F1/10 Yellowtails

Autonomous Racing for everyone

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Motivation

Our client is Dr. Nghiem who is an associate professor here at Northern Arizona University. He is also the director of the Intelligent Control Systems (ICONS) Laboratory on campus. In this lab they develop fundamental theory and advanced algorithms for, and useful applications for, intelligent and high-performance control systems. Trong-Doan Nguyen is a graduate research working for the lab and Dr.Nghiem who is also one of our clients.

FF1RR's goals are to promote education and training in controls, advanced robotics, and autonomous vehicles at NAU and in the Flagstaff area. This project will develop a course on autonomous vehicles for NAU students to study the technology behind autonomous vehicles. It will also develop and organize an annual STEM summer camp to introduce the technology of autonomous vehicles, and smart transportation in general, to school students in Flagstaff.

The course and the STEM camp will be based on the F1/10th autonomous race car platform and custom software programs developed in the project. However the current process is too complicated for high school students to use. The system assumes that students know the command line interface. They also need to know how to program in python. One of the biggest things is the students need to know about Robot Operating System (ROS). Which none of the kids know how it all works. There is also no universal configuration system to follow.

Solution Overview

Our solution is to create a desktop application in the form of a Graphical User Interface (GUI). In this GUI we are taking all of the complicated problems and making a solution that any high school student with some programming knowledge is able to use.

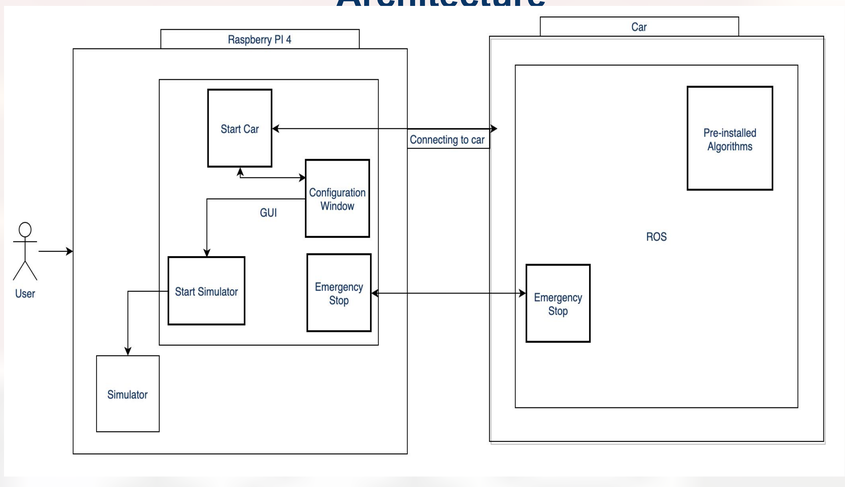
Key Features

Driver Module: This module is what hold all of the main functionality of interacting with the car. In this Module is a Start Simulation, start car and finally stop car.

Configuration/Options Module: This module is what holds the configuration. This is either the file that holds all the information about the configuration. The other part that is included in this section is the options module which the user sees in the GUI.

Emergency Kill Switch: This feature is both on the car as a script and in the GUI as the stop car. This functionality is so if we notice something is going wrong with the car or we lose connection it will stop the car automatically.

Architecture



User interacts with our GUI which interacts with the car and ROS.

The GUI holds all of the functionality so that users don't have to worry about any command line or coding how to actually get it to work.

GUI also allows the user to run how the car will run with the built in simulator. That way they don't damage the car.

Technologies

Future Work

In the future there are some little tasks that can be done to ensure the best product.

- Implementing the Machine Learning modules that are all possible to make sure that they are all working.
- Implement any new sensors that may change to have on the cars.

Outcomes

A user friendly way to get high school students into autonomous racing of the F1/10 platform.

Website

Please visit the following QR Code for more detailed information.