

Simulated Excitation of a Test Rig with Terrain Constraints

Relevance to the Automotive Industry:	<p>Mechatronic Systems are one of the biggest drivers of innovation in automotive engineering. During the last years dual clutch transmissions, active steering, and suspensions entered the market. The interaction of those systems on the vehicle level is essential to obtain optimal results in the fields of safety, efficiency, dynamics, and comfort. In this context the so-called Car-in-the-Loop test rig enables function development and optimization of the interaction of mechatronic systems on vehicle level through repeatable reproduction of driving maneuvers, which include longitudinal, steering, and vertical dynamics.</p>	
Research Location:	TUD (Darmstadt, Germany) Institute for Mechatronic Systems (IMS)	VT (Danville, Virginia) Vehicle Terrain Performance Laboratory
Homepage (Engl.):	http://www.ims.tu-darmstadt.de	http://www.me.vt.edu/VTPL
Faculty Mentor:	Prof. Dr.-Ing. Stephan Rinderknecht	Prof. John B. Ferris, Ph.D.
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Project Description:	<p>The Institute for Mechatronic Systems (IMS) at TUD and the Vehicle Terrain Performance Laboratory at VT are working together to understand how different types of terrain can be realistically reproduced on the Car-in-the-Loop test rig. To complete this task the students will develop a simulation model of the test rig in Matlab / Simulink, which will be excited by reactions generated with a vehicle model and different terrain constraints developed at VTPL. The aim of this project is to define requirements towards the actuators and the mechanical components of the test rig. The student will start with a two-week intense reading phase to become familiar with the terrain models to be used, the vehicle models, the Car-in-the-Loop test rig, and the state of the research. Following this introductory phase the student and the mentors will decide which terrain model(s) will be used. The reactions of the vehicle model to the terrain are the input to the Matlab / Simulink model of the test rig. The development of this model will also start after the introduction phase.</p>	
May 23 - Jul 15, 2011; (8 weeks, 40h/week)		
Target publications:	<ul style="list-style-type: none"> • SAE World Congress 2012 	
Necessary Skills/ Knowledge:	<ul style="list-style-type: none"> • MATLAB / Simulink • Modeling of multibody systems • Fundamental skills in vehicle dynamics 	
Desirable Skills/ Knowledge:	<ul style="list-style-type: none"> • Multi-Body Dynamics software (ADAMS, DADS, CarSim,...) 	
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.