UTCM Graduate Assistant STACKS

Yao Xing is earning a PhD in Civil Engineering from Texas A&M University by solving puzzles. Not Rubik’s cube or Sudoku, but her work in designing algorithms that optimize sequences could be used in these games — better sequence strategies solve them faster. Instead, Yao puzzles over the movement of shipping containers. “Containers have to be loaded onto a ship in a certain order, and that’s never the order that they are sitting in the yard. So the cranes in the port yard spend a lot of time rearranging stacks of containers to get to the next one in the load sequence.”

Ideally, containers on one vessel would be unloaded into the yard in the reverse order that they would be reloaded onto the next vessel — eliminating the need for the cranes to reshuffle them. But factors such as weight, stability and safety impact the ideal unloading order. “My research is about coming up with the best optimizing strategy,” says Yao. She works under the supervision of Dr. Luca Quadrifoglio, Assistant Professor in Texas A&M’s Zachry Department of Civil Engineering, and she is supported by an independent graduate assistantship from the UTCM.

Most of the existing research focuses on optimizing storage strategies in the yard, but Yao is attempting to solve the problem at an earlier step — during the unloading process at the quay. “Quay cranes can handle containers roughly twice as fast as yard cranes, so we’re looking to optimize sequences at the unloading stage, rather than in the yard.”

(continued on p. 4)
The nation’s highways are getting smarter. High-tech overhead signs in some states can now display variable speed limits, lane status, expansion of traffic to shoulders and real-time traffic information so drivers know what’s happening ahead, as well as how fast to drive and what lanes to use. This smarter highway technology is one aspect of Active Traffic Management (ATM), or designing roadways that proactively help drivers travel safer and more efficiently.

“ATM is about advance warning,” says Beverly Kuhn, Head of TTI’s System Management Division. “Knowing what’s coming up can help drivers approaching traffic to slow down and pass through a problem area at a slower but more consistent speed, reducing both stop-and-go traffic and the associated risk of accidents.”

In a TTI study, Kuhn and her team are amassing data on ATM in use on the nation’s roadways. A website and introductory webinar will be launched in March, providing data on ATM use across the nation and the globe, identifying implementations, test sites and best practices. “There’s a lot of data available, but there’s no central clearinghouse for information on who’s using what on their roadways and how well it’s working,” explains Kuhn.

ATM strategies are employed across Europe, and Kuhn traveled there in 2006 as part of a Federal Highway Administration scan tour to survey various installations of variable speed limits, temporary shoulder use, dynamic signage, and other technologies.

“Finding cost-effective ways to optimize the capacity of the roadways is one of the most significant challenges that state DOTs face,” says Kuhn. “This website will help planners develop solutions that use the existing roadways to increase throughput in places where funds or expansion space are not available to add more lanes.”

How do variable speed signs work? Traffic sensors or cameras along the roadway collect data on traffic speeds, identifying events such as temporary bottlenecks or accidents. Central computers reduce speeds in some or all lanes behind an event to gradually minimize the approaching flow of traffic.

TTI’s Urban Mobility Report (UMR) has long been considered the pre-eminent source of U.S. congestion information. And now the 2010 report published this month provides an even clearer and more detailed picture of the problems facing urban travelers. Thanks to continued funding from the UTCM, TTI researchers were able to integrate speed data provided by INRIX, a leading private-sector provider of travel time information. The resulting 2010 report offers a greatly enhanced picture of congestion on a city-bycity basis.

“This year’s report is a remarkable game changer,” researcher David Schrank explained. “The new data address the biggest shortcomings of previous reports. The data show conditions for every day of the year and include the effect of weather problems, traffic crashes, special events, holidays, work zones and other factors directly impacting traffic flow.”


RESEARCH
• “Improving Intermodal Connectivity in Rural Areas to Enhance Transportation Efficiency and Reduce Metro/Port/Border Congestion: A Case Study”
• “Real-Timing the 2010 Urban Mobility Report”
• “Leveraging Land Development Returns to Finance Transportation Infrastructure Improvements”

Director’s Message
How do we best define the outcomes of the UTCM? There are obvious benefits – UTC research yields better ways to plan, design, build and maintain the transportation system. Of equal importance is technology transfer, which ensures that the lessons learned from UTC programs reach potential users.

Melissa S. Tooley, Center Director

UTCM Projects (since 09.01.10)

UTCM Completed Projects

UTCM Researcher Beverly Kuhn

UTCM Researcher Suzie Edrington

UTCM Mobile Data Computer (MDC)

Technology to support rural and small urban transit operations has advanced in recent years, incorporating automated dispatch/scheduling software, mobile data computers (MDCs) and automated vehicle location (AVL) systems. However, cost as well as staff expertise required to run these systems times delay their implementation. Two major pieces of federal legislation have helped address the cost issue, providing transit agencies financial assistance for capital purchases – the 2005 Safe Accountable Flexible Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), and the 2009 American Rehabilitation and Recovery Act (ARRA).

And now, a recent UTCM initiative is helping Texas’ rural and small urban transit agencies gain expertise to exploit these technologies.

“One of the many benefits of transit is its impact on the community as a whole – the ultimate goal of the technology,” says Edrington. Full use of the technology promotes regional coordination among service providers and increases productivity and cost effectiveness of a transit agency. “All this enhances mobility for the community as a whole – the ultimate goal of the technology and our project,” says Edrington. (continued on p. 4)
Facilitating Use of Transit Technology (cont. from p. 3)

One recent successful outcome of the project is evidenced in the request for TTI’s Transit Mobility Program team to facilitate more exchanges between peer groups. A meeting is scheduled this month sponsored by LULAC Project Amistad – an agency providing nearly 200,000 passenger trips annually in the rural area surrounding the City of El Paso. Four rural and small urban agencies will discuss best practices for implementing automated scheduling and dispatching, MDC and AVL.

“This is the first meeting we will have facilitated,” said Edrington, “but others have been occurring across the state as a result of the information and networking we are providing.”

Yao Xing (cont. from p. 1)

The conserved yard crane time can then be spent serving truck fleets picking up containers for distribution, which improves overall traffic flow in the terminal.

What’s more, this type of optimization algorithm could be applied in many areas of transportation, from traffic light queues to demand-response transit scheduling.

Growing up in China, Yao’s grandfather was a port crane operator, and so she spent time as a child watching her grandfather’s cranes at the port load and unload ships. With her doctorate from Texas A&M, Yao hopes to carry on the family tradition of working with port cranes. “In a way, I hope to help make my grandfather’s hard work more productive. I think he would like that.”

New UTCM Projects (cont. from p. 1)

More information on these projects is available at http://utcm.tamu.edu under the Projects tab.

RESEARCH

“Understanding Traveler Behavior: The Psychology Behind Managed Lane Use” - M Burris
- 09.01.11 - 08.31.12 • $100,000

“Designing Communities to Provide Safe Mobility Options for Older Adults” - E Dumbaugh
- 01.01.11 - 02.29.12 • $22,984

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Melissa S. Tooley, PhD, PE, Director
Martha Raney Taylor, Editor

“Using Smartphones to Collect Bicycle Travel Data in Texas” - J Hudson, J Duthie & Y Rathod
- 01.01.11 - 05.31.12 • $72,000

“Enhancement and Outreach for the Active Management Screening Tool” - B Kuhn
- 09.01.11 - 08.31.12 • $100,000

“Comparing Perceptions and Measures of Congestion” - M Le • 01.01.11 - 12.31.12 • $100,053

“Refining the Real-Timed Urban Mobility Report” - T Lomax • 01.01.11 - 12.31.11 • $154,999

“The Value of Non-Medical Transportation for Improving the Quality of Life for the Rural Elderly: Methodology and Information Considerations” - J Mjelde & R Dudensing • 01.01.11 - 05.31.12 • $119,987

“Intercity Passenger Rail: Implications for Transportation Professionals” - M Finley • 01.01.11 - 05.31.12 • $70,000

“Intercity Passenger Rail: Implications for Transportation Professionals” - D Jasek and J Perkins • 01.01.11 - 05.31.12 • $70,000

“An eCertificate in Transportation Planning” - B Wang • 08.01.11 - 07.31.11 • $74,999

“Estimating the Value of Freight Delays in the Freight System”

“Texas Urban Triangle: Pilot Study to Implement a Spatial Decision Support System (SDSS) for Sustainable Mobility”

“Examining Long-Distance Express Bus as an Extension of and Feeder to Passenger Rail Systems”

TECHNOLOGY TRANSFER

“Development of a Mileage-Based User Fee Research Website”

“Promoting Workforce Development for the Transportation Profession Through a Multi-University/Agency Partnership”

“Graduate Certificate Program in Transportation Planning: Phase 2”

More information and final reports on completed projects can be found under the Projects tab on the UTCM website at http://utcm.tamu.edu.

Freight Transportation Projects: Measuring Shippers’ Value of Delay on the Freight System” - B Wang • 08.01.10 - 07.31.11 • $74,999

“Mileage-Based User Fees Symposium” - G Goodin • 09.01.10 - 08.31.11 • $35,585

“Using Innovative Educational Modules to Prepare Our Next Generation of Transportation Professionals” - D Jasek and J Perkins • 01.01.11 - 05.31.12 • $70,000

“An eCertificate in Transportation Planning” - F Ndubisi, E Dumbaugh and K Joh • 01.01.11 - 04.30.11 • $40,000

“Livability Performance Measures Workshop” - T Ramani • 01.01.11 - 12.31.11 • $19,995

“Transportation and Tourism Conference” - B Storey • 01.01.11 - 08.31.11 • $14,000