CrIS | Crash Imminent Safety UTC

THE OHIO STATE UNIVERSITY

PI : Ümit Özgüner, Ph.D.

Consortium Members : North Carolina A&T State (NCA&T), University, University of Wisconsin – Madison (UW), University of Massachusetts (UMass), and Indiana University-Purdue University Indianapolis (IUPUI)

CrIS: A U.S. DOT University Transportation Center

Researchers at The Ohio State University's Crash Imminent Safety (CrIS) University Transportation Center (UTC) hope to save lives and reduce the severity of human injuries in auto accidents by looking closely at what happens in the final seconds before vehicle collisions.

The goal of the CrIS UTC is to improve ground transportation safety through interdisciplinary research and development in the interplay of autonomous and intelligent vehicle systems, human factors, and injury biomechanics. Research will include developing advanced accident simulators, statistical modeling, analyzing past accidents and developing autonomous vehicles. The UTC research team includes over 20 faculty and researchers working at Ohio State and our partner universities.

The center and its research are funded by a grant from the U.S. Department of Transportation. The university received $1.41 million in 2013 and will receive an additional $1.5 million for 2014. The award and associated cost sharing total $4.3 million over the first two years of operation.

Denise Dunn, Grant Manager from the University Transportation Centers Program Office (U.S. DOT) recieves a tour, given by Janet Weisenberger, of the OSU Driving Simulator.

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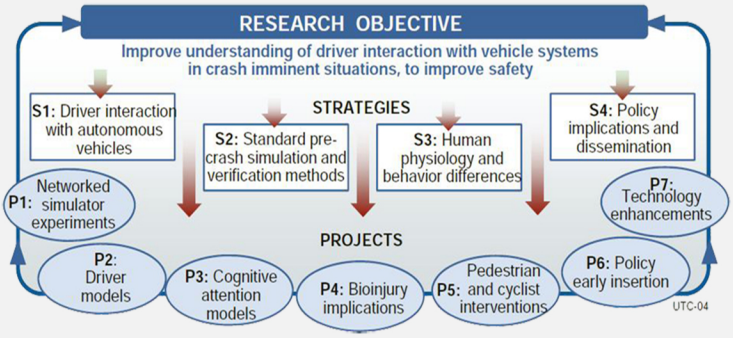
UTC Strategies:

1. Improve the interaction of the driver with an autonomous vehicle system to avert or minimize the impact of crashes.
2. Develop standard simulation/verification models to effectively understand human behavior and pre-crash safety over a wide range of autonomous vehicle properties and behaviors.
3. Use human behavior data across such variables as age, physical size, or alcohol intake, to inform the actions of the driver in pre-crash scenarios.
4. Include policy and regulation considerations early in the R&D process in order to accelerate turning research outcomes into widespread practice.



Autonomous and semi-autonomous vehicles coordinating with each other, human-driven vehicles and a traffic light through V2V and V2I during an outdoor demo at Ohio State.

Project Outcomes

Project 1: Networked Driving Simulators
Project Lead: Prof. Janet Weisenberger (Ohio State)

- Create a virtual driving environment simultaneously accessed by three or more human drivers (from six simulators located across the CrIS UTC's five partner universities), allowing for multi-driver tests and a much closer approximation of reality, with its attendant risks.

Project 2: Driver Modeling
Project Lead: Prof. Ümit Özgüner (Ohio State)

- Create computational models for human behavior in pre-crash scenarios.
- Utilize dynamic inputs about the changing situation and behavior of others.
- Use mathematical or symbolic processing to carry out the functions required to simulate the perception, attention, cognition, and control behavior of interest.
- Integrate different component models, including control theory models, decision and judgment models, learning classifier systems, joint human-automation system models, and attention models.
- Assist with making predictions in pre-crash situations and quantitative estimates of hypothesized safety improvements.

Project 3: Cognitive Attention Modeling
Project Lead: Prof. John Lee (UW)

- Understand how drivers respond to vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) information cues in pre-crash scenarios.
- Understand driver engagement over a range of human physiological and behavioral factors, including age and drowsiness.
- Consider how to re-engage a driver who may be partially or completely disengaged from key attention elements while operating a semi-autonomous vehicle.

Project 4: Bio-injury Implications
Project Lead: Prof. John Bolte (Ohio State)

- Utilize NASS CDC and CIREN databases to document injury outcomes resulting from different automobile safety systems and driver positions and reactions.
- Suggest situations in which the driver should not re-engage and assume control of the vehicle but rather leave the autonomous system in control.
- Determine optimum positions of the driver and the timing of passive restraints for given crash scenarios.

Project 5: Pedestrian and Cyclist Interventions
Project Lead: Prof. Yaobin Chen (IUPUI)

- Create a simulation model for the vehicle pedestrian/cyclist crash testing scenarios.
- Determine how vehicles with pre-crash warning and crash. imminent braking (CIB) capabilities perform in different scenarios.
- Incorporate the bio-injury model to predict pedestrian/cyclist injuries for different crash scenarios.

Project 6: Safety Policy Implications
Project Lead: Prof. Beth-Anne Schuelke-Leech (Ohio State)

- Position the UTC's research program to have maximum awareness of, and alignment with, policy needs.
- Assess how policies and regulations can either support or hinder the adoption of new safety technologies and intelligent vehicle systems.
- Develop and modify pre-crash scenarios and experiment plans to better align with hypotheses and outcome assessments that inform policy recommendations.

Project 7: Technology and Enhancements to Improve Pre-Crash Safety
Project Lead: Prof. Ümit Özgüner (Ohio State)

- Test bio-monitors and their value in improving crash safety and predict, using behavior models, the extent to which monitoring information can be effective in improving pre-crash safety.
- Utilize simulator studies and field tests to clarify the value of V2I and V2V communications for improving pre-crash safety.
- Utilize behavioral models resulting from other UTC projects to study the impact of both intra-vehicle and inter-vehicle communication cybersecurity on pre-crash scenarios.

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