Master's Thesis

Modeling Cyclist Behavior in SUMO based on the SimRa Dataset

Problem & Approach

This thesis is supposed to build upon previous work on the Virtual Cycling Environment (VCE) of TKN, which integrates a real bicycle into a virtual reality provided by vehicular mobility and network simulation. The VCE bike on a stationary bicycle trainer (exercise rollers) is equipped with a number of sensors to enable the user to ride within this environment. In a first empirical study, TKN investigated how the VCE can be used to evaluate modern Advanced Driver Assistance Systems integrated with both cars as well as the bicycle. So far, a cyclist on the VCE can interact only with cars in the simulated environment, but not with other bicyclists. The used road traffic simulator SUMO already supports to integrate bicycles (and bicycle lanes), but the mobility model follows classical car following and lane chance models.

The task is to develop a model of cycling (or cyclist) behavior which can be used within the driving simulator. Starting with psychological studies/accounts of cycling behavior and the existing models of car mobility, a model of bike behavior has to be built and tested for its degree of reality. In order to realize that, the student shall analyze collected ride data from the SimRa project (https://www.digital-future.berlin/forschung/projekte/simra/) and model cycling characteristics such as the approach to an intersection based on this. Using statistical tools, these traces can be transformed into behavioral rules, which, in turn, can be modeled in the SUMO simulator to represent characteristic cycling behavior.

Goal of the thesis

- Analyze cycling traces from the SimRa project and derive a cyclist model.
- Implement that model in a simulator, preferably in SUMO, and/or identify missing data.

Required Skills:

- Advanced programming and data analysis skills
- Passion for bicycle traffic

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