# Safer-Sim Projects Improving Pedestrian and Bicycle Safety

The Safer-Sim University Transportation Center (UTC) recently awarded its initial research projects, including three that focus on pedestrian and bicycle safety. Safer-Sim uses simulators to improve roadway safety for all users. The projects highlighted here embody the interdisciplinary and collaborative spirit of Safer-Sim. Consortium members are:

- University of Iowa;
- University of Central Florida;
- University of Wisconsin – Madison;
- University of Massachusetts – Amherst; and
- University of Puerto Rico – Mayaguez.

The University of Iowa and the University of Massachusetts–Amherst are coordinating activities on studies that examine drivers' behaviors around bicycles.

The first Iowa project is led by College of Public Health and Injury Prevention Research Center researcher Cara Hamann, PhD. This project uses crash and injury records to identify typical crash scenarios involving vehicles, bicycles, and pedestrians. In recent work, Dr. Hamann has instrumented bicycle helmets with cameras to record bicyclist and traffic activity during everyday bicycle trips. Using the scenarios observed in these data, Dr.
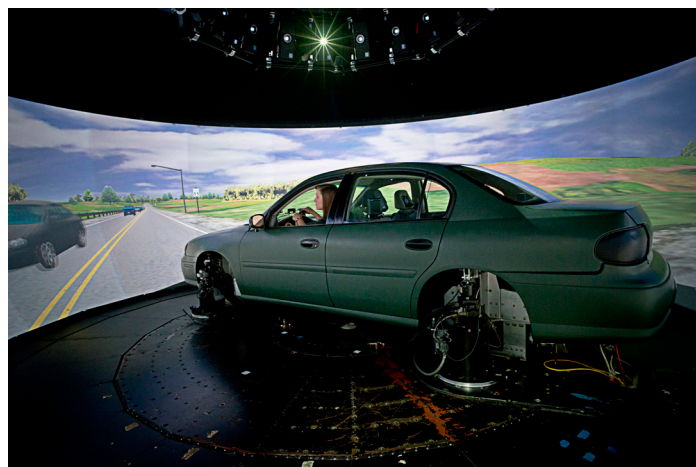


Bill Nellans

The NADS-1 Simulator at the National Advanced Driving Simulator at the University of Iowa.

## About Safer-Sim

The University of Iowa UTC, titled Safety Research Using Simulation (SAFER-SIM), uses simulation to study safety issues prioritized by USDOT. The research will study all road users including passenger car drivers, transit users, pedestrians, bicyclists, and heavy-truck drivers.

Hamann will create similar scenarios in a driving simulator to examine how a wider set of car drivers react to bicycle movements.

These scenarios will be included in a larger study sponsored by the Toyota Collaborative Safety Research Center, which is examining driver response to crash imminent situations with vehicles and pedestrians. Civil Engineering Ph.D. student Mark Pooley will be assisting with this project. The project will use the National Advanced Driving Simulator and specifically focus on the impact of different infrastructure elements (e.g., bicycle lanes, crosswalks, refuge islands, etc.) on driver response to bicyclists and pedestrians in typical settings and during safety-critical events.

The UMass-Amherst project on improving bicycle infrastructure is being led by Kathryn Slater, Program Coordinator, and Michael Knodler, Ph.D., Associate Safer-Sim Director. The project will be integrated, in part, within the Highway Location and Geometric Design course taught on campus. As part of a series of class assignments, students will be asked to evaluate the safety (using existing crash data) of bicycles within the built environment, review literature related to innovative bicycle infrastructure, and design their own bicycle infrastructure innovations.

Some of these bicycle treatments will then be created in the UMass-Amherst driving simulator. The simulator study will evaluate driver response to bicycle behavior within these facilities in areas such as shared lanes and trail crossing areas. The research teams and students from both universities will coordinate activities through webinars and campus visits.

The second University of Iowa project takes advantage of the unique pedestrian simulation capabilities of the Hank Virtual Environments Lab operated jointly by the departments of Computer Science and Psychology. In 2012 pedestrians were among several categories of road users that experienced an increase in deaths, according to the most recently released

**Pedestrian and bicyclist images rendered through the NADS-1 graphics system.**

traffic safety data from the National Highway Traffic Safety Administration. Recent advances in connected vehicles technology allows cars to "communicate" with each other by sending "Here I am" messages. This project will examine the effectiveness of vehicle to pedestrian (V2P) warnings by developing a pedestrian warning system delivered via a mobile device equipped to receive "Here I am" messages from approaching vehicles in the pedestrian simulator.

The study will evaluate responses to warnings about approaching vehicles sent to texting and non-texting pedestrians while they cross a road in their large-screen, immersive pedestrian simulator. With funding from the National Science Foundation Computing Research Infrastructure program, the Hank Lab has recently built an immersive, large-screen pedestrian simulator to study how children and adults cross roads with traffic. The simulator consists of three large screens placed at right angles relative to one another, forming a three-walled room. Three high-resolution, stereo projectors are used to rear-project images onto each of the screens while a fourth projector sends a road surface image onto the floor. The 14.2 foot long screens allow a participant to physically walk across a one-lane virtual road. The view of the scene is rendered for the participant's viewpoint, giving a compelling sense of immersion in the environment. The participant wears 3D glasses and head gear that allows their motion to be tracked with a

motion tracking system in the room. This simulator provides participants with a highly realistic, first-person experience of physically crossing roads.

"The Safer-Sim funding allows our laboratory to move our basic science research on pedestrian crossing gap selection into more applied areas and to use our one-of-a-kind facility to examine new transportation technology" says Joe Kearney, Ph.D., Professor in Computer Science and Associate Dean for Research and Infrastructure in the College of Liberal Arts and Sciences. Dr. Kearney directs the Hank lab along with Jodie Plumert, Ph.D. chair of the Department of Psychology. The project will support undergraduate and graduate research assistants from both departments.

Safer-Sim at the University of Central Florida is also addressing pedestrian safety by cosponsoring a student internship at MetroPlan Orlando to support a student to work full time in summer 2014 and part time in fall 2014 on a pedestrian safety project at the agency site in downtown Orlando.
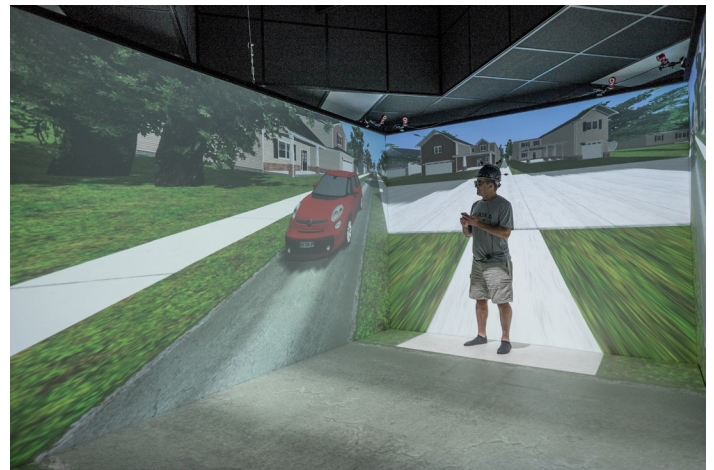


**A texting pedestrian waits to cross the road in the pedestrian simulator at the University of Iowa.**

## About This Project

Sue Chrysler, Ph.D., is the Safer-Sim director and the Director of Research at the National Advanced Driving Simulator (NADS) at the University of Iowa. Trained as a cognitive psychologist, Dr. Chrysler has championed interdisciplinary safety research throughout her career in industry and academic research. Her own research has focused on how roadway design, traffic operations, and traffic control devices affect driver behavior. More recently, she has been overseeing research at NADS concerning impaired driving and advanced vehicle safety systems. She holds appointments in the College of Public Health and the Public Policy Center at the University of Iowa.