

Design Document

1 Overview

The purpose of the system is to traverse the Auto-Nav Challenge course at the 2020 Intelligent Ground Vehicle Competition. The system will traverse a course defined by white-painted lanes and various obstacles.

The robot must be capable of:

- Detecting the lane and travel within track of the competition
- Detecting and avoiding obstacles
- Navigating to specified waypoints
- Traveling as far as possible within limited time.

In order to achieve this, the robot must have these modules:

- Camera and sensors.
- Images processing:
 - Lane detection
 - Obstacle detection
- Mapping
- Motion planning

2 Modules:

2.1 Camera and sensors

This module is responsible for gathering and sending data from the camera and sensors.

2.2 Images processing

These functions allow the robot to detect elements of the environment using the data from the camera and sensors. After processing these elements into a more accessible format, the data will be sent to the mapping functions.

2.2.1 Lane detection

This module allows the robot to recognize the patterns of the lane.

2.2.2 Obstacle detection

This module allows the robot to detect the position and size of the obstacle.

2.3 Mapping

This module will gather the processed data and display them on a virtual map. The map will show the positions of the robot, the waypoints, the obstacles and the lane.

2.4 Motion planning

From the data in the virtual map, the robot will find a path from its position to the waypoint. The path will be subjected to change as more data from the course is gathered.

After finding a path, this module will control the robot to physically follow this path plan.

3 Diagram:

