Obtained CAN logs from Solar Car.	7.5	7.5
Ryan Willman	Researched industry uses of supercapacitors for regen braking	7.5	7.5
Joe DeFrancisco	Explored current research in supercapacitor regeneration/ hybrid regeneration systems.	6.5	6.5
Connor Luedtke	Looked into capacitors and solar car system diagram	5.5	5.5

Upcoming Plans

Joe DeFrancisco
- Research performance parameters. How are we going to judge the performance of this thing from a car system perspective?
- Define different possible architectures.

Connor Luedtke
- Form a simple basis of comparison to pick the best path forward. (weight vs. capacity "curve")

Ryan Willman
- Start researching/listing supercapacitor safety procedures
- Finish motor/battery block diagram

Ben Kenkel
- Organize a better meeting place
- Find/make software for viewing the CAN logs to better characterise the motor controller's regenerative abilities.

Bryan Kalkhoff
- Look into templates for Bi Weekly Status reports and other documentation.
- Look into Latex for report formatting

Kyle Czubak
- Look more into bootloader information in datasheet.
- Parse CAN data from old races

Summary of Weekly Advisor Meeting
The weekly meeting provided guidance on what knowledge must be obtained to move forward in the project. The main todos from the meeting were to create a system block diagram, understand how capacitance effects pack size, and understand the solar car battery circuitry.