CRASH-IMMINENT SAFETY (CRIS) UTC

2017 UTC SAFETY SUMMIT

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04/06/2017

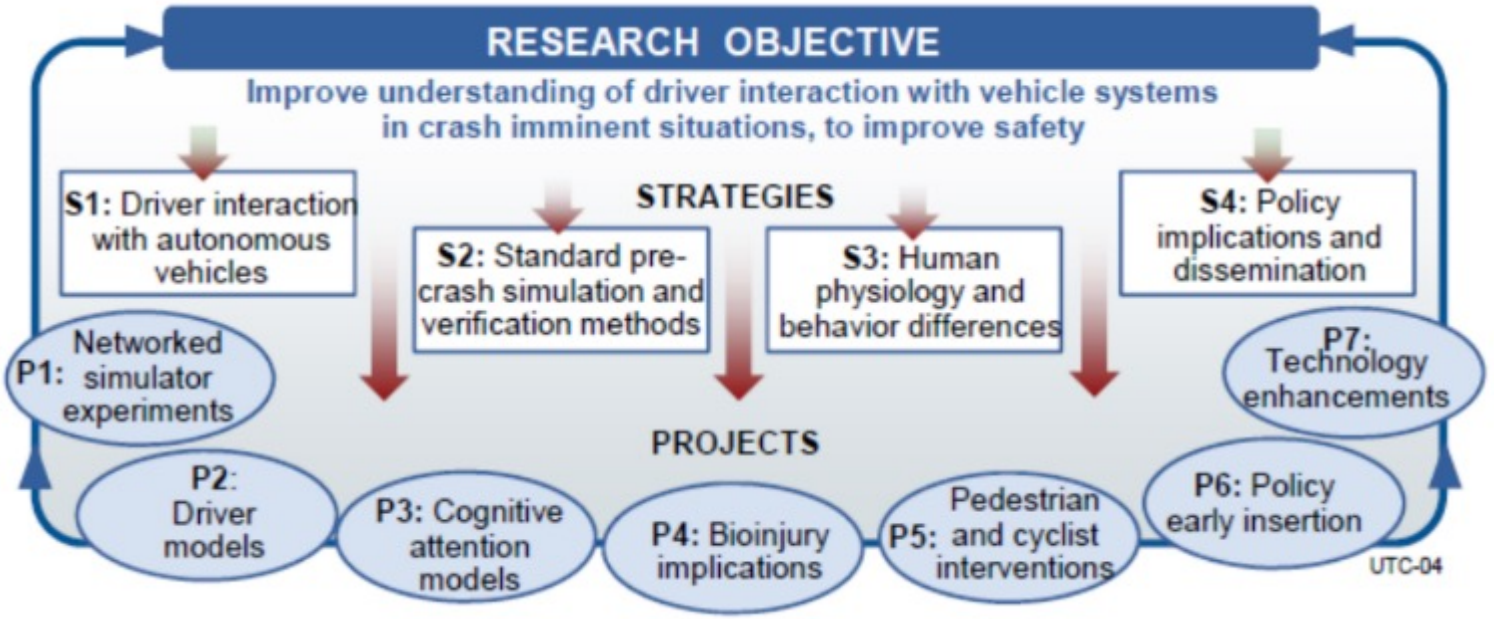
THE OHIO STATE UNIVERSITY
CENTER FOR AUTOMOTIVE RESEARCH

OVERVIEW

- A consortium of five universities.
- “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 includes 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 OSU and our partner Universities

UMASS AMHERST
IUPUI
WISCONSIN
UNIVERSITY OF WISCONSIN–MADISON

SEVEN PROJECTS



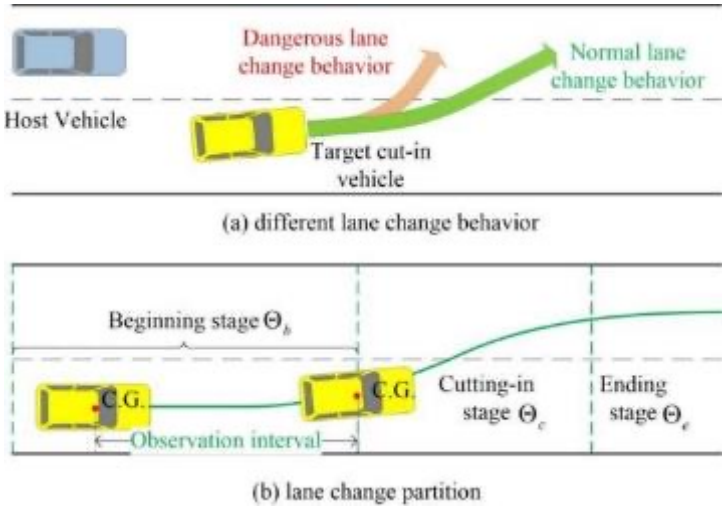
- Prof. U. Ozguner, Director

Investigators at OSU:

- Prof. J. Bolte
- Prof. E. Ekici
- Prof. A. Kurt
- Prof. F. Ozguner
- Prof. K. Redmill
- Prof. B-A Schuelke-Leech
- Dr. D. Stredney
- Prof. J. Weisenberger
- Prof. D. Woods

PROJECT SYNOPSIS: HUMAN DRIVER MODELS

- Example: Building lane change maneuver models of human drivers, so that we can make automated vehicles safely integrate with the mixed traffic.



- Behavior difference of cut-in vehicle affects control inputs applied to the host vehicle
- Need to recognize behavior difference of lane change and cut-in maneuvers
- Focus on the trajectory difference during a lane change caused by *different driver states*
- Classify the driver states into two : *Normal driving and dangerous driving*
- *dangerous driving* is defined as driving behavior with unexpected maneuvers involved during lane change, e.g. fatigue or aggressive driving, emergency obstacle avoidance, etc..

- Different methods (HMM, SVM, Fuzzy models…) were used for classification, and applied to a wider range of scenarios
- Estimators using these models were used for distributed control (DMPC) in more complex convoying/merge simulations

AUTONOMY IN THE NEAR FUTURE: LANE CHANGES AND MERGING CONVOYS

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Investigate different aspects of vehicular collaboration:

- Communication between vehicles in a relatively simple scenario:
  - DSRC message exchange for coordination (who does what)
  - DSRC and beyond for information fusion (who knows what)

- Partial autonomy for smarter transportation:
  - Mixed traffic scenarios are more realistic in the short term:
    - Partial/full automation mixed with purely manual vehicles
    - Having human drivers in key roles/responsibilities
    - Computer ←→ human interactions w.r.t. vehicle control authority
- Control and decision making in a multi-vehicle environment:
  - Decision making among multiple agents
  - Scenario specific decisions: gap acceptance, computer → human signalization
  - Communication-induced delays and uncertainties
  - Human-induced delays and uncertainties
- Towards automated lane changes into and out of convoys