THE NATIONAL ADVANCED DRIVING SIMULATOR
THE UNIVERSITY OF IOWA

TheDriverSeat

NADS - THE NATIONAL ADVANCED DRIVING SIMULATOR - JUNE 2012

New simulator rates for 2012 *
Now the highest fidelity research is more affordable!

NADS-1	$740 / hr	$2800 / day
NADS-2	$300 / hr	$1200 / day
miniSim	$50 / hr	$400 / day

* Prices subject to finalization

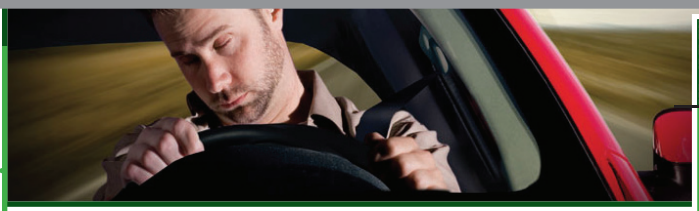
Herm Reininga
Interim Director

Sue Chrysler
Director of Research

Omar Ahmad
Director of Operations

THE NATIONAL ADVANCED DRIVING SIMULATOR
The University of Iowa
2401 Oakdale Blvd
Iowa City, IA 52242
Phone: (319) 335-4673
Fax: (319) 335-4658

contacts@nads-sc.uiowa.edu



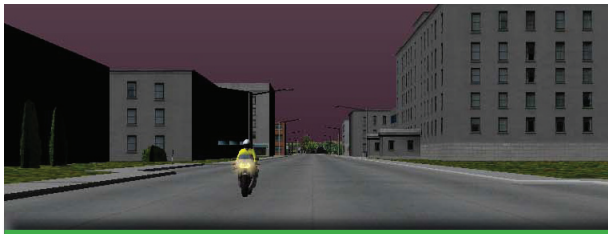
DRIIVE: Driver Monitoring of Inattention and Impairment using Vehicle Equipment

NADS is conducting a series of projects examining detection of driver impairment due to drowsiness, alcohol, and distraction. This program, sponsored by the U.S. Department of Transportation National Highway Traffic Safety Administration, has recently been renamed DRIIVE. The goal of the program is to develop algorithms that can detect impairment and distinguish between different types of impairments using existing vehicle sensor equipment, such as steering, to monitor driver inputs. The most recently completed project demonstrated that algorithms, such as the boosted decision tree that successfully detected alcohol-impaired driving, could be generalized to detect drowsiness when trained on drowsy-driver data. Another set of real-time algorithms, based on lane-keeping and steering behavior, successfully detected drowsiness six seconds before a lane departure due to driver inattention. Bayes Network algorithms successfully differentiated alcohol-impaired drivers from drivers who were both drowsy and alcohol-impaired.

Dr. Tim Brown directed the research projects and Dr. Chris Schwarz participated in developing the algorithms. Work in this exciting new area is continuing and is done in collaboration with Dr. John Lee of the University of Wisconsin.

Motorcycle Conspicuity

Motorcycle rider deaths are rising. The Iowa Motorcycle Operator Manual states, "Over one-half of motorcycle/car crashes are caused by drivers entering a rider's right-of-way." And, "In crashes with motorcyclists, drivers often say that they never saw the motorcycle." Increasing the conspicuity of the motorcycle is one way to address this issue.



Where is the motorcycle?

Using the NADS-2 driving simulator, an enhanced visual system presented car drivers with on-coming and lead vehicles using different colors of motorcycle rider apparel and headlight settings. Two age groups, 35 to 55, and over 65 were tested.

New Project Highlight: Connected Vehicles to Speedway Test Track

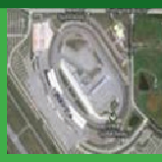
The Connected Vehicles project aims to develop and evaluate situation awareness measures for connected vehicles

1. MiniSim

Evaluating a range of situation awareness measures and visual occlusion as metrics to detect distraction while interacting with Connected Vehicles displays; Collecting eye tracking data to verify perceptual salience model for display features

2. Test Track

Evaluating metrics developed in the MiniSim in a closed course driving environment in the parking areas of the Iowa Speedway in Newton IA



3. MiniSim

Validating measures of first two studies with the addition of crash imminent scenarios to examine warnings of hidden threats enabled by Connected Vehicles technology.

Distraction Guidelines:

NHTSA released draft Distraction Guidelines in February 2012. Several of the recommended evaluation procedures utilize a driving simulator and eye tracking system. NADS is implementing these procedures with data reduction scripts that will be available to MiniSim partners for an additional fee.

NADS can also evaluate your product according to these guidelines on any of our simulation platforms. Please contact us for details.

(Motorcycle Conspicuity...)

The goal was to better understand some of the factors that affect the conspicuity of motorcyclists by vehicle drivers. Both groups indicated when they first saw motorcycles in both rural and urban environments.

Preliminary results indicate younger drivers saw the motorcycles at a longer distance than older drivers and there may be interactions between the color the driver is wearing and the distance seen by the different age groups. The results also showed that modulating headlights help motorcycles be seen at longer distances.

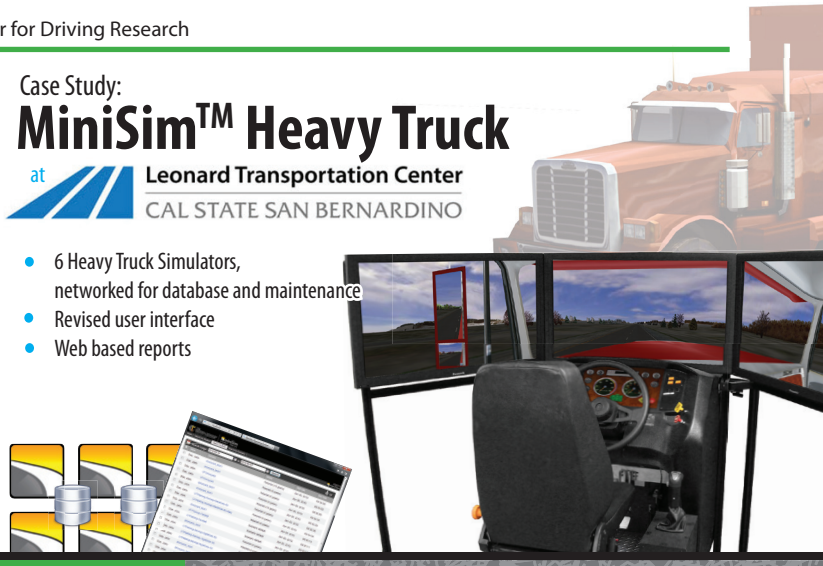
Funded: Iowa Department of Transportation / Midwest Transportation Consortium.

Case Study:

MiniSim™ Heavy Truck

at Leonard Transportation Center
CAL STATE SAN BERNARDINO

- 6 Heavy Truck Simulators, networked for database and maintenance
- Revised user interface
- Web based reports



New MiniSim users: • Clemson University • Hyundai • University of Kentucky

Triggering Crash-Imminent Events based on Driver Gaze

In support of research for the National Highway Traffic Safety Administration's (NHTSA) Crash Warning Interface Metrics (CWIM) program, we have developed a protocol for evaluating the driver-vehicle interfaces of crash systems. The protocol is made more effective by the triggering of scenario events based upon data from real-time eye or head tracking. This capability allows us to create a closed-loop control mechanism so that surprise events occur only when the driver's visual attention is off of the road at the critical time during the event.

This approach is being used for both lane drift and for forward crash events. For both types of events, the driver is presented a distraction task prior to the event and is supposed to engage in that task while the event is triggered. On occasion in this situation, drivers would not be engaged with the task at the critical moments and would see the event unfolding. This would cause us to lose that participant from the study as they would be aware of what we were doing without having actually experienced the surprise event. To counter that, we have linked the crash-imminent events to where the driver is looking. For the lane departure events, we move the vehicle laterally in the lane without motion cues so that when they look back at the road they are out of their lane. If the driver is looking at the forward roadway at the time the lateral drift is to begin, the event is aborted and another attempt is made during a subsequent distraction task. For the revealed lead vehicle forward crash event, a stopped vehicle is created ahead of the lead vehicle at the appropriate distance when the task begins; however, if the driver is attending to the road when the lead vehicle is supposed to change lanes, the event is aborted and the stopped vehicle is deleted.

The addition of this capability opens new opportunities for triggering scenario events that better meet the experimental needs of the project across all of the NADS simulation platforms.

Partnering with Industry to Advance Technology

With our partners at Advanced Brain Monitoring (Carlsbad, CA), we collaboratively worked to develop a mobile, smartphone/tablet -based neurocognitive assessment for providing a multifactorial (i.e., neural, physiological, performance) evaluation of cognitive functioning associated with impaired driving due to stimulant or depressant usage. The specific aim of this project was to deliver a road-side ready tool for worldwide facilitation of epidemiological, comparative studies of drugged driving.

In the recently completed Phase 1 Small Business Innovative Research (SBIR) project sponsored by the National Institute on Drug Abuse (NIDA), a platform for the Mobile Alertness and Memory Profiler (M-AMP) was developed and implemented to support data acquisition from neurocognitive tests in conjunction with wireless collection of electroencephalogram (EEG), electrocardiogram (EKG) and actigraphy on a smartphone-based platform. The project included a double-blind, cross-over, within-subject assessment of performance on the M-AMP and driving simulation while under the influence of either diphenhydramine (sedative) or caffeine (stimulant). The results demonstrated the ability to differentiate between the states.

Following review of the Phase 1 report, NIDA has invited a Phase 2 application which has been submitted and will be reviewed in August. The plan for Phase 2 is to extend the M-AMP, and expand the algorithm to discriminate between additional types of drugs. To ensure the tool is practical and applicable for the intended end-users, we will additionally conduct a workshop with the law enforcement and research community seeking their feedback.

Recent studies @ NADS: • NIOSH (young tractor driver) • NIDA (drug testing) • IDOT CAD data to simulator transfer • Great Plains tractor design