

Test Scenarios for Conduct-by-Wire

Relevance to the Automotive Industry:	Conduct-by-Wire (CbW) is a research project that breaks away from today's vehicle guidance by shifting the vehicle control task from a stabilization level to a conducting level. Instead of continuous stabilization on a designated trajectory—using the conventional control elements for manual steering, braking, and accelerating—a Conduct-by-Wire vehicle is controlled by means of maneuver commands. By keeping the driver in the loop, the vehicle guidance is cooperatively shared between the driver and the automation. This highly automated vehicle guidance concept realizes a maximum amount of automation without removing the responsibility from the driver.	
Research Location:	TUD Fahrzeugtechnik (FZD)	
Homepage (Engl.):	http://www.tu-darmstadt.de/fzd/index_en.html	
Faculty Mentor:	Prof. Dr. rer. nat. Hermann Winner	
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Project Description: May 23 - Jul 15, 2011; (8 weeks, 40h/week)	<p>The main focus of Conduct-by-Wire research at FZD, funded by the Deutsche Forschungsgemeinschaft (DFG), lies on the design, test, and iterative improvements of driving functions, which are necessary to execute a driver's maneuver commands. These driving functions (e.g., follow lane, change lane, follow vehicle) are grouped into a so-called driving functions catalog. One of the major demands made on the functions catalog is completeness; i.e. the suitability for use in any type of traffic situation. For this purpose, a falsification approach has been developed. The intention is to find driving missions that cannot be accomplished by exclusively using the catalog's elements. The analysis of these incomplete missions either results in the identification of necessary but missing driving functions, or shows insufficient implementation of existing modules.</p> <p>The Conduct-by-Wire project's driving functions are implemented as control algorithms in MATLAB/Simulink and provide command variables to simulate the vehicle behavior in the 3D vehicle simulation tool IPG CarMaker. The aim of this NSF REU project is to derive test scenarios of increasing complexity from real driving missions. Using videos from test drives on public roads, these test scenarios have to be systematically identified, abstracted from reality according to the simulation tool's constraints, and then implemented as environment scenarios in CarMaker. Finally the CbW functions catalog will be tested using these scenarios.</p>	
Target publications:	<ul style="list-style-type: none"> • FISITA 2012 • ITS World Congress 2012 	
Necessary Skills/ Knowledge:	<ul style="list-style-type: none"> • High motivation to work independently • Willingness to familiarize with the simulation tool IPG CarMaker • MATLAB/Simulink 	
Desirable Skills/ Knowledge:	<ul style="list-style-type: none"> • IPG CarMaker • Basic knowledge of advanced driver assistance systems (ADAS) 	
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.