Master’s Thesis

Enabling Cooperative HuTL-Experiments for VRU in the Virtual Cycling Environment (VCE)

We built the Virtual Cycling Environment (VCE)\(^1\) to investigate driver assistance systems for Vulnerable Road Users (VRU) like cyclists. Within the system, a human test subject can use a physical bicycle to ride through a virtual 3D environment, while realistic road traffic and Vehicular Communication (V2X) between traffic participants is simulated. In this way, we can study the behavior of the test subject and its use of newly developed assistance systems in a realistic but safe environment in a so called Human-In-The-Loop (HuTL)-Experiment.

Goals of the Thesis

The system currently only allows a single test subject to ride through the virtual environment. However, the ability to have multiple test subjects (e.g., two cyclists or a cyclist and a car driver) in the virtual environment at the same time would enable us to develop and study more advanced and cooperative assistance systems and their impact on the individual human driver. Therefore, the idea of this thesis is to extend the existing VCE system with "Multiplayer" support, allowing more than one test subject to ride through the virtual environment at the same time.

- Extend the Virtual Cycling Environment to provide "Multiplayer" support.
- Create corresponding 3D graphics for visualizations of cyclists and car drivers.
- Design & conduct a small physiological study to demonstrate the functionality of the extension.

Required Knowledge

You should have a basic understanding of Vehicular Networking, Unity 3D, GNU Linux, Python, and C++.

Keywords

Cooperative Driving, Vulnerable Road Users, Driver Assistance Systems, Virtual Cycling Environment, Human-In-The-Loop, Psychological Studies


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