Project FSAE

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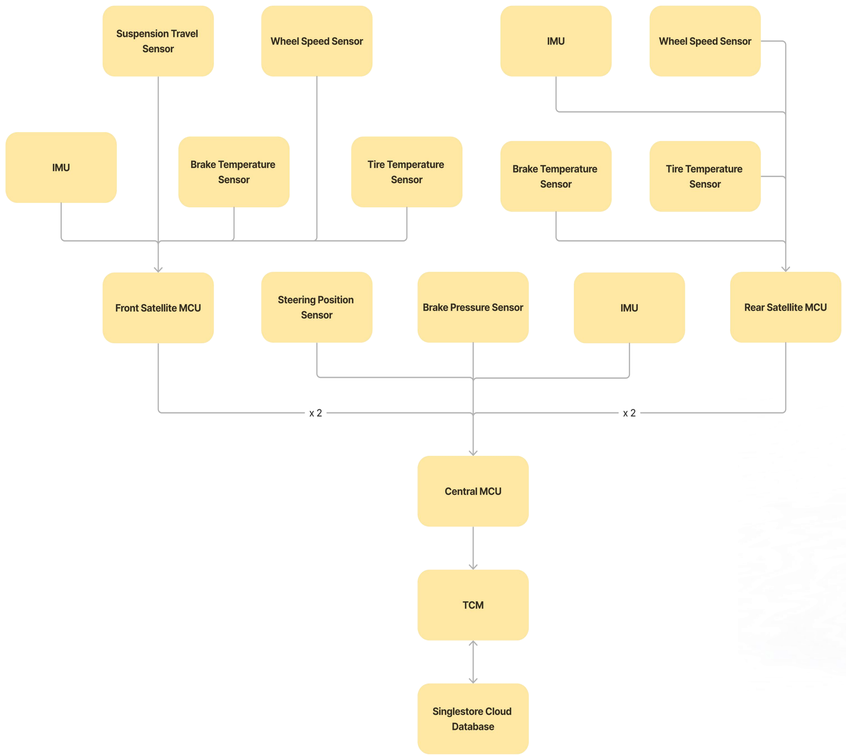
Background

Gaucho Racing aims to enable students to gain hands-on experience in all phases of the engineering process and propel them forward into their careers. We do so by design and building, from the ground up, an electric racing car to compete at FSAE competition. FSAE is a collegiate engineering competitions with over 500 participating schools.

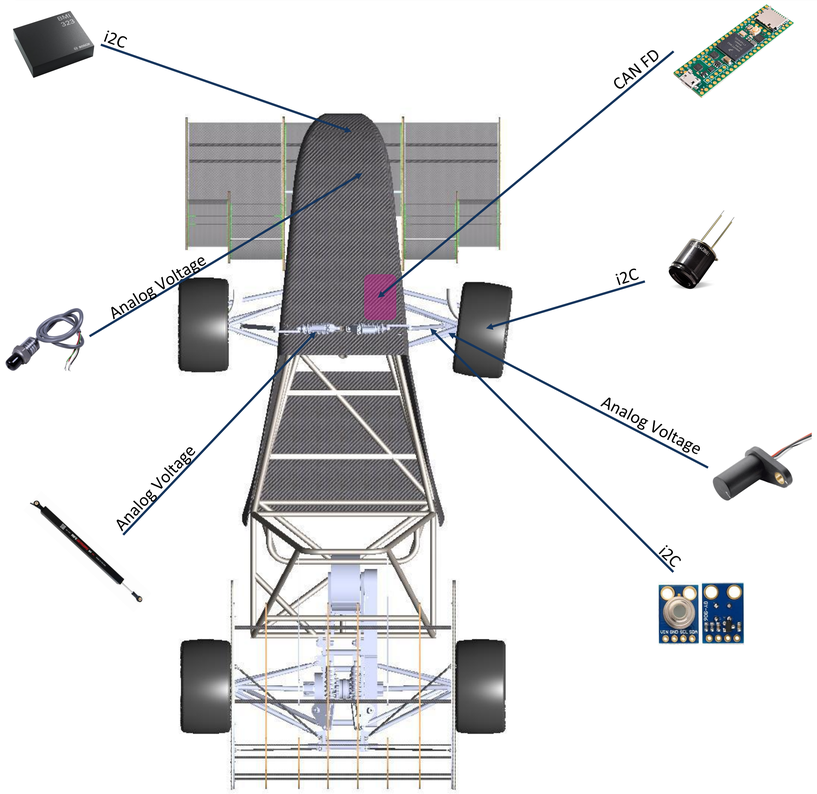
Overview

For the CE Capstone we oversaw designing and building the Body Control Module (BCM), which includes a central microcontroller to send data via CAN and 4 satellite modules connected to critical sensors with different interfaces sending sensor data to central. One of the main challenges we faced was having to design our own PCBs to interface the sensors with the satellite modules. Our goal is to win the FSAE competition.

Block Diagram

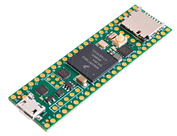


Sensor Placement in Car



All the wheel sensors are representative of 1 satellite module. In our full architecture we have one module on each wheel

Key Hardware Components



Microcontroller – Teensy 4.1
- ❑ Performs reads of sensors and packages data

Inertial Meas. Unit (IMU) – BM323
- ❑ Uses gyroscope to provide x, y, and z position measurements.

Multi Pixel IR Sensor – MLX90640
- ❑ Provides tire temperature.

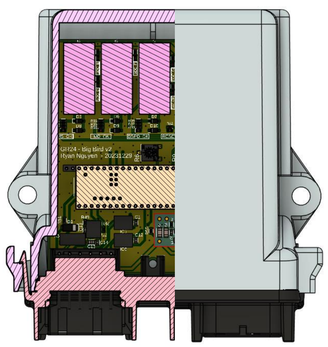
Single Pixel IR Sensor – MLX90614
- ❑ Provides brake temperature.

Hall Effect – Littelfuse 55505-00-02-A
- ❑ Provides RPM of each wheel.

Pressure Transducer – MSP300
- ❑ Provides brake pressure.

Linear Potentiometer– Rife G-Series
- ❑ Provides suspension travel.

Integration & Harnessing



This is the CAD for our box mounting solution that houses all the microprocessors in the car making them water-proof (needed for the rain test in FSAE competition) and heat resistant. Additionally, we 3D printed custom mounts to integrated it in the car

All the wires used are automotive grade and were measured and cut to fit the perfect distance along the chassis of the car. The wires that connects the sensors to microprocessors were cut shorter than 2 ft to avoid interference, which required creative placement of the box.

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