

1 Introduction

This is the 2nd report of team ATROTON for the Bosch Future Mobility Challenge 2025. In this report we are going to cover the activities that were prepared during the last month and what we are looking to accomplish till the next report.

2 Planned activities

In this part of the report, we are going to enumerate all of the planned activities for this period and specify the members for each activity.

Vehicle Perception & Control:

- Lane Detection
- Intersection Detection
- Lane Following and Steering/Speed Control
- Traffic Signs Detection
- Traffic Lights Detection

External activities:

- Track Setup
- Simulation
- Camera problem

The tasks regarding Lane Detection and Intersection Detection have been assigned to Ioakeimidis Panagiotis and Aimilios Gerasimos Korkovelos. Moreover, the two of them are looking into the Traffic Signs and Lights Detection, as well communicating with the rest of the team that is working on the rest of the projects, as we think that synergy is the key. Symeon Konstantinos Charitounian and Georgios Xristoforou have been assigned the task of Lane Following in combination with the Steering/Speed Control. Lastly, Dimitrios Akritidis is working on setting up the track.

3 Status of planned activities

In this part of the report the status of the planned activities is going to be analysed.

Lane Detection

Status: **Completed**

Implementation: We looked into the different algorithms that exists for lane detection and we tested the two that we found that are more suitable for our case. Firstly, we tried detecting the lines through the Hough Transform Algorithm and then we also tried the Sliding Window Algorithm. Both of them were implemented with Python and the OpenCV library. After applying both we, found out that the best for our use is Hough Transform.

Difficulties: We still don't have the track to test out our algorithms but we are trying our best by using the videos that are provided by you.

Intersection Detection

Status: **Ongoing**

Implementation: This is still under development, we are looking into ways to implement it. We've been thinking about using the horizontal lines that proceed the intersection or using a state machine algorithm for our goal.

Difficulties: So far this topic is in the research state yet so we don't have any difficulties that have occurred during the implementation.

Lane Following and Steering/Speed Control

Status: **Ongoing**

Implementation: We have already implemented a lane following algorithm and have interfaced the algorithm's output of the steering angle to the car's servos. We tested if the output of the algorithm is correct by playing one of the videos provided by you in front of the camera, but we still haven't tested if it works reliably, since we don't have the testing track yet.

Traffic Lights & Signs Detection

Status: **Almost Completed**

Implementation: Both traffic lights and signs are being detected by our model that we trained with YOLO8s in ROBOFLOW, but we haven't implemented it in rpi to detect any of them in real time.

Difficulties: We still have some difficulties with obtaining a bigger dataset that will cover every condition that we thought of as we still don't have our own track. Moreover, we are looking into finding better hardware to train the model, so it takes less time.

Track Setup

Status: **Ongoing**

Implementation: We have been in contact with different companies regarding the acquisition of the tarp and we want it to be pre-printed with our test track.

Difficulties: Unfortunately, we have been encountering problems as some of them cannot print on the material we are asking them to do so or some of them that can haven't communicated with us back.

Camera

Status: **Completed**

Implementation: We were having problems with detecting the rpi camera, but we solved it by replacing it.

Difficulties: We lost valuable time as we didn't have a working camera in the beginning and we could figure out what was the problem. It was later solve by obtaining a new camera.

Simulation

Status: **Cancelled**

4 General status of the project

So far, we can control manually the car as for the beginning stages and moreover on the autonomous features it can detect lines through the Hough line transform and we are able to get the steering angles as output to feed them in our servo for the steering, but we still don't have the script and the controller to control the steering.

5 Upcoming activities

The next steps are finishing the tasks that are still ongoing from this report and then moving forward on working on the upcoming activities that will be assigned according the previous ones to each member. For starters, the most important is setting the track and then the rest.

Perception:

- Lane Following
- Intersection Detection
- Traffic Signs & Lights Detection

Vehicle Control:

- Path Planning Algorithm
- Finite State Machine Diagram
- Speed Control