FSAE Electric Race Car: Electric Vehicle Controls & Tractive System

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Introduction

Team Lithium will continue to design and implement new iterations for the FSAE Electric Race Car student design competition held every year in Lincoln, Nebraska. This project contains the development of the Electrical Vehicle Safety system as well as the improvement in the High Voltage Batteries and DC Motor system. The new designs of the tractive and controls system will be assembled onto the previous version of the race car including changes in the PCB components, Low Voltage and High Voltage Batteries, and the potential swap from Brushed to Brushless DC motors. Overall, team Lithium aims to produce a power efficient racecar that can be easily manufactured and safely enjoyed by consumers.

Goals & Objectives

- Build an electric race car that competes in Formula SAE International Competition in Lincoln, Nebraska
- Pass all technical requirements specified by SAE
- Build an electrical safety system powered by 12V that monitors car's critical parameters and runs a safety logic.
- Output up to 40kW of power from batteries to motors.
- Produce an affordable formula style Electric Vehicle
- Design a high voltage battery pack with 300A current output.
- Design battery management system to regulate high voltage battery pack.

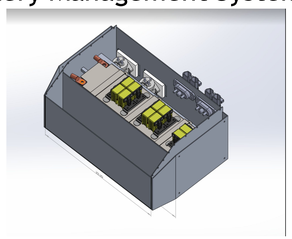
Team Responsibilities

Ryan Wong (EE) **Batteries Lead**	• High Voltage System • Battery Management System • High Voltage System Container
Faisal Altassan (EE) **Electrical Lead**	• Electrical Safety System • LV Wiring • Design, assemble and test PCBs
Kevin De Guzman (EE) **Powertrain Member**	• Brushed DC motor to BLDC motor • Power transmission of up to 40kW • HV wiring for batteries & ESC

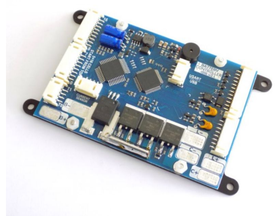
Current Progress

Batteries:

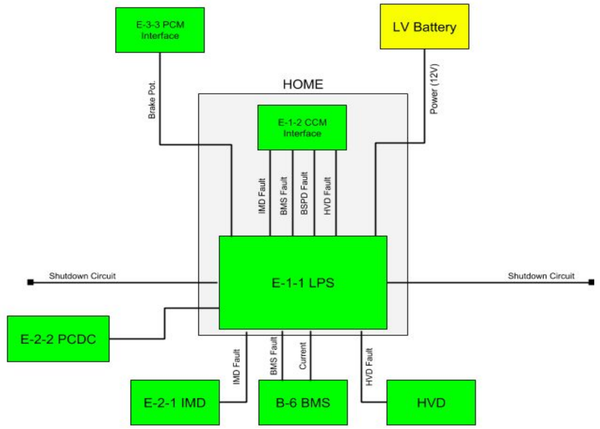
- Battery Pack design is complete. (20p26s; 109.2V;300A)
- High Voltage Battery Enclosure design is in progress.
- Battery Management System boards have been purchased.



High Voltage Battery Enclosure



Battery Management System

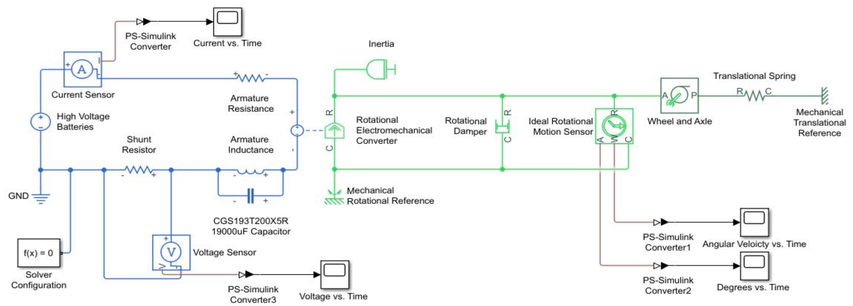


Electrical:

- Safety System concept design is complete
- Connections between safety boards and monitoring devices are made with all signals specified

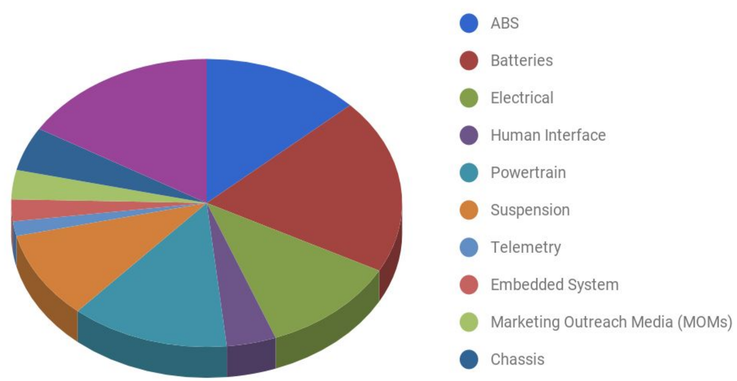
Powertrain:

- Model of Electromechanical Tractive System in MATLAB (below)
- Trade studies on BLDC motors suitable for regenerative braking



MATLAB DC Motor (ME1003) Simulation Block Model

Proposed Budget



Electrical Budget	$6,597.50
Batteries Budget	$12,589.12
Powertrain Budget	$7,307.87

Future Timeline

- **Week 8:**
  - Finish trade study for BLDC & DC motors
  - Complete High Voltage Battery Enclosure Design.
- **Week 9:**
  - Finish Designing all PCBs and send them to be manufactured
  - Begin manufacturing High Voltage Battery Enclosure.
- **Week 10:**
  - Order PCB components and assemble them
- **Final Week:**
  - Prepare for Fall Design Poster Review & presentations

Website & Social Media

https://www.anteaterelectric.com
Instagram: @anteaterracing

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