1 Introduction

This report outlines the progress achieved during the third month of the project. The team's primary focus was on implementing the lane-keeping feature. Significant advancements were made in image processing, system optimization, and inter-component communication. The team also enhanced the interface for debugging purposes and optimized the steering control to prevent unnecessary signal overload.

2 Planned activities

At the beginning of the reported period, the following activities were planned:

1) **Implementation of lane-keeping algorithm**
- Develop an algorithm to detect lane markings using classic image processing techniques.

2) **Modification of the interface for debugging**
- Update the dashboard to display processed images, allowing real-time monitoring of the car's perception.

3) **Task delegation among system components**
- Assign image processing tasks to one component and movement control to another to improve efficiency.

4) **Optimization of steering control**
- Design a system that ensures the steering component sends signals only when necessary to prevent command overload.

3 Status of planned activities

1) **Implementation of lane-keeping algorithm**
- Status: Ongoing
- Implementation: After we made sure our code is up to date with the official one, we developed and implemented a lane detection algorithm using classic image processing techniques (with OpenCV).
- Difficulties: The system is fairly consistent, but issues remain, such as failure to detect the left/right lane in certain conditions, causing too large curves.

2) **Modification of the interface for debugging**
- Status: Completed
- Implementation**:** The dashboard was successfully modified to display processed images, enabling real-time debugging.
- Difficulties: Ensuring smooth real-time rendering of processed images without lagging.

3) **Task delegation among system components**
- Status**:** Completed
- Implementation: The system was designed so that one component handles image processing while another is responsible for movement control.
- Difficulties: Establishing reliable communication between the components.

4) **Optimization of steering control**
- Status: Completed

- Implementation: A signal regulation system was implemented, ensuring that the steering component sends signals only when necessary.
- Difficulties: Balancing responsiveness with efficiency to prevent under or oversteering.

4 General status of the project

The project has made significant strides in its third month:

- The lane-keeping algorithm has been implemented but still requires refinement.
- The interface now provides a clear view of the processed images for debugging.
- Task delegation between components has improved system efficiency.
- The steering control mechanism prevents unnecessary signal transmission, optimizing system performance.

Outstanding tasks include further refining the lane detection algorithm to improve accuracy.

5 Upcoming activities

- Improve the lane detection algorithm to ensure reliable detection of both left and right lanes.
- Fine-tune the lane detection algorithm to handle more diverse road conditions.
- Enhance the state machine to adapt to dynamic road environments and make extensive testing to ensure reliability under various scenarios.
- Start integrating other algorithms, so that road signs are successfully detected and obstacles are properly avoided.
- Continue regular team discussions to address challenges and plan future work, in order to be ready for the Qualifications.