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Heavy Vehicle Review

MESSAGE FROM THE DIRECTOR

HEAVY VEHICLE SAFETY, SECURITY & OPERATIONAL EFFICIENCY

The six research projects selected for immediate funding in January 2007 have been placed on contract and research initiated. A memorandum of understanding for one project requiring private industry participation has been signed.

Funding for the six projects approved for Grant Year 1 total approximately \$1,616,360 with cost share from participating university and industry partners in the amount of \$525,964.

The new NTRCI website went live in May 2007. The website allows access to UTC ongoing project information, completed reports, monthly reporting and proposal forms and open/closed RFP's. Users can access the UTC section from anywhere throughout the website. The site has a search engine to enable easy access to ongoing and completed research topics.

In June 2007 one of the selected research projects on Enhanced Finite Element Analysis Crash Model of Tractor-Trailers was briefed to the Federal Highway Administration (FHWA) in Washington, DC. Also attending the briefing were representatives from the National Highway Traffic Safety Administration (NHTSA) and Federal Motor Carrier Safety Administration (FMCSA). Both organizations expressed interest in expanding the project to include their agencies' model requirements. FHWA will host a meeting to determine the specifics of the interested agencies' needs with the goal to modify the current scope of work and identify additional funding.

The UTC expects to obtain release of funds for Grant Year 2 in late summer. In preparation for this we are preparing the release of the Grant Year 2 Request for Proposals. A requirement for all projects to obtain funding is cost share with priority from industry.

*Joseph A. Petrolino
Center Director*

RESEARCH PARTNER SPOTLIGHT



Heavy Vehicle Safety Research



Since its establishment in April 2000, the Heavy Vehicle Safety Research Center (HVSRC) has worked to develop technologies that will enhance the safety of heavy vehicles operating on our nation's highways. The Center takes a holistic approach in technology development, allowing its technologies to be more readily deployable. Its research contributes to national transportation goals, such as reducing truck-related fatalities and maintaining the economic viability of the U.S. trucking industry.

HVSRC has undertaken research on heavy-vehicle safety challenges of both national and strategic importance. The Center provides unique research capabilities, as well as solutions to critical heavy-vehicle safety problems. The Center's researchers have a close working relationship with inspection and weigh stations in the region, including the weigh station on Interstates 40 and 75 in Knoxville, TN, the second busiest weigh station in the US. The roadside testing lab provides researchers with the opportunity to study safety inspection techniques practiced at truck stops and will be performed in conjunction with the inspection station on Interstate 81 in Tennessee.

The Center's researchers also have access to sensor and radio frequency identification (RFID) technologies for the study of sensor techniques and RFID capabilities that may be used to improve the efficiency of weigh station checks.



RESEARCH FOCUS

In its first year, HVSRC focused its efforts on the safety of integrated brake systems. Since then, the main focus of HVSRC has expanded to include impacts that energy efficiency technologies, such as aerodynamics, may have on heavy truck safety. HVSRC researchers look at the safety impacts of driver-in-the-loop technologies, including driver workload and attention. HVSRC has also expanded its focus to infrastructure issues such as work zones, congestion and regulation.

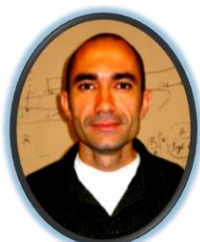
EXPERTISE

Heavy vehicle experience at HVSRC draws on significant, heavy vehicle-specific expertise from the Oak Ridge National Laboratory (ORNL) and the University of Tennessee (UT). ORNL's expertise in material characterization is being used to establish qualification procedures and to evaluate the performance of replacement brake materials. ORNL and UT's systems integration capabilities are enabling the development of performance based brake-testing equipment and the development of heavy vehicle duty cycles. In addition, HVSRC draws on expertise from other national labs, including the National Renewable Energy Laboratory, the Pacific Northwest National Laboratory, Brookhaven National Laboratory, and Argonne National Laboratory.

Student Spotlight



Richard Wunderlich, a graduate student in the Electrical Engineering and Computer Science (EECS) department at the University of Tennessee, Knoxville campus has been working with Dr. Tom Urbanik of the Civil and Environmental Engineering Department and Dr. Itamar Elhanany of the EECS department on algorithms for the Safety-Aware Vehicle Traffic Control project. His work, which relies on a hybrid hardware/software platform, has helped introduce novel algorithms for scheduling vehicles in transportation networks. In particular, he has developed a unique software interface between VISSIM, an industry standard transportation simulation software, and the Matlab™ scientific environment, to facilitate advanced studies of complex scenarios.



Francisco Moraes de Oliveira-Neto is a doctoral student in civil engineering at the University of Tennessee, Knoxville Campus. Francisco is a math-wiz of sorts, who has developed an *Edit Distance* matrix to help dramatically improve the matching rate. In fact, the research team he is currently working with is now able to overcome many License Plate Recognition (LPR) accuracy limitations and achieve matching rates far higher than expected initially.



Elliott Moore is a graduating civil engineering senior with a 3.73 GPA at the University of Tennessee, Knoxville Campus. He has served as the chapter president of Chi Epsilon Honor society. Elliott is a member of two other Honor societies and has been awarded five scholarships in the past four years. He has recently accepted yet another scholarship from Southeastern Transportation Center (STC) to pursue a master degree in transportation engineering at UT in January 2008

Safety-Aware Traffic Control in Next-Generation Transportation Infrastructure

Dr. Tom Urbanik of the Civil and Environmental Engineering Dept at the University of Tennessee, in collaboration with Dr. Itamar Elhanany from the Electrical Engineering and Computer Science Department, are conducting research on an NTRCI-funded project for controlling vehicular traffic flows in complex transportation settings. The work utilizes a novel approach for scheduling vehicles across a network of intersections. By employing graph theory and systems control techniques, as commonly used in the area of high-speed communication networks, this work aims to deliver a robust and scalable framework for next-generation transportation infrastructure that can adapt the control decisions to reflect the characteristics of vehicles with a focus on trucks.

Unlike existing schemes for traffic signal control, which focus on vehicle throughput across intersections and the minimization of queueing delay, this work addresses a broader spectrum of performance criteria. In particular, a unique aspect of this project is the emphasis on truck safety. The latter renders safety an inherent component in the traffic signal control process which dictates traffic light configurations. This results in a reduced probability of truck-related accidents, as well as improves the condition of the road. As a result, it is expected that overall flow of traffic, as well as safety, will

CURRENT RESEARCH

**U01-ENHANCED FINITE
ELEMENT CRASH ANALYSIS OF
TRACTOR-TRAILERS**

**U02-HEAVY TRUCK ROLLOVER
CHARACTERIZATION**

**U03-LICENSE PLATE
RECOGNITION**

**U04-MARINE CONTAINERS ON
CHASSIS: SAFETY ISSUES**

**U05-HEAVY VEHICLE TRAFFIC
SIGNAL SAFETY**

U06-TRUSTED TRUCK™ 2



UT Students Contributing to Heavy Truck Profiling and Enforcement

Since early summer a team of University of Tennessee (UT) students have been seen setting up sophisticated license plate recognition (LPR) cameras and computers at several key locations by Interstate 40 to collect truck plate data. The equipment temporarily placed at these sites and the students are a part of a joint research effort of National Transportation Research Center (NTRC) and UT sponsored by US DOT's Research and Innovative Technology Administration (RITA). By matching individual trucks at different locations, researchers are able to identify speed/regulation violators and, when implemented in the future, enable real-time enforcement at weigh stations and other strategic locations without the need of additional troopers or resorting to dangerous high-speed pursuit.

Because the limitation of LPR equipment accuracy, individual license plate condition, and the elements such as lighting and weather, the "reading" of each truck plate may or may not be 100% correct. For instance, a plate of "ABC123" could be read as "A8C123" or "ABCI23" or many other possibilities, including of course "ABC123." To match a plate reading that may or may not be 100% correct with another plate reading somewhere else is a rather challenging task. In fact, the research team is now able to overcome many LPR accuracy limitations and achieve matching rates far higher than expected initially.

This study, which is lead by Professors Lee D. Han and M.K. Jeong at UT, is ongoing in its first phase. In the next phase, the joint research team plans to commence a pilot field deployment to see how the system functions in real-time.

PARTNERSHIPS

ACADEMIC

The University Of Tennessee
Clemson University
Western Michigan University
Pellissippi State Technical
Community College
University Of Michigan-
Transportation
Research Institute

NATIONAL LABORATORIES

Oak Ridge National Laboratory

FEDERAL GOVERNMENT

Federal Highway Administration
National Highway Traffic Safety
Administration
U.S. Department of Energy

STATE/LOCAL GOVERNMENT

Knox County Regional Planning
Organization
Knox County Fleet Service Center

INDUSTRY/PRIVATE PARTNERS

AirSage Corporation
Dana Corporation
EconoPlug
Fleet Tire
GiaLink
InterCode Technologies
Link Testing Laboratories
Michelin-Laurens Proving Grounds
Michelin America Research &
Development Corp.
Safety Messenger
Tennessee Trucking DBA Walker
Trucking
Volvo Technology of America
Volvo Trucks North America
Waste Connections

NON-PROFIT PARTNERSHIPS

Battelle Memorial Institute
UT-Battelle, LLC
Transportation Research Center