

**UNIVERSITY OF MASSACHUSETTS
TRANSPORTATION CENTER**

**UNIVERSITY TRANSPORTATION CENTER
INITIATIVE**

**ANNUAL REPORT FOR GRANT YEAR ENDED
SEPTEMBER 30, 2008**



Section A.

CORPORATE STYLE REPORT

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- The theme of the UMass/UTC Initiative is:

Improving Transportation Mobility and Safety with Innovative Technologies and Strategies

- The management structure of the UMass/UTC Initiative consists of a Director, three faculty and two administrative staff, all located on the Amherst campus. The Director and faculty members formulate the operating policies and administrative procedures that guide the UMass/UTC Initiative business activities, the staff ensure that the administration of the grant is maintained in accordance with the terms of the contract.

- Center Staff:

- Director
 - Dr. John Collura, PE, Professor Civil & Environmental Engineering
- Faculty
 - Dr. Michael A. Knodler, Jr., Assistant Professor Civil & Environmental Engineering
 - Dr. Daiheng Ni, Assistant Professor Civil & Environmental Engineering
 - Dr. Song Gao, Assistant Professor Civil & Environmental Engineering
- Administrative Staff
 - Kristina Stetson, Administrative Manager
 - Crystal Nielsen, Bookkeeper

- The major programs of the UMass/UTC Initiative will include: 1) research activities; 2) education activities, including Graduate Fellowships; and 3) technology transfer activities. The programs will focus on all modes of surface transportation including highways, rail and bus transit, commuter ferries, parking, bicycling, and pedestrian facilities. The nation, the New England Region, and the Commonwealth of Massachusetts depend on a safe and efficient multi-modal transportation system to ensure their economic growth and vitality. The system also plays an important role in the day-to-day lives of all travelers. Whether commuting to an urban area during rush hour or visiting a rural tourist destination, the transportation system must be safe, efficient, and accessible. Meanwhile, an underlying goal of the

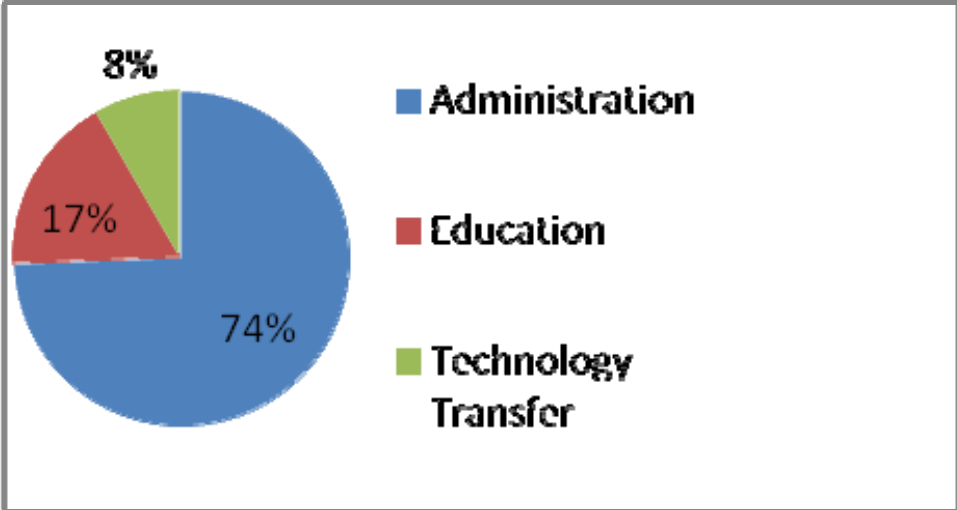
UMass/UTC Initiative is to make sure that research is integrated where appropriate into educational, training, technical assistance, technology transfer, and other learning activities. The linkage between research activities and learning activities will help meet the transportation system challenges by improving the knowledge and skills of the existing and future transportation workforce.

- Sources of Fundings:

USDOT/RITA and University of Massachusetts

- Expenditures:

\$754,000



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Section B.

RESEARCH PROJECT STATUS REPORT

As a result of an RFP issued in FY2008, the Center funded the following research proposals:

1. Vehicle Modeling for Future Generation Transportation Simulation

Dr. Daiheng Ni, UMass/Amherst

Abstract:

Transportation systems in the 21st century are facing many critical issues including mobility and safety problems. Critical issues call for innovative technologies and solutions. Systems soon to be launched under the United States Department of Transportation (USDOT) Vehicle Infrastructure Integration (VII) Initiative are directed toward addressing these critical issues. To facilitate an understanding of the VII initiative and to assess future VII-enabled transportation systems, future generation transportation simulation tools will be required. In response to this need for simulation tools, this research will develop a dynamic vehicle model as the first step toward achieving long-term VII goals. Such a model is practically unavailable but particularly needed in a VII setting because many VII-enabled vehicle and traffic control strategies work directly on vehicles and the dynamic response of these vehicles determines the effect and overall performance of the VII strategies. This project is undertaken with Federal, State, and local transportation research interests in mind. In addition, this project addresses the UMass Transportation Center theme "Improving Transportation Mobility and Safety with Innovative Technologies and Strategies" and this research responds to a national priority by contributing to the VII initiative.

\$150,000

2. Value of Information for Optimal Adaptive Routing in Stochastic Time-Dependent Traffic Networks: Algorithms and Computational Tools

Dr. Song Gao, UMass/Amherst

Abstract:

The objective of the project is to develop algorithms and computer implementations to study a class of optimal adaptive routing problems in stochastic time-dependent traffic networks where a wide variety of traveler information situations can be modeled and the value of information can be compared. The project is motivated by two observations of the traffic system: 1) the system is inherently uncertain with random disturbances such as incidents, bad weather, work zones and so forth; and 2) traveler information is or will be available so that travelers could make travel decisions adaptive to the random disturbances to reduce negative effects of uncertainty. The project will contribute to the state of the art by solving a class of fundamental network optimization problems; it will also provide algorithms and computer software for assessing

effects of various forms of Advanced Traveler Information Systems (ATIS) in terms of reducing expected travel time and increasing travel time reliability.
\$129,298

3. Development and Evaluation of an Attention Maintenance Training Program
Dr. Michael Knodler, Dr. Donald Fisher, UMass/Amherst

Abstract:

This research focuses on one of the key attributes that puts younger drivers at increased risk. In particular, we will focus on the finding that younger drivers pay less attention to the forward roadway and/or are more likely to be engaged in a distracting behavior. Distractions are estimated to cause some 20% - 30% of crashes among older teen drivers, and to be larger among newly licensed drivers than they are among more experienced drivers. Furthermore there is evidence to suggest that the longer time that younger drivers spend with their eyes off the forward roadway leads to an increased potential of an incident. Nevertheless, the data suggest that it may be possible to train newly licensed drivers to develop and adopt a more strategic scan pattern that allows successful completion of a task without a decrease in driving safety. Given both the increased number of in-vehicle electronic devices and the potential impact on traffic safety of a program designed to increase attention to the forward roadway, there is a definitive need to identify an effective attention maintenance training program. This research provides such a training program, in the form of a Roadway Attention Maintenance Training (RAMT) program which aims to reduce the time that newly-licensed drivers spend with their eyes away from the forward roadway to under two seconds a glance, a duration below which the risk is minimal. The training will be developed as a computer-based training program and will consist of game like elements which make the benefits and costs associated with performing an in-vehicle secondary task similar to what they might be in the real world. Following development of RAMT, its effectiveness will be evaluated using a virtual world in a driving simulator environment where drivers' eye movements will be tracked to quantify their attention maintenance. The evaluation will then move to an on-road environment (closed course) to determine the extent to which the training translates to the real world driving environment. Given the national attention currently being focused on younger drivers, distracted driving, and traffic safety in general, it is anticipated that this research will serve as the foundation for larger-scale future research efforts at the national level.

\$149,928

4. Does Monitoring Naturalistic Driving through Vehicle Instrumentation Make a Difference in Decision-Making for Fitness to Drive in Early Stage Dementia? An Intervention Study

Dr. Tomas Materdey, Dr. Nina Silverstein, Dr. Geri Adler, UMass/Boston

Abstract:

Latest technologies are used in the vehicle to collect detailed information on ability and performance of drivers in early-stage dementia in an on-going collaboration involving the University of Michigan Transportation Research Institute (UMTRI), the University of Massachusetts Boston, and the University of Houston. With funding from the Alzheimer's Association (2006-2009), the collaborative is exploring the perspectives of three of the stakeholder groups (persons with dementia, family members, and specialists in driving assessment) and will compare their assessments with empirical data on on-road performance gained through in-vehicle monitoring. Funding will support a control group of drivers that have not been monitored with the in-vehicle instrumentation to treat the instrumentation as an intervention and to test its effects related to decision-making among drivers with dementia and their family members. Pre and post test survey instruments have already been developed for the experimental group through the Alzheimer's Association funding. The scope of the research is to utilize the research tools developed for the experimental group and obtain and analyze the control group data. With our contribution, the collaborative will be able to achieve the following goals that reinforce and in some instances may go beyond their initial project: 1) Compare the validity of multiple forms of assessment of driving skills with naturalistic driving in persons with early stage-dementia and a control group; 2) Inform decision-makers about appropriate intervals for checking driving competency; 3) Bring greater visibility to deficits in driving performance unique to people with early-stage dementia; 4) Understand behaviors and issues of older drivers with dementia and their families; and 5) Assess the attitudes, knowledge, and activities of occupational therapists and driver rehabilitation specialists as they relate to older drivers with dementia.

\$142,850

5. Interactive TMC Decision Support Tool Combining Simulation and Optimization

Dr. Nathan Gartner, Dr. Cindy Chen, Dr. Chronis Stamatiadis, Lee Jones, UMass/Lowell

Abstract:

This project addresses the operation of Traffic Management Centers (TMS). Traffic Management Centers play a critical role in the monitoring, management and planning of traffic within urban areas. The goal of the study is to enhance the capabilities of TMCs by providing an advanced and versatile decision support tool that can be used across a broad range of applications. Specifically, the objective is to develop an interactive combined simulation-optimization decision support tool for TMC operations that can be used for both off-line applications as well as in real-time; can assist operators in

developing optimal traffic control and management plans for a wide range of incident or emergency situations; can evaluate consequences of operator actions in response to special circumstances; can be used to train operators and management agencies to respond to special circumstances and can be used to plan for eventual emergencies. The research builds on the unique capabilities and past developments of the research team. It combines the capabilities of researchers from two disciplines: civil engineering and computer science.

\$137,956

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Section C.

BASELINE MEASURES FOR UMASS/UTC INITIATIVE

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Research Selection

1. Number of transportation research projects selected for funding.

a. Number of those projects that are considered to be;

basic research	<u>0</u>	,
advanced research	<u>0</u>	, and
applied research	<u>5</u>	.

Projects may be included in more than one category if applicable.

2. Total budgeted costs for the projects reported in 1 above.

\$ 710,000

Research Performance

3. Number of transportation research reports published.

0

4. Number of transportation research papers presented at academic/professional meetings.

1

Education

5. Number of courses offered for college credit that are considered to be part of a transportation curriculum. Report courses shown in the university course catalog as being offered, whether or not they were conducted during the academic year being reported.

Undergraduate:	<u>4</u>
Graduate:	<u>6</u>

6. Number of students participating in transportation research projects. Count individual students (one student participating in two research projects counts as one student).

Master's Level: 7
Doctoral Level: 2

Human Resources

7. Number of advanced degree programs offered that are considered to be transportation-related.

Master's Level: 2
Doctoral Level: 2

8. Number of students enrolled in those transportation-related advanced degree programs.

Master's Level: 12
Doctoral Level: 5

9. Number of students who received degrees through those transportation-related advanced degree programs.

Master's Level: 5
Doctoral Level: 1

Technology Transfer

10. Number of transportation seminars, symposia, distance learning classes, etc. conducted for transportation professionals.

2

11. Number of transportation professionals participating in those events.

100