

COLLABORATIVE CONTROL OF AUTONOMOUS CARS

PROJECT REQUIREMENTS

Introduction

The Collaborative Control of Autonomous Cars project aims to enhance the existing simulator by implementing several key features to improve realism, user interaction and autonomous driving capabilities.

REQUIREMENTS

Functional Requirements

1. Vehicle Dashboard Implementation

Description

The system shall include a functional vehicle dashboard that provides real-time information to the user.

Sample Input

- User starts the simulation
- User spawns a vehicle

Expected Output (Correct Behavior)

- The vehicle dashboard displays essential information, including its speed, RPM and turn signals.
- Information updates in real-time as the vehicle operates.

Incorrect Behavior

- The dashboard fails to display any information.
- Information displayed is inaccurate or not synchronized with the vehicle's state.
- The dashboard is displayed but pops up a new window.

2. Autopilot Control

Description

The system shall allow the user to take control over the autopilot system at any time.

Sample Input

- User initiates the autopilot
- User manually takes control of the vehicle

Expected Output (Correct Behavior)

- The autopilot engages or disengages as per the user's command
- Transition between manual and autopilot driving modes is smooth and instantaneous
- Autopilot doesn't cross into other lanes of traffic

Incorrect Behavior

- Autopilot does not respond to user commands
- Transitions between modes are abrupt and lead to erratic vehicle behavior
- Autopilot fails to respect traffic laws

3. Overtaking and Lane Switching

Description

The system shall enhance the behavior of the parent vehicle to enable overtaking and lane switching when blocked by slower vehicles.

Sample Input

- A slower vehicle is detected on the current lane

Expected Output

- The system initiates a safe overtaking maneuver, changing lanes to pass the slower vehicle.
- Lane switching behavior is realistic and avoids collisions
- System does not attempt to overtake on single-lane road

Incorrect Behavior

- The vehicle attempts to overtake in a dangerous manner, leading to collisions.
- Lane switching does not occur when it should, leading to traffic congestion.

4. Turn Indicators

Description

The system shall implement functional turn indicators (e.g left and right blinkers) for vehicles in the simulator.

Sample Input

- User activates the left turn signal
- User activate the right turn signal

Expected Output

- The corresponding turn signal is displayed on the dashboard.
- Turn signals are synchronized with the vehicle's movements.

Incorrect Behavior

- Turns signals do not activate when the user commands them
- Turn signals are out of sync with the vehicle's turning actions

5. Lane Invasion Handling

Description

The system shall optimize the autopilot system to handle lane invasions efficiently when making right turns

Sample Input

- The vehicle makes a right turn at an intersection

Expected Output

- The autopilot efficiently navigates the right turn without crossing the solid line or invading adjacent lanes.
- Lane invasions, if unavoidable, are brief and safe.

Incorrect Behavior

- The vehicle frequently invades the solid line or adjacent lanes when making turns

- Lane invasions results in collisions with oncoming traffic

Interface Requirements

Description

The system shall provide a user-friendly graphical interface to control and monitor the simulator.

Requirements

- The user interface shall include controls for initiating autopilot, toggling indicators, and viewing the vehicle dashboard.
- The user interface shall also provide information collected by the sensors which can be viewed by the user.