1 Introduction

This report outlines the progress of Quantum Surge, with completed tasks including traffic signal classification and lane detection. While physical testing for these components is ongoing, the software is ready for further development. The team is focused on enhancing lane-following, detection accuracy, and vehicle/obstacle detection, with plans for parking functionality and one-way detection.

2 Planned activities

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

- Road Lane Detection
- Traffic Signal Classification
- Improve Lane-Following and Traffic Signal Algorithms
- Vehicle and Object Detection Capabilities
- One-Way Lane Detection
- Zebra Crossing Detection

Team Assignments:

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

Team Member	Activity	Role
Kamaleshwar K K	Enhance lane-following algorithm	Algorithm Development
Ankit Chandran R	Improve traffic light and sign detection accuracy	Algorithm Refinement
Selvadharshini S	Develop vehicle and object detection capabilities	Sensor Integration & Development
Chitrupa S	Finalize physical testing environment	Testing Setup & Coordination
Mugesh G	Implement parking functionality	Design & Development
Team Effort	Fixing issues and preparing reports.	Collaborative Effort

3 Status of planned activities

Lane Following:

- *Status:* Completed
- *Progress:* Developed a robust lane detection algorithm that performs well across different road types.
- *Challenges:* Challenges involved resolving inaccuracies during initial tests and ensuring the algorithm performed efficiently in real-time, especially in varying road conditions.

Traffic Signal Classifier:

- *Status:* Completed
- *Progress:* Developed and successfully deployed a YOLO based classifier for detecting traffic signals.
- *Challenges:* Challenges included dealing with an imbalanced dataset and addressing occlusions and signal visibility issues, which impacted detection accuracy.

Improve Lane-following and Traffic Sign Detection:

- *Status:* On-going
- *Progress:* Actively refining the lane-following algorithm and working to improve the detection accuracy of traffic lights and signs.
- *Challenges*: Challenges include fine-tuning the algorithms for various traffic scenarios while maintaining real-time performance and accuracy.

Develop Vehicle and Object Detection Capabilities:

- *Status:* On-going
- *Progress:* Planned for the upcoming phase, where we will begin integrating sensors and algorithms to detect vehicles and obstacles.
- *Challenges*: The main challenges are designing algorithms that can distinguish between objects under different conditions while ensuring optimal real-time performance.

Crosswalk Recognition:

- *Status:* On-going
- *Progress:* This feature is planned for the upcoming phase. We aim to develop algorithms that can detect zebra crossings effectively.
- *Challenges*: The main challenge is ensuring accurate identification of zebra crossings in various environments, along with seamless integration of the detection system with the vehicle's navigation system.

One-Way Lane Detection:

- *Status:* On-going
- *Progress:* This feature will be developed after testing and algorithm validation. It aims to identify one-way streets based on traffic signs and road markings.
- *Challenges*: Key challenges include ensuring accurate one-way street identification and integrating the detection system seamlessly with the vehicle's navigation system.

Finalize the Physical Testing Environment::

- *Status:* On-going
- *Progress:* The physical testing environment setup is in progress, with hardware calibration underway.
- *Challenges*: Hardware availability and sensor calibration are being addressed to ensure smooth testing.

4 General status of the project

Our team has successfully developed and tested the traffic signal classifier and lane detection algorithms. The software is now ready for further development, and we have completed physical testing for both components. Our next steps involve refining the algorithms and integrating additional capabilities such as vehicle and obstacle detection, as well as improving lane-following and traffic sign recognition.

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.
- One-Way Lane Detection
- Implement parking functionality.
- Introduce one-way street detection.