

Dynamic Damper Model

Relevance to the Automotive Industry:	Simulation of vehicle dynamics is an important task in the development of a vehicle suspension design. Most common damper models are based on look-up tables and do not consider dynamic aspects. A dynamic damper model is required to attain accurate simulation results over a wide frequency range.	
Research Location:	TUD Fahrzeugtechnik (FZD)	
Homepage (Engl.):	http://www.tu-darmstadt.de/fzd/index_en.html	
Faculty Mentor:	Prof. Dr. rer. nat. Hermann Winner	
Faculty Mentor Email:	winner@fzd.tu-darmstadt.de	
Graduate Mentor:	Dipl.-Ing. Sebastian Claus	
Graduate Mentor Email:	claus@fzd.tu-darmstadt.de	
Project Description: May 21 - Jul 13, 2012; (8 weeks, 40h/week)	<p>FZD does research in the field of semi-active suspension design. The relevant frequency range exceeds the operating range of common damper models, which usually cover frequencies up to 8 Hz. Furthermore, common models cannot simulate failures such as cavitation.</p> <p>The object of this project is to develop a damper model for excitation frequencies up to 30 Hz, and that enables simulation of dampers with foamed oil. The <i>IPG CarMaker</i> simulation tool, which is the target of this project, includes an interface with MATLAB/SIMULINK. This interface makes it possible to calculate suspension forces using a customized model described in MATLAB/SIMULINK.</p> <p>Two NSF REU students will work on this project: The first NSF REU student will focus on developing an initial conceptual understanding of the damper model. Based on literature research, the student will derive a structured breakdown of the fundamental physical effects. The second NSF REU student will focus on implementing an analytic damper model in MATLAB/SIMULINK that represents the basic physical effects of hydraulic dampers, using the fundamentals identified by the first student. Together, these students will then analyze their new model by comparing its characteristics to those of other damper models, and by validating it against physical experimental test data.</p>	
Target publications:	<ul style="list-style-type: none"> • Vehicle System Dynamics • Journal of Vibration and Acoustics • International Conference Advanced Suspension Systems • International Conference Vehicle Dynamics 	
Necessary Skills/ Knowledge:	<ul style="list-style-type: none"> • MATLAB • SIMULINK 	
Desirable Skills/ Knowledge:	<ul style="list-style-type: none"> • Multi-Body Simulation 	
Additional Online Resource(s):		

NSF REU Students must have completed at least two semesters of engineering studies prior to the proposed summer research, and they must have at least one semester remaining before they can earn their BS in Engineering.