

TOPIC FOR A BACHELOR / MASTER'S THESIS

DRIVING SIMULATOR FOR MODERN CAR2X SCENARIOS

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Motivation

The integration of autonomous and connected driving technologies presents a wide array of opportunities for the development of advanced driver assistance systems (ADAS). The integration of multiple sensors and controllers facilitates the vehicle's comprehensive perception of its environment. This implementation, such as the implementation of adaptive cruise controllers, serves as a very first step in this direction.

Through communication technologies, the exchange of sensor data among vehicles or the implementation of new algorithms, such as collision avoidance algorithms, on public roads is made possible.

Although substantial research is being conducted at an algorithmic level regarding the implementation of these technologies, the impact on drivers, who still play a partial role in the driving process, remains largely unexplored.

To address this issue, our research aims to investigate the impact of ADASs on drivers through the use of a driving simulator, based on the CARLA simulator. The idea is to extend CARLA to support a set of new features. This extended driving simulator should provide different user input devices, including a keyboard, steering wheel, and virtual reality headset, to enable a user to a predefined driving route. While driving, this user will be guided through various visual instructions and assistance on driving behavior, road conditions, and other road users. The impact of this guidance will be evaluated through user studies.

Task description

- Development of dynamic UI elements in the context of cooperative driving (e.g., alerts, driving instructions) based on the driver's actions.
- Realization of different user interfaces (keyboard, steering wheel, or VR technology)
- Development of a versatile driving environment (sun, rain, snow, etc.)
- Conducting user studies and evaluating user feedback

Prerequisites

- Knowledge in the field of human-machine interaction
- Good knowledge in Python and C++ (or willing to learn)
- Ideally knowledge of the CARLA Simulator and the Unreal 4 Engine

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