

Analyzing Road Friction Characteristics of the Tire using Measuring Wheel

Relevance to the Automotive Industry:	The study of the road friction characteristics of the tire is important for understanding tire-suspension behavior and predicting the road-friction coefficient under different driving situations. The optimization of vehicle safety will benefit from the result of this research. Therefore relevant simulation and testing are needed.	
Research Location:	TUD Fahrzeugtechnik (FZD)	VT Blacksburg Center for Tire Research
Homepage (Engl.):	http://www.fzd.tu-darmstadt.de/fzd/aktuell/aktuelle_meldungen.en.jsp	http://www.centire.centers.vt.edu
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Project Description: May 21 - Jul 12, 2013; (8 weeks, 40h/week)	<p>The TUD Institute for Automotive Engineering (FZD) and the VT Center for Tire Research (CenTiRe) are working together to understand the road-friction characteristics of the tire. To complete this task, the two NSF REU students will work with their graduate mentors at FZD and CenTiRe, respectively, to analyze the road-friction characteristics of the tire during braking, accelerating, cornering, and other driving situations on TUD's testing ground using the measuring wheel and other measurement technologies. The main focus of this research is to obtain the rolling resistance, longitudinal and lateral characteristics, and combined characteristics of the tire.</p> <p><u>PHASE 1:</u> During the first two weeks, the two NSF REU students will get familiarized with the subject and scope out the specifics of the project, including performing a literature review on the tire mechanics, tire-road interactions, and novel technologies such as intelligent tire or measuring wheels.</p> <p><u>PHASE 2a:</u> The following four weeks, a simulation model will be described and parameterized using the vehicle dynamic simulation software CarMaker and MATLAB/Simulink®, and the influence of road friction condition on vehicle dynamics will be investigated experimentally on TUD's testing ground using an instrumented vehicle and a measuring wheel.</p> <p><u>PHASE 2b:</u> Simultaneously, the Blacksburg team will focus on the utilization of the intelligent tire technology. The efforts will mainly concentrate around developing a prototype system and analysis/utilization of sensor inputs from the prototype for road friction characterization. The results will be commended in comparison to the Darmstadt team's test results, which are expected to lead to a strategy to integrate both technologies for friction characterization.</p> <p><u>PHASE 3:</u> During the final two weeks, the two NSF REU students will coordinate their results and generate a presentation, report, and materials for a conference paper under the supervision of their graduate mentors.</p>	
Target publications:	<ul style="list-style-type: none"> • Vehicle System Dynamics • International Conference Vehicle Dynamics • SAE World Congress 2014 	
Necessary Skills/ Knowledge:	<ul style="list-style-type: none"> • MATLAB/Simulink 	
Desirable Skills/ Knowledge:	<ul style="list-style-type: none"> • Vehicle Dynamics software for Simulation (CarMaker, CarSim,...) • Basic knowledge of Vehicle Dynamics, Tire Model • Driver's license for passenger cars 	
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.