MAUTC, a five-university consortium led by The Pennsylvania State University, seeks to attract talented researchers and students to the study of transportation, and to engage them in new approaches to the transportation issues of today and tomorrow. MAUTC’s theme is Technology for Integrated Transportation Systems Operation and Performance.

### Student News

A number of students supported by MAUTC will be graduating this academic year. We wish them much success as they begin their careers.

**Nair Wins Best Ph.D. Dissertation from the Transportation Network Modeling Committee, Transportation Research Board**

Rahul Nair is a Ph.D. student in transportation engineering at the University of Maryland College Park. Along with advisor Dr. Elise Miller-Hooks, he is currently studying the role of vehicle sharing systems in alleviating urban transportation problems. His work is partially funded by MAUTC through two grants. Shared vehicle programs involve a fleet of vehicles positioned strategically at stations across the transportation network. Users are free to lease vehicles (cars, electric vehicles or bicycles) to complete a trip and drop the vehicle at a station close to their destination. Such systems are a sustainable and economical alternative for urban movement, offering a level of flexibility that traditional transit cannot provide. Rahul’s research focuses on design and operations of shared-vehicle systems.

> Continued on page 2 >

### Workforce Development Summit to Address National Jobs Priority

**Building the Transportation Professional of the Future: A Transportation Workforce Development Summit**

April 21-22, 2010, Penn State

The Larson Institute at Penn State will bring together transportation engineers, managers, administrators, and university educators to discuss key issues and challenges facing tomorrow’s transportation professionals. It is one of a number of summits being held nationally to identify the skills, education, and training beyond the traditional civil engineering degree that will be needed to meet the challenges of operating and maintaining a diverse transportation system.

The summit will focus on surface transportation workforce needs and consider perspectives from government, industry and higher education experts. Registration is open and further details about the summit are available at [http://www.conferences.psu.edu/workforcesummit](http://www.conferences.psu.edu/workforcesummit).

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**MAUTC Research to be Featured at Smithsonian Exhibit**

Beginning May 14, 2010, and continuing through January 9, 2011, the Clearview font will be recognized in the Smithsonian’s Cooper-Hewitt, National Design Museum’s exhibition, “National Design Triennial: Why Design Now?”

In 1993, Penn State’s MAUTC program funded a 15-month project, “Study Legibility of Road Sign Typography and Format,” to find a font that could be more clearly seen at greater distances. The result was the development of the Clearview font.

In field research conducted at Penn State’s Larson Institute using older travelers and high-brightness materials, nighttime legibility distances for the Clearview font were found to be 16 percent greater than for Standard Highway Series E(M). With a 15-inch letter height, this could increase legibility distance by 150 ft, allowing drivers almost two seconds longer to read highway guide signs.

Project team members include Martin Pietrucha, professor of civil engineering and director of the Larson Institute; and Philip Garvey, a human factors expert at the Institute. Implementation of Clearview on the nation’s highways is already underway in Pennsylvania, Texas, Maryland, Alaska, Virginia, and other states.

*Example of the Clearview font*
Student News (from page 1)

systems, and evaluating their role in the larger context of urban mobility.

His dissertation, titled “Design and Analysis of Vehicle Sharing Programs: A Systems Approach,” was awarded the Best Dissertation Presentation Award by the Transportation Research Board Network Modeling Committee at their annual meeting in January 2010. Rahul has also been supported by an I-95 Corridor Coalition Fellowship. He expects to graduate in May 2010 and plans to pursue a career in academia.

Additional graduating students include:

Maria-Paulina Diosdado-De-La-Pena, Masters in Public Administration and Economics, West Virginia University

Katherine Feeley, M.S., Civil Engineering/Structures, University of Virginia

Maryam Naghsh Najad, Masters in Civil Engineering and Economics, West Virginia University

Nien Chun Wu, M.S., Civil Engineering/Transportation, University of Virginia

Featured Research Projects

Dynamic, Stochastic Models for Congestion Pricing and Congestion Securities, Terry Friesz and Tao Yao, Penn State

Dynamic allocation and pricing of roadway capacity is being practiced today using essentially ad hoc methods. In this study, researchers will develop mathematical models for congestion pricing and novel congestion securities that allow travel rights to be priced and traded to reduce the social cost of congestion. The decision support tools developed during this project will be placed in the public domain and thereby seed additional research by other scholarly teams.

Evaluation of Remote Sensing Aerial Systems in Existing Transportation Practices, Yu Gu and David Martinelli, West Virginia University

The application of small, remotely controlled (R/C) aircraft for aerial photography presents many unique advantages over manned aircraft due to their lower acquisition cost, lower maintenance issues, and superior flexibility. The extraction of reliable information from these images could benefit departments of transportation engineers in a variety of research areas including, but not limited to, work zone management, traffic congestion, safety, and environmental topics.

During a research effort at West Virginia University, an R/C aircraft was instrumented for a proof-of-concept demonstration of aerial data acquisition. Specifically, the aircraft was outfitted with a GPS receiver, a flight data recorder, downlink telemetry hardware, a digital still camera, and an R/C shutter-triggering device. Several hundred high-resolution geo-tagged aerial photographs were collected during 10 flight experiments at two different flight fields.

Geo-reference software was developed for measuring distances from an aerial image and estimating the geo-location of each ground asset of interest. A comprehensive study of potential sources of error has also been performed with the goal of identifying and addressing various factors that might affect the position estimation accuracy. In particular, a GPS/INS (Inertial Navigation System) sensor fusion algorithm based on a nine-state Extended Kalman Filter was developed to provide estimates of aircraft attitude angles and enhanced position information.
Network Design of Vehicle Sharing Systems, Rahul Nair and Elise Miller-Hooks, University of Maryland – College Park

Transit, touted as a solution to urban mobility problems, cannot match the addictive flexibility of the automobile. Over 85% of all trips in the United States are in personal vehicles. A more recent approach to reduce automobile ownership is through the use of Vehicle Sharing Programs (VSP). A VSP involves a fleet of vehicles located strategically at stations across the transportation network. In its most flexible form, users are free to check out vehicles at any station and return the vehicle at a station close to their destination. Vehicle fleets can be comprised of bicycles, cars or electric vehicles. Such systems offer innovative solutions to the larger mobility problem and can have positive impacts on the transportation system as a whole by reducing urban congestion. VSP’s have been gaining ground around the world for providing an environment-friendly, socially responsible and economical mode of transport.

VSP operators make several design decisions that are critical to the success of these systems. These decisions pertain to pricing, station locations, fleet composition and size, and lease policies. Few quantitative analysis tools exist to support decision-making related to these innovative systems. Researchers at the University of Maryland have been working to fill this gap. In their most recent MAUTC funded project on VSP operation and design, they are developing techniques to determine optimal system configuration so as to extend the reach of existing transit systems. The analysis framework accounts for the various stakeholders such as transit agencies, private VSP operators, and users. The developed framework allows for the interaction of various transport modes so that users can string together efficient intermodal legs to complete a trip. To account for the multiple stakeholders, the theoretical framework is based on a leader-follower Stackelberg game of transport supply and demand. The leaders are the suppliers who roll out a system configuration. Users, who are followers, respond to a particular configuration in a myopic manner, attempting to save in delay time and the number of vehicle stops.

As this study moves forward, higher traffic volumes, different levels of market penetration, and the potential adverse impacts, if any, will be investigated.
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**The MAUTC Partners:**  
- Penn State (lead)  
- University of Maryland  
- University of Virginia  
- Virginia Polytechnic Institute and State University  
- West Virginia University

**Strategic Alliances:**  
- University of Delaware  
- Morgan State University  
- University of Pennsylvania

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**New Research Projects and Reports**  
*A number of new research projects were initiated and final reports completed during the period from February 2010 through March 2010.*

**New Research Projects**

- Dynamic, Stochastic Models for Congestion Pricing on Congestion Securities, Terry Friesz and Tao Yao, Penn State (PSU-2009-01)
- Large Scale Evacuation Transportation Systems: Robust Models and Real Time Operations, Tao Yao, Penn State (PSU-2009-02)
- In-Vehicle Driving Behavior Field Study, Paul Jovanis, Penn State (PSU-2009-03)
- Quantifying Benefits of Cooperative Adaptive Cruise Control toward Sustainable Transportation System, Byungkyu (Brian) Park, University of Virginia (UVA-2009-01)
- Tele-robotic Platform for Bridge Inspection, Steven Chase, University of Virginia (UVA-2009-02)

Exploratory Data Analysis of NBI, Steven Chase, University of Virginia (UVA-2009-03)

Developing a Framework for the Prioritization of Infrastructure Improvements, Michael Demetsky, University of Virginia (UVA-2009-04)

**Recent Final Reports**