

1 Introduction

This report outlines our team's activities since the project kick-off, highlights the progress made, and shares insights into our journey so far. Our main focus has been on developing software algorithms for key perception tasks, such as lane detection and traffic sign identification. The team has collaborated effectively, both remotely and in the lab, ensuring steady progress despite challenges.

2 Planned activities

During this reporting period, we planned to focus on the following:

- Lane Following
- Traffic Sign Classification and Implementation
- Setting Up the Physical Testing Environment

Team Assignments:

For the above-mentioned activities the team has been split as follows:

Team Member	Activity	Role
Kamaleshwar K K	Designing the system setup and physical test setup Setting up system communication framework	System Setup
Ankit Chandran R	Defining system flow and project planning Combining and integrating sensors	Development & Updates
Selvadharshini S	Implementing traffic light and sign recognition Testing and fixing detection systems	Development & Testing
Chitruha S	Checking path planning and lane detection Implementing intersection detection and updates	Development

Mugesh G	Vehicle speed, control, and acceleration Complex driving actions (e.g., lane switching, parking)	Testing & Optimization
Team Effort	Fixing issues, logging performance data Setting up the physical testing environment Preparing project reports and documentation	Collaborative Effort

3 Status of planned activities

Lane Following:

- *Status:* In Progress
- *Progress:* We successfully integrated a lane detection algorithm to guide the vehicle along lanes.
- *Challenges:* Lane detection accuracy is affected by factors like lighting changes, shadows, and adverse weather. Curved or broken lanes and complex intersections require robust algorithms. Achieving real-time performance on embedded systems also demands efficient processing and calibration.

Traffic Sign Classifier:

- *Status:* Completed
- *Progress:* We developed a CNN model capable of identifying traffic signs from the Traffic Sign Dataset.
- *Challenges:* Ensuring a balanced dataset was difficult, leading to occasional prediction biases. Training the model required significant computational power, and real-world conditions like faded signs or occlusions further complicated detection. Optimizing the model for deployment on edge devices introduced additional hurdles.

Physical Testing Environment:

- *Status:* Completed
- *Progress:* We created a testing setup similar to the one used at BFMC.
- *Challenges:* While the setup is functional, it requires a larger space, which is yet to be arranged.

4 General status of the project

Since December 3rd, our team has achieved significant milestones, including completing foundational documentation and software development for the self-driving vehicle project. Due to delays in the arrival of the car kit, we could not implement more features during this period. However, we have focused on software components like lane detection and traffic sign classification, which are now operational. Looking ahead, we plan to implement additional features, such as lane detection for overtaking, traffic light recognition, parking, object detection, crosswalk identification, and one-way street detection, as the car kit becomes available.

5 Upcoming activities

Looking ahead, our team plans to:

- Enhance lane-following algorithms and improve traffic light and sign detection accuracy.
- Develop vehicle and object detection capabilities.
- Finalize the physical testing environment.
- Implement parking functionality.
- Introduce one-way street detection.