Overview of SAFER SIM UTC Research

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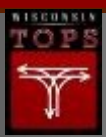**University of Wisconsin – Madison**

Presentation Outline

- About SAFER SIM
- Center Themes
- Sources of Matching Funds
- Research Projects Overview
  - Individual Active Projects
  - Collaborative Projects
- Center Outreach

About SAFER SIM

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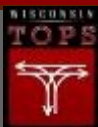
Center Themes

- Safety of Roadway Users
  - Drivers
    - Passenger Vehicles
    - Heavy Trucks
    - Transit Vehicles
  - Vulnerable Road Users (Pedestrians, Bicyclists, Motorcyclists)
- Roadway Design and Safety Evaluations
- Traffic Operations and Safety Evaluations
- Simulation in the Transportation Planning Process
- Simulation in Vehicle Safety Research

- Collaboration
- Non-traditional Disciplines

Sources of Match Funds

- Research project funded by Toyota Collaborative Safety Research Center

- Safety Education Campaign project funded by court order in class action settlement

- Belgian government funding for roadway design work

- State DOT funded research
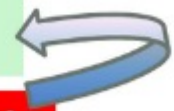
- Faculty release time

Overview of Research Projects

THE UNIVERSITY OF IOWA
1. Using Connected Vehicle Technology to Deliver Timely Warnings to Pedestrians
2. Examination of Driver Behavior in Response to Pedestrian and Bicyclist Behaviors

Cross-Platform Driving Simulator Scenarios to Use in the Roadway Design and Planning Process

WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON
1. Effectiveness of In-Vehicle Virtual Traffic Control Devices
2. Driving Simulators for Virtual Road Safety Audits

UMASS AMHERST
1. The Effect of Roadside Vegetation and Clear Zone Design on Driver Behavior
2. Development and Evaluation of Infrastructure Strategies for Safer Cycling
3. Impact of Deflection Angle on Roundabout Driver Behavior

Operational and Safety-Based Analyses of Varied Toll Lane Configurations

University of Central Florida
1. Integration of Microscopic Big Traffic Data in Driving-Simulation-Based Safety Analysis
2. Dynamic Simulation Models for Road Safety and its Sustainability Implications

Effectiveness of In-Vehicle Virtual Traffic Control Devices

BMW Concept
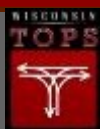
In-Vehicle displays are growing in popularity. Existing implementations include OEM solutions and after market solutions. Advance concepts for augmented reality have also been proposed.

Millions of Dollars Spent on Signs Every Year

Can existing in-vehicle display systems be used to effectively replace traffic signs instead of providence supplemental information?

Driving simulator provides a safe environment to test new technologies and exploit their capabilities.

SAFER SIM
SAFETY RESEARCH USING SIMULATION
UNIVERSITY TRANSPORTATION CENTER

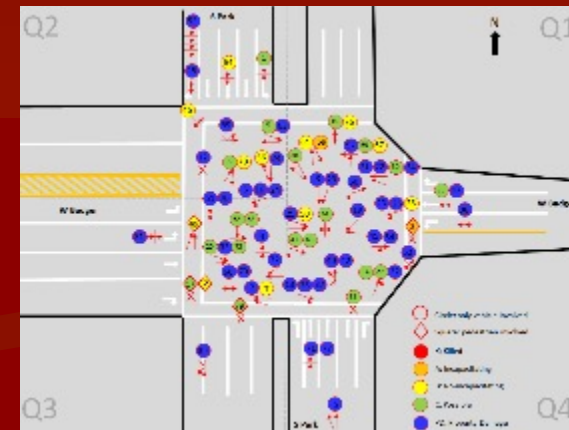Wisconsin Traffic Operations and Safety Laboratory

WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON

Department of Civil and Environmental Engineering
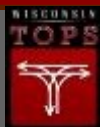University of Wisconsin-Madison
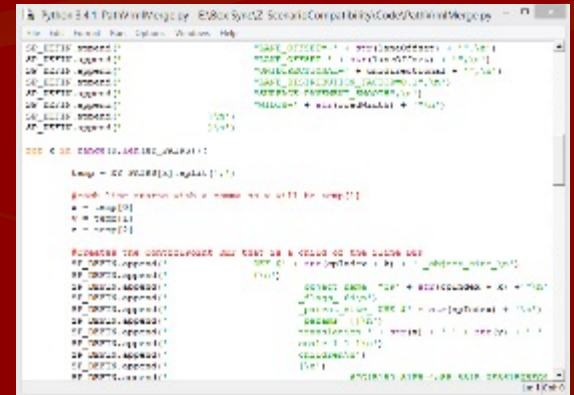
Driving Simulators for Virtual Road Safety Audits

- Existing road safety audit approaches are based on expert knowledge and crash history.

- Driving simulator will be used to add a human behavior component to road safety audit process.

- An intersection in Madison, WI will be studied in the driving simulator.

SAFER SIM

SAFETY RESEARCH USING SIMULATION
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Cross-Platform Driving Simulator Scenarios to Use in the Roadway Design and Planning Process

- No guidelines for making visual worlds compatible among platforms.

- Lack of compatibility is a barrier to collaborative research.

- Proposed solution will be a set of guidelines and software.

- Output of process will be a world compatible with the visual engine and road definition of RTI and MiniSim platforms.

The Effect of Roadside Vegetation and Clear Zone Design on Driver Behavior

- Landscape can reduce stress and frustration on drivers but increase severity of crashes.

- Driving simulator used to study relationship between clear zone design and driver speed, lateral positioning, and hazard anticipation.

- Study will help in making clear zone design decisions.

Author: Dwight Burdette

UMassAmherst

Wisconsin Traffic Operations and Safety Laboratory

Department of Civil and Environmental Engineering
University of Wisconsin-Madison

Development and Evaluation of Infrastructure Strategies for Safer Cycling

- Numerous bicycle-related infrastructure treatments have been introduced over the past decade.

- Project will review and analyze new bicycle infrastructure treatments to identify patterns around driver behavior.

- Performance of these treatments in terms of driver behavior will help in the selection of treatments.

Photo: Kask rowerowy

UMassAmherst

Impact of Deflection Angle on Roundabout Driver Behavior

- Effect of roundabout entry deflection angle on driver performance and safety studied.

- Video from roundabouts in Amherst, MA used to obtain microscopic field measurements.

- VISSIM SSAM used to obtain surrogate safety measures.

- Model relating roundabout entry deflection angle to driver behavior expected.

Operational and Safety-Based Analyses of Varied Toll Lane Configurations

- Scenario of toll plaza will be created on the driving simulator.

- Effectiveness of different lane configurations used for electronic toll collection will be assessed.

- Focus will be on how signage dimensions and queues affect safety in or around the toll plaza area

Integration of Microscopic Big Traffic Data in Driving-Simulation-Based Safety Analysis

- Field data from radars and loop detectors will be integrated with supplemental technologies.

- Fusioned data will be used to create a traffic microsimulation model to study safety.

- A simulation-based tool will be developed to study dilemma zone decisions at signalized intersections.

Dynamic Simulation Models for Road Safety and its Sustainability Implications

- A complex feedback loop exists between vehicle, drivers, and infrastructure with a complexity only amplified when socio-economic influences are added to the equation.

Author: Trevithj

- A holistic modelling approach will be developed to analyze the safety system as a whole and consider all feedback loops.
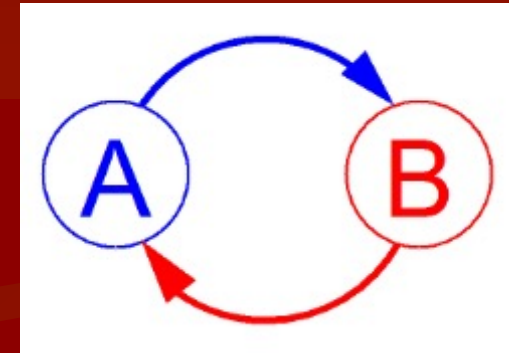
Using Connected Vehicle Technology to Deliver Timely Warnings to Pedestrians

- Mobile devices (cellphones) used to deliver warnings to pedestrians about upcoming vehicles.

- Proposed technology will rely on the DSRC to send "messages" from vehicles to pedestrians.

- Potential to provide warnings about unsafe crossing situations.

Examination of Driver Behavior in Response to Pedestrian and Bicyclist Behaviors

- Naturalistic bicycling data collected. Safety critical events coded and examined to identify common characteristics.

- Scenario replicating conditions will be created on the National Advanced Driving Simulator.

Sample of Education and Outreach Activities

- **UCF:** Transportation Summer Camp Connect

- **UPRM:** Transportation Week

- **UMass:** Freshman General Engineering Course

- **UW Madison:** Technical College Students

- **UI:** FirstTECH Robotics Super Regional, Iowa City Public Schools

Thank You!

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