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SSOE Research Symposium Dean's Awards

Title

Autonomous Racecar - Racecars2.zip

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Autonomous Racecar
— Racecars2.zip —

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Professor Mohammad Al Faruque

F1/10

Objective

- Develop robust software on a modular platform to run on an embedded real-time system
- Display metrics like telemetry on a web interface
- Implement adaptability mechanisms through wall-following and obstacle avoidance algorithms
- Utilize information from multiple onboard sensors for on-the-fly decision making

Background

- Given that human error can be considered a major factor in most vehicular accidents, the use of autonomous vehicles stands to improve the safety of transportation.
- The preceding project relied on turn-by-turn directions to navigate without adapting to track conditions or obstacles

Michael Choi

Aaron Liao, Julian Andrews, Kelvin Phan
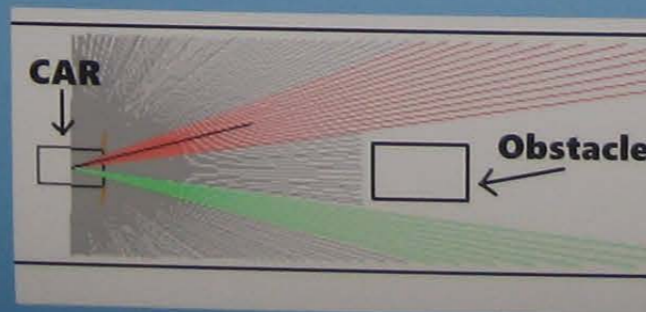
Our mentor: Mohammad Al Faruque

Components

- Hokuyo UST-10LX LIDAR
- ZED 3D Camera
- BNO055 Inertial Measurement Unit
- Ubiquiti picostation Wireless Access Point
- Nvidia Jetson TK1 running Robot Operating System on Ubuntu Linux
- Traxxas 1/10th scale RC car

Software

- The car will align itself parallel to the walls on its sides and increase its speed when no obstacle is present.

Lidar rays

CAR
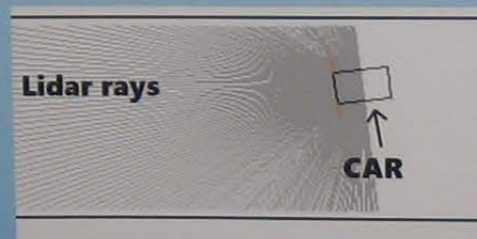
- When an obstacle is detected, collision avoidance mode selects a turning direction by segmenting the Lidar view into regions that pass obstacle.
- The algorithm then selects the mid-point in the region with the largest area.

CAR

Obstacle

Operation Overview

Collision Avoidance
Maneuver around imminent obstacle

Slow
Obstacle seen ahead

Cruising speed
No obstacle ahead

"Speed Limit Pyramid"

Sample telemetry on web interface

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