F1/10 YELLOWTAILS

Autonomous Racing
For Everyone

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Faculty Mentor: Isaac Shaffer

Introduction

Clients

Dr. Nghiem

- Assistant Professor
- Director of ICONS Lab

Doan Nguyen
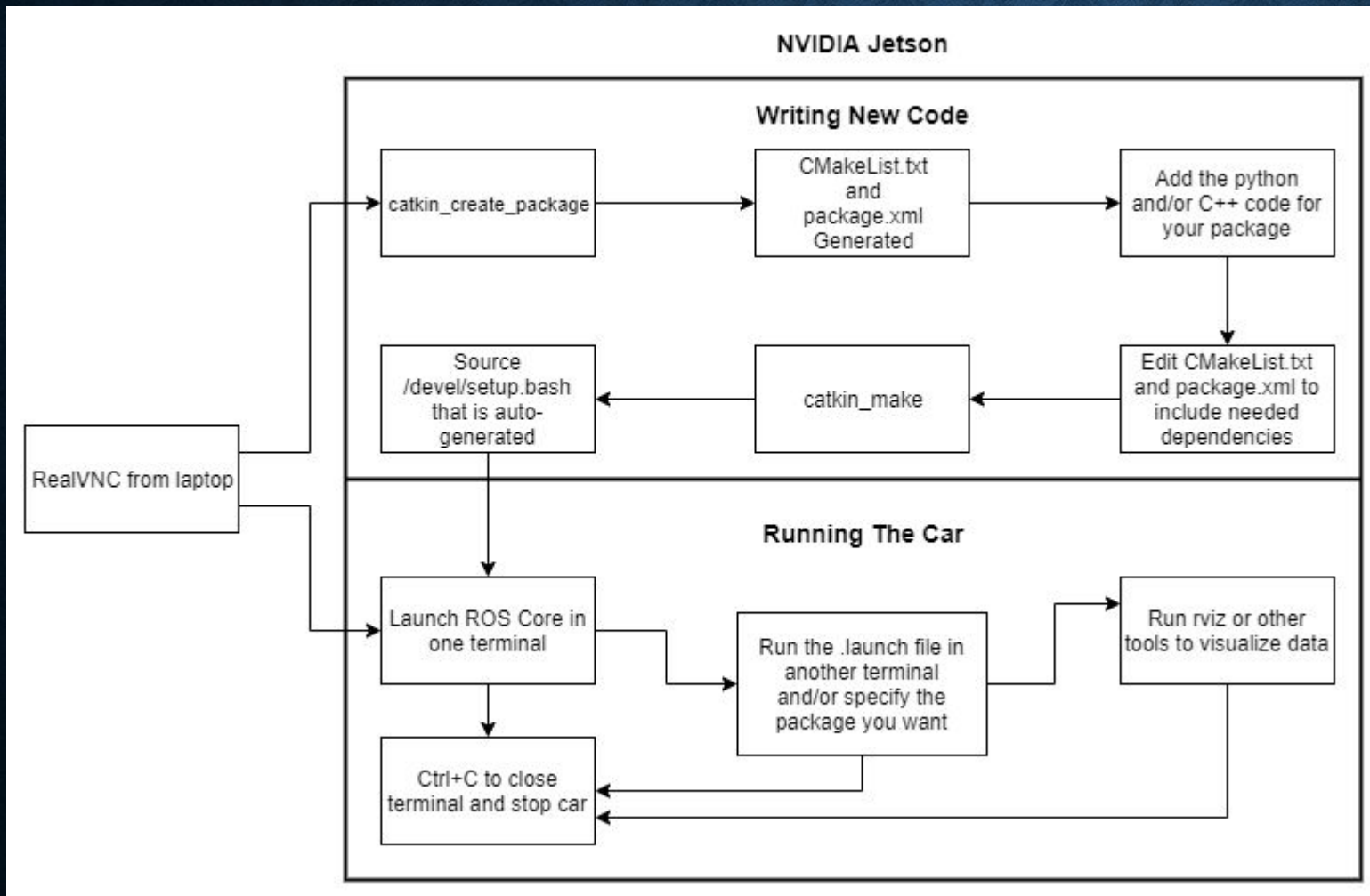
- Graduate Research Assistant

Flagstaff's F1/10 Robo-Racing Project

Director and researcher of the Intelligent Control Systems (ICONS) Laboratory

Robotic Operating System (ROS)

Problem Statement

1. Overly complicated

2. Disconnected Configurations

3. No emergency stop

Solutions Overview

An Interactable System
For High School Students!

RosLauncher

File Settings

Display Files Here

Racing Strategy

○ option1   ○ option 2

Perception   Mapping   Planning

○ camera   ○ option1   ○ option1

○ lidar   ○ option2   ○ option2

Display Updates and Progress Information Here

Run Sim

Start Car
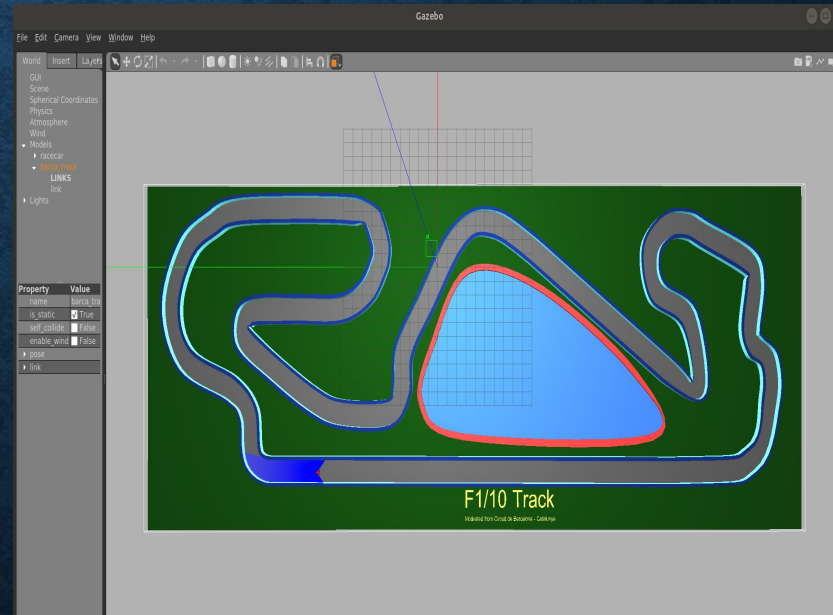
1. Implicit File Organization

2. Configuration Window

3. Kill Switch System

Requirements Acquisition

- Weekly meeting with clients in ICONS lab

- ROS Research outside ICONS Lab
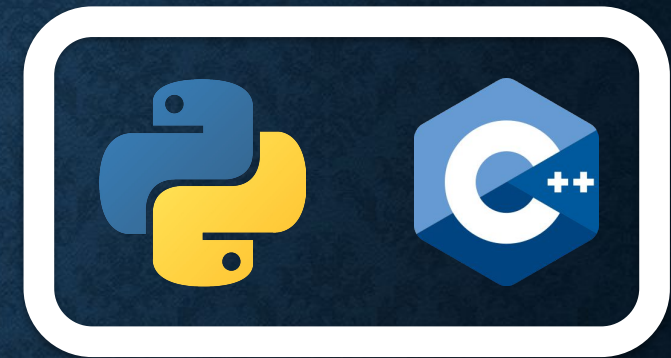
- Sourcing UPenn F1/10 simulation

Environmental Software Requirements

- Driver System

- Ambient System

- Languages used to create ROS Nodes

Environmental Hardware Requirements

NVIDIA Jetson

Raspberry PI

- Brains of the car
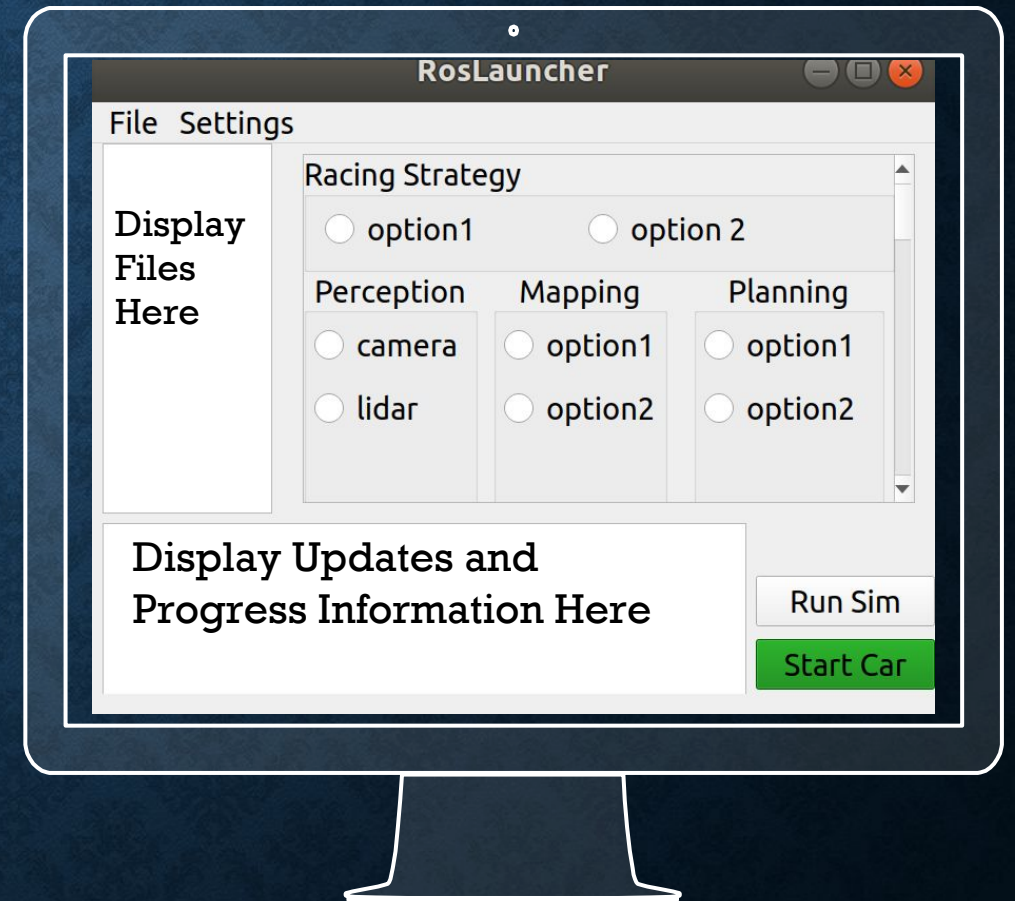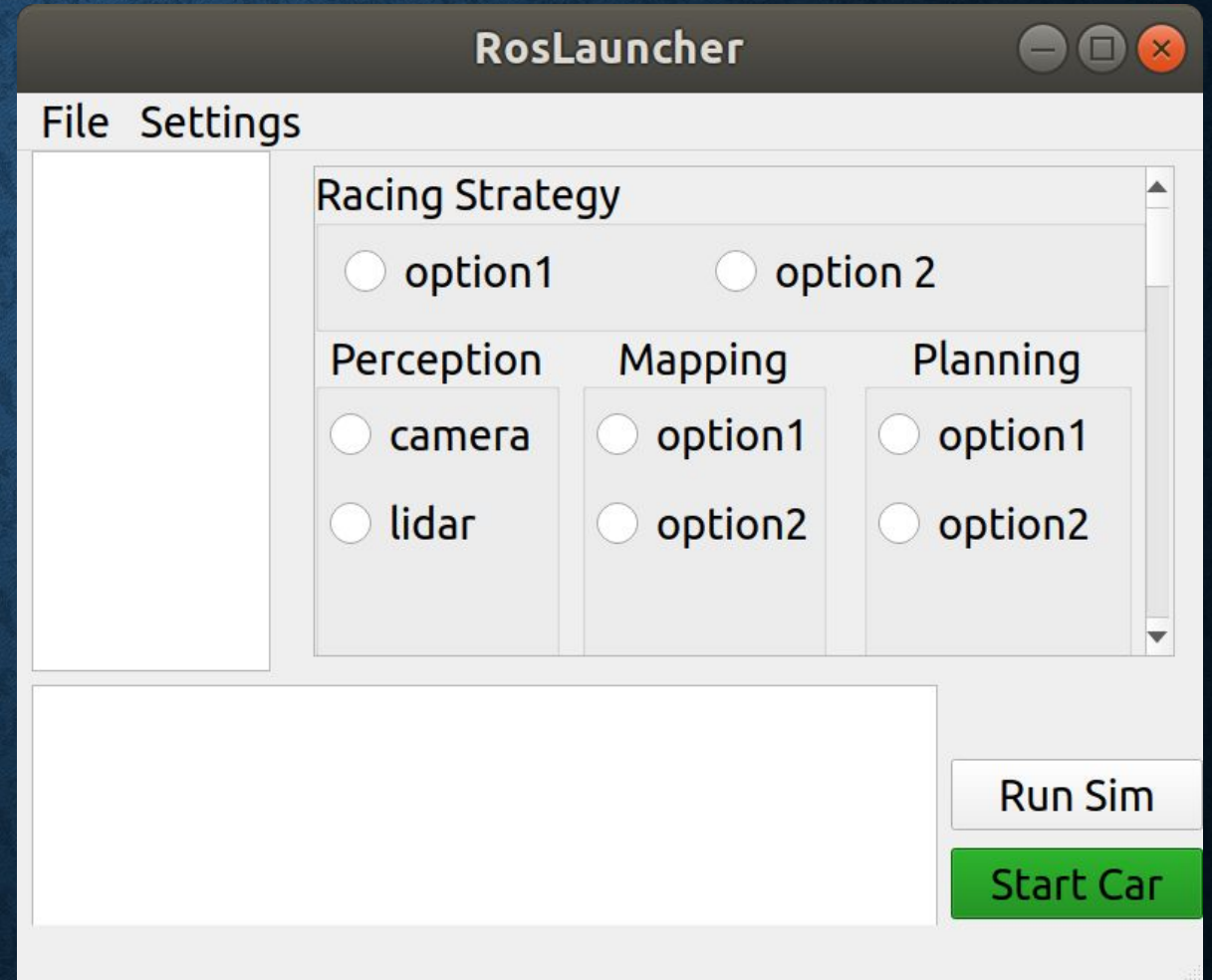
- Students Computer

Functional Requirements

- Configuration System

- Communication Tool Kit

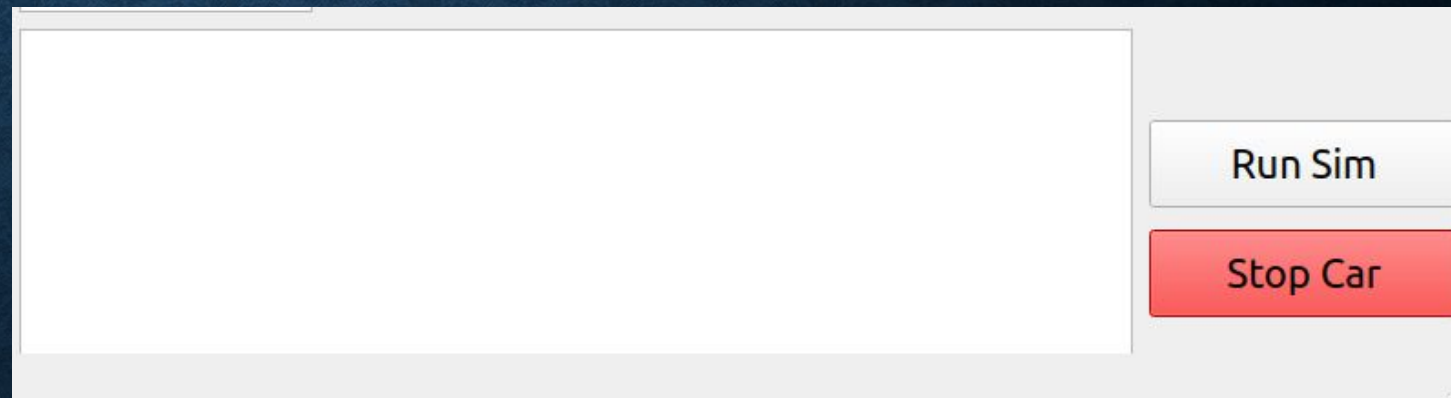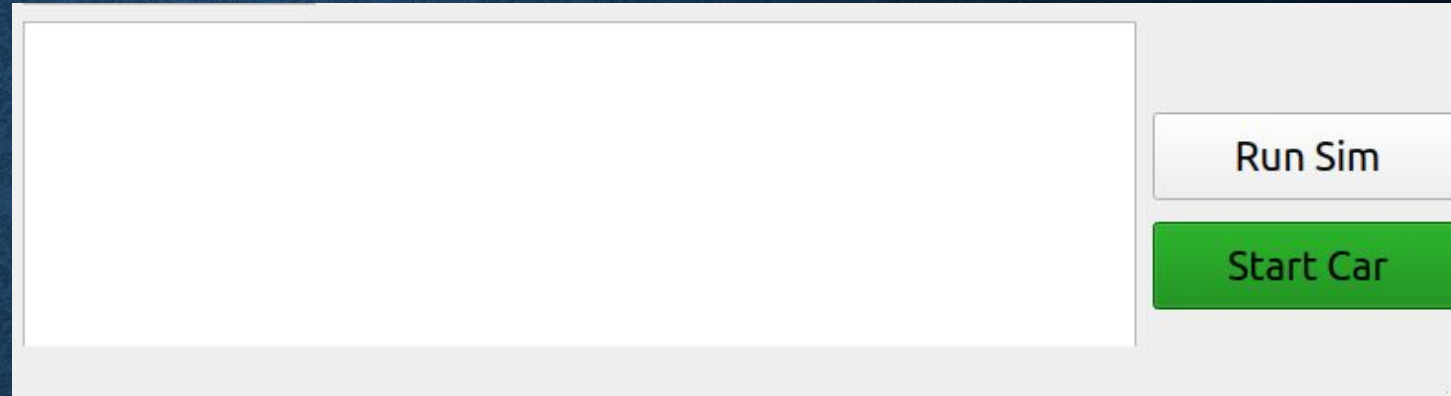- Implicit File Organization

- Profiler

- Console

Configuration System

- No code required

- No misconfiguration

- Upload of around 5 seconds

Kill Switch System

- Ability to Start and Stop Car via Button

- Listener Script for checking connection

- If connection is lost, Listener Script Stops Vehicle

Risks and Feasibility

Losing connection

Internet interruption -> wifi-SSH connection lost.

Severity: High

Likelihood: High

Responses: Onboard script to check connection

Operational error

Actual operating error -> Car deviates from the ordered track

Severity: Medium/High

Likelihood: High

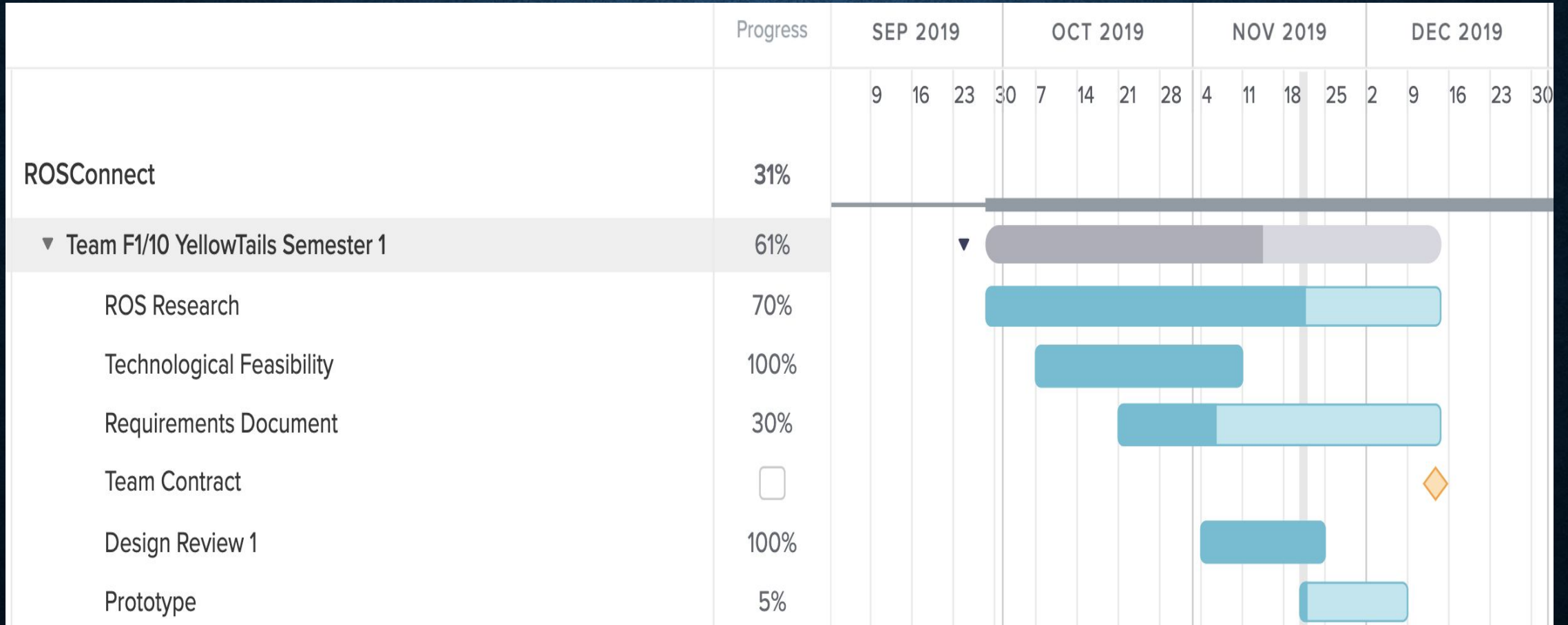Responses: Run simulation to minimize the error

Compatibility

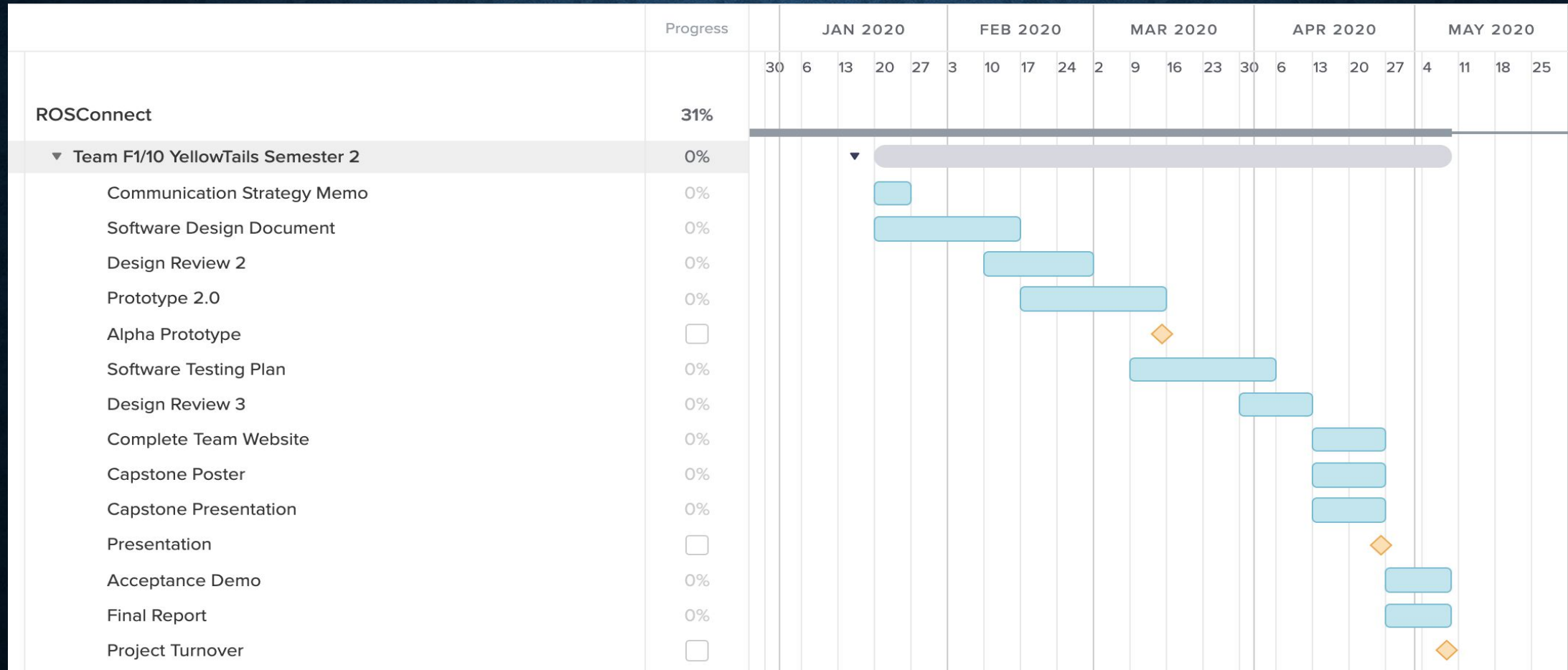GUI, Raspberry Pi, Ubuntu compatibility

Severity: High

Likelihood: Low

Responses: Test whether they can work together or not

Schedule

Schedule (Spring Semester)

Conclusion

Big Picture

- Self-driving cars are the future!

Problem

- Autonomous F1/10 program is currently Inaccessible to HS students

Solution

- Graphical User Interface for Better Accessibility