

Announcement for Master Thesis / Bachelor Thesis

Robustness and sensitivity analysis of vehicle lateral dynamics

Motivation

In control engineering, one of the most important aspects is model design. Models in the literature that describe the lateral dynamics of vehicles vary from point mass models to complex multi-body models. Furthermore, dynamic vehicle models require tire models to describe and define the behavior of the tire forces causing the lateral acceleration.

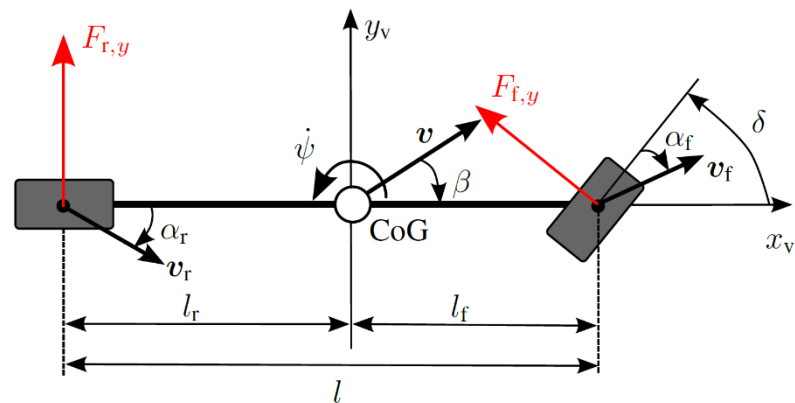


Figure 1: Single track model

The different tire models also vary in their depth and complexity. Developing models that are as simple as possible and only as complex as necessary requires extensive knowledge of their limitation, robustness and sensitivity to, e.g., environmental changes. Therefore, this thesis aims at ascertaining these aspects for different vehicle and tire models.

Task description

At first, a comprehensive literature review is required to examine the state-of-the-art of vehicle and tire models. Accordingly, a number of different vehicle models shall be implemented with various tire models. The sensitivity of the models to different parameters, e.g. mass, wheel-base, cornering stiffness, coefficient of friction, etc. is to be determined and compared. Furthermore, nonlinear observers shall be implemented using the previously mentioned models.

Requirements

Fundamental knowledge of linear control theory (e.g., by having attended the courses Regelungstechnik A and B) and mechanics as well as experience with using Matlab/Simulink. Note that the thesis can be written in either English or German.

Contact

Fadi Snobar, M.Sc.
 Chair of Automatic Control
 fadi.snobar@fau.de