Project Status 1

Team PSIML

December 2024

1 Overview

During this period, we focused on understanding the requirements, reviewing the competition documentation, and analyzing the code provided on GitHub. Since the car kit for our team has not arrived yet, our goal was to familiarize ourselves with the rules, the software environment, and the simulation tools, laying the groundwork for the subsequent development and testing phases.

2 Planned activities

At this initial phase of the project, our team focused on foundational activities to set the stage for successful development.
• **Research and Planning** - all members
• **Team Roles and Responsibilities** - all members
• **Environmental preparation** - Elena Nešović

3 Status of planned activities

• **Research and Planning**
Various software architectural designs were explored to determine the most suitable approach for the project. Additionally, the BFMC documentation and regulations were reviewed to ensure alignment with competition requirements and guidelines. We investigated potential additional hardware components to enhance the system's capabilities such as distance sensors (ultrasonic sensors, LiDAR), and single-board computers (Jetson Nano).
• **Team Roles and Responsibilities**
We conducted discussions to define roles and responsibilities within the team. Following Conway's Law, we structured our team's responsibilities to reflect the software architecture, which is divided into three primary components: perception, motion planning, and control. Given individual preferences and strengths, we assigned roles accordingly. Ognjen Vinčić and Milica Gojak, with a strong interest in image processing and AI, are focusing on tasks related to perception, including object detection and environmental analysis. Marko Kojić, the team lead with a strong passion for simulation and AI, is responsible for motion planning, where he leverages simulations to develop and test safe navigation algorithms, while also overseeing the overall project plan. Elena Nešović is responsible for system-level integration in ROS, with a particular focus on threading and inter-process communication, ensuring seamless coordination and efficient operation across the entire architecture. Finally, Uroš Pantelić, with a keen interest in sensor systems, is leading the work on sensor data acquisition and processing, which supports all three architectural layers.
• **Environmental preparation**
We installed and configured ROS Noetic alongside Ubuntu 20.04. As we currently do not have access to the physical car, we reviewed the provided start-up code from Brain, Computer, and Embedded for guidance. Additionally, we attempted to start the Gazebo simulator and explored the provided examples to simulate the car's behavior in a virtual environment.

4 General status of the project

The project is currently in its initial phase. The software architecture has been defined, and a project plan has been established, outlining the timeline and deliverables for the upcoming phases. Although discussions regarding potential hardware improvements have taken place, no final decisions have been made yet. Since the physical car is not yet available, a video of a given simulation has been recorded as a substitute for a car demo.

5 Upcoming activities

In the upcoming phases, the team will focus on testing basic car functionalities once the physical car is available. This will include evaluating essential systems such as motor control, steering, and sensor integration. Additionally, efforts will be directed towards processing input from sensors, such as the camera, to generate rough output for systems like the motors.