EE 494 Fall 2023 Professor: Dennis Hite

Project Abstract

Team: J.I.B^2
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Project: FSAE Motor Controller and AC Motor Calibration

This senior design project focuses on developing and programming the powertrain for an electric vehicle designed to compete in the Formula Society of Automotive Engineers, Electric Vehicle (FSAE EV) racing category. The objective is to initialize a high-performance and energy-efficient powertrain system, referred to by FSAE as the Tractive System, that maximizes the vehicle's performance within the constraints of the FSAE competition rules.

This project began under our mentor, Dr. Nicholas Ginga, and under his guidance several subsystems have been designed and realized by his previous Mechanical and Aerospace Engineering senior design groups. The central focus of our project centers around initiating, programming, and synchronizing the Cascadia PM100DX Inverter/Motor Controller Unit (MCU) paired with a EMRAX 228V Axial Motor, both sourced by Dr. Nicholas Ginga.

To verify the initialization of these two main components, our senior design team has experimented with Cascadia's motor control algorithms, real-time feedback systems, and dynamic power management to fine-tune the power delivery to the EMRAX motor through their provided software: RMS GUI. Our design team established a test-bench environment to enact hardware-in-the-loop testing, facilitating communication between the MCU and the motor. Hardware-in-the-loop testing allows our team to proactively validate communication between the MCU and AC motor without the need for each M.A.E design team to have their respective subsystems complete. Our ultimate goal is to deliver a powertrain control system that not only fulfills the stringent requirements of the FSAE competition but also initiates a powertrain that will push the boundaries of electric vehicle performance in the competitive racing environment.