GR24 Capstone Design Review
Team Overview

Gaucho Racing at FSAE Electric
Michigan 2023

Team Goals

- Pass Technical Inspection at FSAE Michigan 2024
- Positively impact educations and careers of UCSB students
- Establish lasting organizational structure to support iterative vehicle improvement
System Overview

Control Architecture

Primary CAN
Data CAN
BCM CAN
isoSPI
Analog

VDM - Vehicle Dynamics Module
BCM - Body Control Module
TCM - Telecommunications Module
ACU - Accumulator Control Unit
Block Diagram of the BCM

- Comprised of 5 Teensy 4.1 Microcontrollers

- 4 Teensy devices on the wheel handle sensors near it.

- Center Teensy for sending master packet.

- All the Microcontroller are connected via BCM CAN
Hall Effect Sensor

- Track RPM of each wheel
- Reading on a separate thread
- Uses interrupts to measure RPM
- RPM Derivation:
  - Number of the valid edges sampled at / teeth on the gear
  - Formula to be tested and verified on a test rig
- Operated VIA Analog Voltage
Single Pixel IR Sensor

- Part Number MLX90614
- Used for sensing brake temperature
- Mounted on Suspension A-arm
- Dual Mode
- Temp range: -70°C to 380°C
- Data Binning Protocol:
  - 00 - Cold
  - 01 - Warm
  - 10 - Overheat
  - 11 - Error
Multi Pixel IR Sensor

- Part Number MLX90640
- Used for sensing tire temperature
- Communicate through I2C
- Comprised of 768 pixel sensors
- Data Binning Protocol:
  - 00 - Cold
  - 01 - Warm
  - 10 - Overheat
  - 11 - Error
IMU

- 3-axis Gyroscope
- Used to record car turning condition
- I2C communication protocol used
- Raw data in 2’s Complement
- Unit in °/s
- Mounted at nose cone
- Run by main thread

```
ChipID: 17169  gyr_x:0  gyr_y:0  gyr_z:0
Reading Message: 1
Received message with ID: 124
Message contents:
Temp: 23.17
Ambient: 22.13
```

```
ChipID: 17169  gyr_x:9  gyr_y:-15  gyr_z:20
Reading Message: 1
Received message with ID: 124
Message contents:
Temp: 23.08
Ambient: 22.17
```
What’s Next?

This quarter (Winter 2023):

● Finish Brake Pressure Sensor (M3021)
● Finish Linear Potentiometers
● Full Network Integration

Next quarter (Spring 2024):

● Run Full System Test
● Begin Harnessing
● Final assembly