RACECAR*

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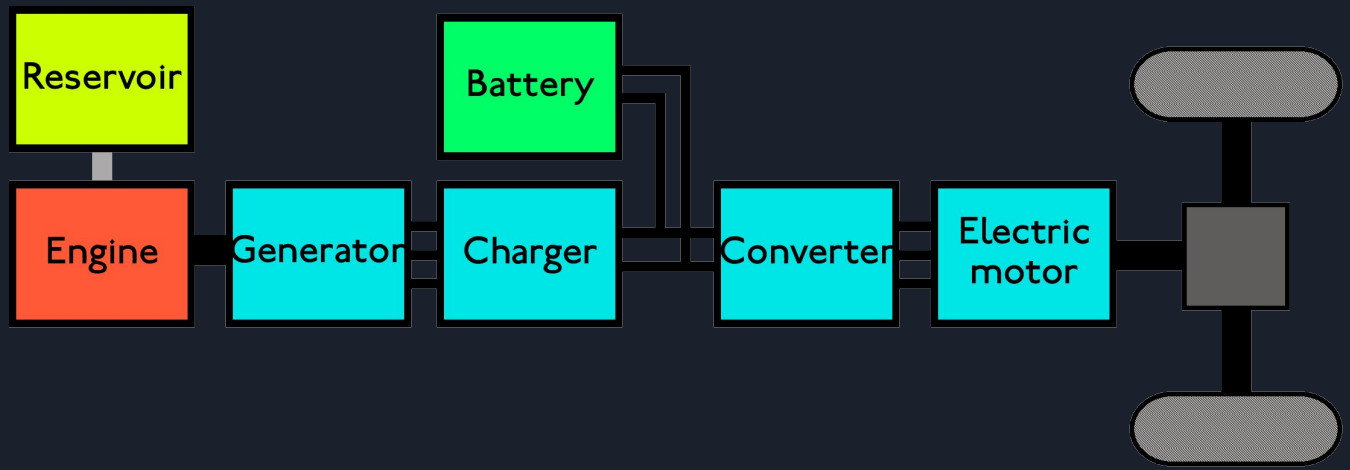
Introduction

Formula Hybrid Competition

Series Hybrid Block Diagram:



NOTRE DAME
HYBRID RACING

Problem Description

- Need system to monitor the activity of vehicle components:
  - Engine
  - Accumulator bank of ultracapacitors
  - Motor controllers
- That can both provide information on and control of the car's performance.
- Serve as Accumulator Management System and monitor energy.
- Reliable and meet specifications of 2019 Formula Hybrid Rules

Proposed Solution

Demonstrated Features

AMS Controller

- Monitor when its active
  - Voltages
  - Temperature
- Safety shutdown
  - Restricted startup
- Measure 10% of cell voltages
  - Balancing boards
- Fuses and resistors
- Isolation

Driver inputs

- Brake and gas pedals
  - Torque output
  - Regenerative Braking signal
- Steering wheel angle
  - Determines optimal torque settings for each wheel

Display controller

- Informs charging rate of the capacitors
- Monitor engine's RPM
  - Gas throttle
- Display to LCD
  - All feedback information
- Wireless communication
  - Output system information to the team

Available Technologies

- Absolute rotary encoder
- Dual Variable−Reluctance Sensor
- PIC32
- Optical couplers for the HV accumulators
- Transceiver circuit
- Driver LCD
- Ucap balancing boards

Engineering Content

Hardware:

- throttle sensors, rotary encoder, temperature sensor, etc. connectivity
- Sending data to display for driver and remotely collecting data

Software:

- Inputting from systems, computing, and outputting to other systems/sensors

Safety and Feedback:

- Protecting boards from high voltage failures

Testing:

- Testing with the Formula One Hybrid car and team

Questions?