Background

For vehicle manufacturers it is important to know how their vehicles are used during their lifetime, especially the load characteristics (e.g. torque, speed, current etc.), to be able size the components and also for designing the controls of the vehicle. For example, the load characteristics of the engine or the battery in a hybrid electric vehicle determines how effective the components are used. The load characteristics depends on the aggressivness on the driver, the vehicle, and traffic environment (road type, traffic signals, queues etc). Usually driving cycles (speed vs time) are used for comparison of vehicles but a drawback is that it is difficult to separate the driver from e.g. the vehicle and external factors. If a vehicle manufacturer wants to do tests with varying combinations of driver models, vehicle models and different traffic environment, microscopic simulation models can be used. Microscopic models [1] study individual elements of transportation systems, such as individual vehicle dynamics and individual traveler behavior.

Purpose of thesis

The objective of this thesis is to assess the potential in microscopic simulation. Can it be used to size the components and design the robust control for tomorrow? The thesis shall review existing microscopic simulation softwares and decide for suitable candidates for further use. A driving mission shall be modeled with traffic junctions, traffic lights and be used in the simulation. Examples of research questions are how different factors affects the load characteristics and how many simulated driving missions are needed to get a sufficiently good spread of the load characteristics?

Thesis work description

A microscopic simulation software is to be implemented and different drivers, vehicles and traffic environment be modeled within the used software. The load characteristics for different combinations shall be investigated. The work can typically include

- Literature study in order to get familiar with microscopic simulation models.
- Choosing suitable softwares for microscopic simulation that enables stochastic modeling.
- Modeling of drivers, vehicles, and traffic environment i.e. roads, traffic lights, intersections etc.
- Investigation of how different combinations of drivers, vehicle, and other factors affects the load characteristics of certain components in the vehicle.
- Possibly focus more on passenger cars or on heavy-duty-trucks.
- Documentation and presentation of results for Volvo cars, Scania, and within SHC.

Qualifications

- Good knowledge in Matlab or equivalent.
- Basic knowledge in mathematical modeling.
- Number of students: 1-2.
- Estimation of time needed: 20 weeks.

Contacts

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References