Formula 1/10 Autonomous Vehicle Team 303

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Background

The Formula 1/10 Autonomous Racing Competition gives students an opportunity to learn about perception, planning and control for autonomous vehicles. As technology improves, autonomy hopes to lead to safer roads, less accidents, and improved travel time. Autonomous vehicles operate through a combination of sensors and software. Robot Operating System (ROS) is a robotics firmware that is commonly used to implement autonomous navigation and will integrate sensors for decision making.

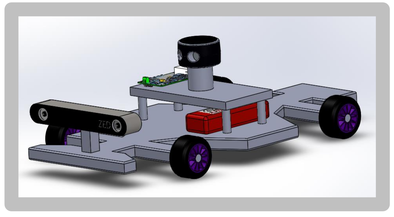
Project Scope

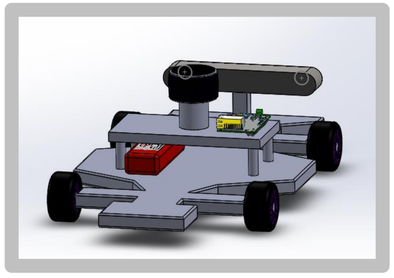
Goal Statement: Design and build an autonomous 1/10th scale vehicle capable of navigating a course while avoiding collisions with walls and obstacles.

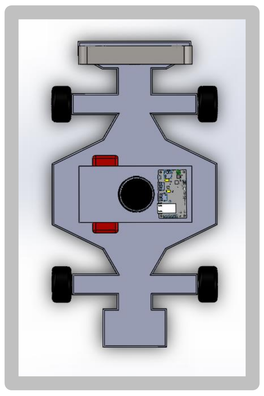
Assumptions:

- Vehicle must adhere to the rules and guidelines presented in the F 1/10 Autonomous Racing Competition Rule Book.
- Vehicle theme will be based on Spaceballs: The Movie (Mel Brook's 1997 Cult Classic).

Current Design







Key Components

- Autonomous Processing Unit: **Jetson TX-2**
- Motor and Steering Controller: **mbed FRDM-K64F**
- Video Sensor: **ZED SteroscopicCamera**
- Position Sensor: **RPLIDAR A2M8 360**
- Inertial Sensor: **SparkFun 9DoF Razor IMU M0**
- Speed Controller: **FOC BOX**
- Motor: **Castle Creations 1/10th 9600kv - sensorless**
- Battery: **Floureon 7.2v 5300mAh 30C**

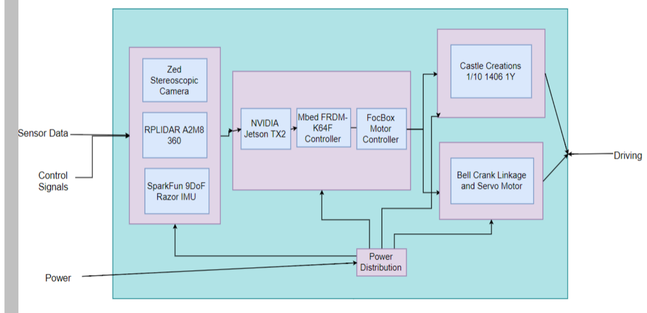
Future Work

- Begin developing code using Robot Operating System
- Gather data using the Zed Stereoscopic Camera and Nvidia Jetson TX2.
- Determine PID control architecture for vehicle mobility.
- Finalize CAD assembly and drawings for custom parts.
- Order parts and start assembly of vehicle.

Objectives

- Navigate around obstacles autonomously.
- Complete 8/10 laps around a rectangular track without any collisions.
- Make decisions in real time.
- Operate at a safe and controlled speed.
- Able to switch between autonomy and remote control.

Functional Decomposition



Projected Design

Acknowledgements

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