UTC Project Information	
Project Title	Cognitive Attention Models for Driver Engagement in Intelligent and Semi-autonomous Vehicles
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Funding Source(s) and Amounts Provided (by each agency or organization)	US DOT RITA: $313,691.40 University of Wisconsin Matching Funds: $142,746.35
Total Project Cost	$456,437.75
Agency ID or Contract Number	DTRT13-G-UTC47
Start and End Dates	O9/30/2013 – 09/30/2017
Brief Description of Research Project	The focus of this project is to improve the state-of-the-art in human cognitive modeling in order to more accurately describe the human-machine interfaces that take place in the pre-crash scenarios. This project develops a cognitive attention model that provides a fundamental understanding and analysis capability for driver attention. In particular, the model will be used to understand how drivers respond to vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) information cues in pre-crash scenarios. It also addresses how to re-engage a driver who may be partially or completely disengaged from key attention elements while operating a semi-autonomous vehicle. We seek to understand driver engagement over a range of human physiological and behavioral factors, including age and drowsiness. As vehicle systems become more autonomous, human drivers engage in other activities and tasks—in other words, drivers disengage from the driving situation. This is especially true of look-ahead functions that support early responses to defuse risky situations, such as taking back vehicle control when entering an area with a high density of pedestrians. It will be especially important to monitor for these situations as vehicle systems become more autonomous. Re-engagement can take many forms, such as alerting/warning, redirecting driver attention to look ahead to developing risk, directing the driver to take charge of some control functions while automation handles others, or reconfiguring automated subsystems. The primary approach we will pursue is the development and use of a computational model of attention. Computational simulations of attention now exist that can be applied to the re-engagement challenge for driving and added to driving simulators as a new resource. We have been developing one that is specifically designed to handle situations where multiple sensors and algorithms assess anomalies and risk at multiple temporal and spatial scales. This simulation of attention can be used for design of warnings and automation to facilitate re-engagement. It can also be used as a critical

	measuring tool to assess the effectiveness of re-engagement under different conditions and with different types of response to pre-crash risk assessment. While the model is general, our focus in the CrIS UTC is to develop the model as it applies to the pre-crash University Transportation Centers Program time interval; this interval will be longer than the immediate pre-crash interval, because of the importance of modeling attention state before the immediate event, and because we hypothesize that early attention-engagement strategies will significantly improve pre-crash safety. Research Objectives • Year 1: Develop cognitive attention models that address pre-crash environments. • Year 2: Refine the model of driver-automation interaction and assess performance in response to critical pre-crash safety events.
Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	Pending project completion.
Impacts/Benefits of Implementation (actual, not anticipated)	Pending project completion
Web Links • Reports • Project website	http://citr.osu.edu/CrIS/wp-content/uploads/CrIS_UTC_PPPR_Final_Draft_043014.pdf http://citr.osu.edu/CrIS/?page_id=97