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Project Description

Our software will be used by an electric formula SAE car to control the vehicle. This is similar to the ECU for existing electric cars without the consumer features. The software consists mainly of the Central Control Unit that communicates with sub-systems to change and manage car dynamics. There will also be an out-of-car database that records all the telemetry on the track. This telemetry will include tire temps, steering angle, pedal positions, active suspension settings, speed, GPS location, relative angle of the car, and more if we get the funding. The project uses a Raspberry Pi 5 (Central Control Unit), several Arduino Uno 4s (Sub-Sytems), and another Raspberry Pi TBD (For the steering wheel UI). These units will control different aspects of the car such as active suspension, pedal telemetry, and steering wheel UI. Modules will be tied to their specific hardware applications. For example, the Active Suspension Unit will simulate suspension for the tire it is attached to, only communicating to the Central Control Unit for sensor data. The end user of our product is the Formula Race Club. This includes the driver in the car (we want them to be able to effectively control and monitor the car on the fly) and the team around the driver (which needs access to the latest telemetry to also effectively manage and coach the driver).

Project Justification

The project includes many aspects of previous classes including: graphics from graphics for the steering wheel UI, linear algebra for calculations, CSO and Logic for its low level operations and c/c++, algorithms for the algorithms to control car dynamics, and databases for the telemetry database. This project needs a breadth of different coding expertises and requires the utmost reliability. The effect of this means that team members must use the best coding practices throughout. This project also requires a thorough knowledge of low-level programming since it is a real-time program, a language without a garbage collector such as C/C++ or Rust must be used. While this is a complex project it is achievable with proper planning and the appropriate manpower. Over the course of the semester great strides can be made to develop the program, but it will most likely require additional time to thoroughly vet and make sure its production ready. Any bug in the programming can lead to serious safety hazards so proper time must be allocated for quality control. The team comes from a background of: graphics, game development, low-level engineering, and a love of racing. Separately they have brought many projects to completion from apps and games to SURP projects and rendering engines. The team is passionate about racing and pushing the boundaries of the Formula SAE competition. We are looking to not only make a piece of software that functions well, but also impresses and does what no one thought would be possible.