

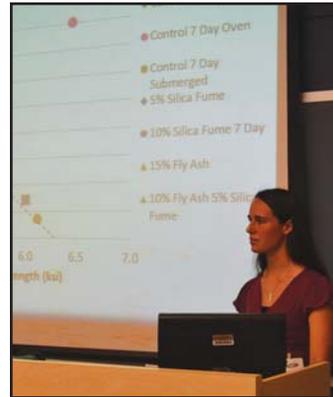
THIRD ANNUAL NEXTRANS UNDERGRADUATE INTERNSHIP CONCLUDES WITH PRESENTATIONS

The NEXTRANS Center is a Regional University Transportation Center funded by the U.S. Department of Transportation's Research and Innovative Technology Administration (RITA) to implement a multidisciplinary program of transportation research, education and technology transfer. The Center's theme is to develop integrated and innovative solutions to transportation challenges by explicitly studying the interactions between vehicle, traveler and infrastructure.

The third annual NEXTRANS Undergraduate Internship in Transportation concluded with final presentations on Wednesday, July 27, 2011 at Purdue University's Discovery Park. This event was an opportunity for interns to showcase their research accomplishments to faculty, graduate mentors, staff, and other undergraduate students from the Center's major partner universities.

This year's internship provided five competitively-selected undergraduate students with the opportunity to complete a ten-week program of transportation research and activities at Purdue University, the

University of Illinois at Urbana-Champaign or The Ohio State University.



Emily Van Dam presents her summer research on July 27 at Purdue.

Interns participated in hands-on research involving a broad range of transportation modes and topics. They

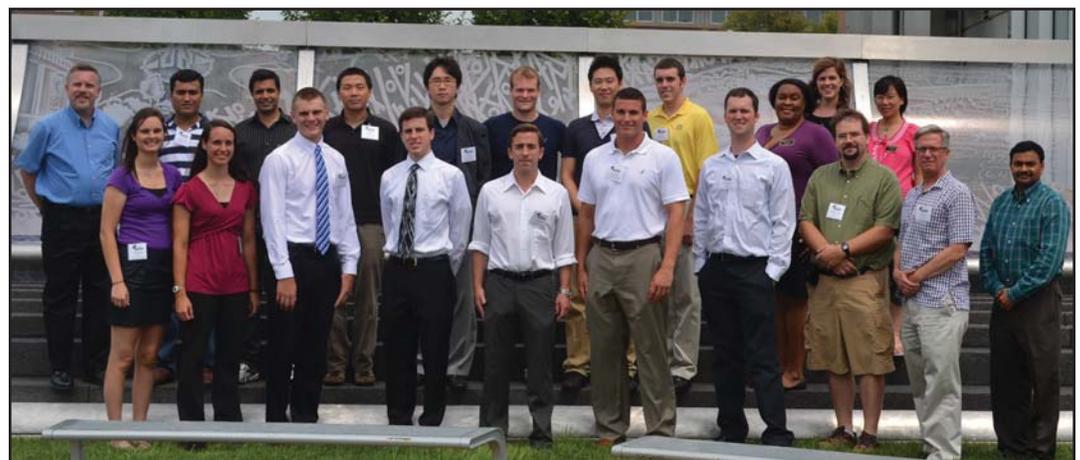
were challenged to learn basic modeling techniques, develop frameworks and experiments, participate in the collection of field data, and utilize a variety of innovative technologies. Their broad research projects covered a variety of topics including:

- Freight transportation and the effect of disruptions to the system
- Sustainable pavements and thermal cracking
- Loop detectors compared to radar
- Transit in a large campus setting
- Concrete crosstie and fastening system design

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Written and Designed by Andrea McIntyre



NEXTRANS faculty, students, staff, and undergraduate interns attend final presentations at Purdue University's Discovery Park on July 27, 2011.

(Continued on Page 5)



Srinivas Peeta, Ph.D.
NEXTRANS Center Director

Investments in innovation and education are critical to economic growth in the U.S. In April, I was honored to see some of the products of the investment made in the UTC program by joining colleagues from around the country at University Research Technology Transfer Day in Washington, D.C. (pages 2-3). In this issue of the NEXTRANSporter, we have briefly highlighted our continuing dedication to innovation and education.

Innovation is reflected in NEXTRANS projects by leveraging one or more of the following elements: technology, disparate data sources, limited resources, public-private partnerships, and novel financing strategies. One such project is focused on keeping our economy in motion by leveraging existing technology to promote efficient, rapid and secure freight shipments (page 4).

In education, training the workforce of the future is a key goal at NEXTRANS and the 2011 undergraduate interns are an excellent example (page 1). Five competitively-selected interns (pages 5-6) joined NEXTRANS researchers at Purdue University, The Ohio State University and the University of Illinois at Urbana-Champaign for a 10-week program of hands-on learning and activities.

As we close the selection process of the current round of research projects, I look forward to sharing more of our findings, student accomplishments, strides in technology transfer, and real-world application of research results. Enjoy this issue of the NEXTRANSporter and please visit www.purdue.edu/dp/nextrans for up-to-date information on all NEXTRANS activities. As always, we welcome your feedback.

NEXTRANS PRESENTS AT UNIVERSITY RESEARCH TECH TRANSFER DAY

Dr. Srinivas Peeta, NEXTRANS Center director, and Dr. Sushant Sharma, research associate, presented NEXTRANS project, "Field Deployment to Quantify the Value of Real-time Information by Integrating Driver Routing Decisions and Route Assignment Strategies," on Wednesday, April 6, 2011 at United States Department of Transportation (USDOT) headquarters in Washington, D.C. during University Research Technology Transfer Day, hosted by the Research and Innovative Technology Administration (RITA).

The project analyzes how various stakeholders can participate beneficially and develop innovative partnerships in the evolving real-time travel information market. Real-time travel information enhances the quality and safety of the travel experience by providing travelers with information on congestion, accidents, alternate routes, weather conditions, work zones, and more. Innovative partnerships resulting from the evolution of the real-time travel information market will aid critical national goals: holistic innovation, advanced services, holistic policy-making, connected infrastructure, and auto sector rejuvenation.

Researchers of twenty-eight, competitively-selected projects from universities around the country were invited to attend. RITA Administrator Peter Appel, Transportation Deputy Secretary John Porcari, and other members of DOT leadership were in attendance. The event highlighted research products that have been, or are in the process of being deployed into the marketplace or impacting policy. The Center for Integrated Transportation Systems Management (CITSM) of the Department of Civil and Environmental Engineering at the University of Maryland, in partnership with RITA, organized the one-day exhibition.

INNOVATIVE PARTNERSHIPS

Field Deployment to Quantify the Value of Real-time Information by Integrating Driver Routing Decisions and Route Assignment Strategies

Investigated by Srinivas Peeta (Purdue University)

NEXTRANS project, "Field Deployment to Quantify the Value of Real-time Information by Integrating Driver Routing Decisions and Route Assignment Strategies," brings together a collaborative of university and private/public sector partners (INDOT, NAVTEQ), to address problems that represent USDOT priorities and are directly relevant to the NEXTRANS Center's theme and vision.

As advanced traveler information and management systems are maturing in the U.S., there is increasing consensus that the effective deployment of information-based traffic management and control entails an understanding of the value of real-time information for various stakeholders. However, there are currently gaps between the technological capabilities and research studies that seek to understand the effects of real-time travel information. That is, there is a key need for "ground-truthing" studies that measure the benefits in a real-world setting, so as to eliminate the shortcomings of existing studies in terms of what can be inferred from them.

This project seeks to bridge some of these gaps by developing a field experiment that additionally seeks to develop and calibrate more realistic models of traveler behavior under information provision. It also involves various stakeholders (from the public and private sectors) whose meaningful participation is required for the fruition of real-time information-based traffic control paradigms. The project findings will benefit both the private sector and public agencies. The interactions with public and private sector agencies will further the Center's theme of enabling new models for public-private partnerships.



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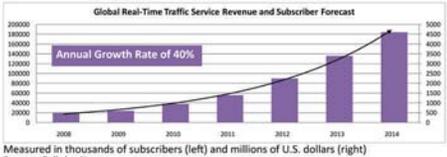
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- Ohio State University
- Illinois Institute of Technology
- Wayne State University
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- Martin University



ENRICHING THE QUALITY OF TRAVEL EXPERIENCE: INNOVATIVE PARTNERSHIPS

PROBLEM & SIGNIFICANCE

Real-time travel information enhances the quality and safety of travel experience by providing travelers with information on congestion, accidents, alternate routes, weather conditions, work zones, etc.

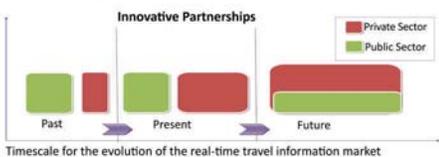


Measured in thousands of subscribers (left) and millions of U.S. dollars (right)
Source: Cellular News

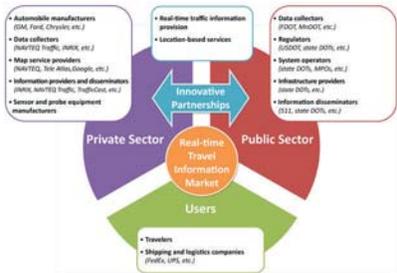
- The evolving real-time travel information market represents a key **win-win opportunity** to generate revenue and resources through **innovative partnerships**
- The potential for new innovations and significant investments from the private sector in emerging technologies and applications related to real-time travel information can foster **new businesses**

The evolution of these partnerships addresses multiple synergistic goals which:

- Supplement **limited public sector resources** with **private sector funding** to reduce congestion delays and improve safety
- Assure future **U.S. economic competitiveness** by significantly increasing the efficiency of the utilization of existing transportation facilities
- Meet **multiple national objectives** using a holistic approach
- Reinforce **ongoing national programs** that leverage technological advances (IntelliDrive/Connected Vehicle Research)

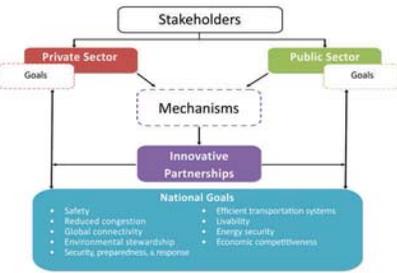


RESEARCH PRODUCT



The study **identifies mechanisms** to help foster **innovative partnerships** among various stakeholders.

The research product will help analyze how various stakeholders can participate beneficially and develop innovative partnerships in the evolving real-time travel information market.



POTENTIAL IMPACTS



Innovative partnerships resulting from the evolution of the real-time travel information market aid critical national goals:

- Holistic Innovations:** Ability to leverage market processes, technology-reinforced infrastructure renewal needs, and enhanced utilization of existing infrastructure to aid U.S. global economic competitiveness and generate new revenue streams
- Advanced Services:** Ability to develop markets for location-based services and next-generation navigational services to enhance the quality of travel for transportation users and spawn a new generation of service businesses
- Holistic Policymaking:** Foster collaborations between public and private sectors to develop standards and mechanisms to leverage investments from both sectors to achieve disproportionately favorable impacts
- Connected Infrastructure:** Leverage technological advances to connect vehicles, transportation infrastructure, and users to seamlessly improve travel experience for users and enhance efficiency of U.S. freight services
- Auto Sector Rejuvenation:** Leverage infrastructure enhancements due to the travel information market to seamlessly foster active safety capabilities, which can lead to a new generation of autos in the U.S. that are technologically savvy and energy efficient

Director Peeta and Sushant Sharma, research associate, presented this poster at University Research Technology Transfer Day on April 6, 2011 in Washington, D.C.

ECONOMY IN MOTION

Measuring and Documenting Truck Activity Times at International Border Crossings

*Investigated by Mark McCord and Prem K. Goel (The Ohio State University)
& Colin Brooks (Michigan Tech Research Institute)*

International commerce is critical to the U.S. economy. The necessity of ensuring that shipments entering the U.S. are secure, as well as the limited infrastructure at international crossings, leads to additional travel time and, especially, increased variability in the travel time of these shipments. As a result, border crossings are major chokepoints for international freight trips. Decreasing congestion at these chokepoints will help to keep the U.S. economy in motion by promoting efficient, rapid and secure freight shipments.

Reliable information on the times trucks require to cross the border is important to facility planners, operators and users. Private carriers and shippers can benefit from having objective crossing time measures for trip planning and scheduling. By monitoring trends in the crossing times, facility operators and planners can detect when conditions have sufficiently changed to warrant adjustments in infrastructure or operations. In addition, developing, calibrating and validating predictive models of how crossing times respond to alternate infrastructure configurations or operations policies requires extensive and valid data on existing crossing times.

To date, acquiring border crossing time information has been labor intensive and institutionally difficult. Traditional methods rely on surveillance personnel or technologies placed at fixed locations along the infrastructure to record truck identifiers as they pass by. These methods are complicated because the associated infrastructure and operations involve multiple agencies located in two countries. In addition, the spatial extent



Working with Canadian investigators, NEXTRANS researchers will provide data related to congestion and overall efficiency of truck activities at international border crossings based on an innovative approach to technology already in use. Decreasing congestion at border crossings will help to keep the economy in motion by promoting efficient, rapid and secure freight shipments.

of the border crossing facility makes it difficult to obtain information on the times incurred when conducting the multiple activities associated with crossing the border.

NEXTRANS researchers previously developed an approach to document truck activity times associated with an international border crossing by using technologies that are already in use by truck fleets. They are now demonstrating and refining the approach in partnership with a major North American freight hauler whose trucks regularly traverse two of the busiest North American freight crossings, both of which connect Michigan and Ontario.

The approach relies on position, navigation and timing (PNT) systems, onboard data units (OBDU), a mechanism for data transmission, and virtual electronic polygons called geo-fences that surround areas of interest. When the PNT system determines that the truck has crossed a geo-fence, a crossing record is transmitted to a database with location, time and accompanying descriptive information. By calculating the difference of geo-fence crossing times in matched records, the

travel times between the corresponding geo-fence locations can be determined. The researchers have worked with their freight partner to configure geo-fences in unique ways so that unprecedented information on times spent approaching and queuing at the border can be collected, as well as times spent undergoing inspections or visiting duty-free facilities.

The coordinates of the points defining the geo-fence are remotely digitized and transmitted to the OBDU in the truck. Since it requires no roadside infrastructure, the method is easy to implement, provided cooperation of fleet operators is obtained (as is the case in the present project). In addition, many fleets use the underlying technologies for management purposes, so equipment already in place can be leveraged.

This project is providing unique and valuable empirical information on activity times of freight trucks at both public and private gateways into the U.S. and Canada. NEXTRANS researchers are also working with Canadian investigators and facility stakeholders to develop a means to sustain the data collection effort in the future using this innovative approach.

MEET THE 2011 NEXTRANS UNDERGRADUATE INTERNS



Craig Collins is currently pursuing a bachelor's degree in civil engineering at Purdue University. This summer, Craig worked with Dr. Satish Ukkusuri at Purdue University to study the economic impacts of disruptions to freight systems. This project intends to identify and estimate the impact of disruptions through the integration of engineering, economics and

policy frameworks. There is potential to strengthen transportation systems by analyzing the effects of disruptions to the movement of goods across multiple modes. Craig's role was to develop a framework and familiarize himself with the broad research topic. Following his May 2012 graduation from Purdue, Craig is considering attending graduate school to study transportation.



Steven Gresk is currently pursuing a bachelor's degree in civil engineering at the University of Illinois at Urbana-Champaign (UIUC). This summer, Steven worked with Dr. William Buttlar and graduate researcher Md Shahidul Islam at UIUC on a project aimed at integrating a pavement cracking prediction model with actual infrastructure conditions.

This continuing project will build upon research to develop a user-friendly pavement cracking prediction tool to assist in the infrastructure renewal planning process across multiple modes. Steven's role was to assist in software testing, including that related to climate data from different locations across the U.S. Steven plans to graduate in May 2012 and attend graduate school to study structural engineering.



Troy Karski is currently pursuing a bachelor's degree in civil engineering at The Ohio State University (OSU). This summer, Troy assisted Dr. Benjamin Coifman at OSU on a project aimed at evaluating radar and loop detectors to detect vehicle speed. Data from loop detectors is used throughout all levels of transportation planning and traffic operation. Understanding

the comparison between radar and loop detectors is especially important as the Ohio Department of Transportation (ODOT) is switching from loop detectors to low cost radar. Troy's role was to evaluate speeds found by loop detectors and compare them to speeds collected by radar. Following his June 2012 graduation, Troy plans to look for a job in transportation, possibly at a state department of transportation.



Alyssa Moniaci is currently pursuing a bachelor's degree in civil engineering at Texas Tech University. This summer, Alyssa worked in the Campus Transit Lab (CTL) at The Ohio State University. Her faculty advisors were Dr. Mark McCord and Dr. Rabi Mishalani. Research done in the CTL is important in terms of providing useful information to other bus systems and as an

educational tool for many graduate students from several disciplines. Alongside graduate students, Alyssa worked to create stop groupings and origin-destination (O-D) flows from zone-to-zone. The data is collected using technology including automatic passenger counting (APC) and automatic vehicle location (AVL). Following graduation in May 2012, Alyssa plans to attend graduate school to study business administration (MBA) and/or civil engineering.

MEET THE 2011 NEXTRANS UNDERGRADUATE INTERNS



Emily Van Dam is currently pursuing a bachelor's degree in civil engineering from the University of Illinois at Urbana-Champaign (UIUC). This summer, Emily worked with Riley Edwards and Dr. David Lange at UIUC on a project focused on identifying methods to improve concrete railroad crosstie and fastening system design and performance. Through this re-

search, investigators will be able to provide design recommendations to the railway industry, increasing safety and reducing the lifecycle costs for certain railway infrastructure components. Emily's role was to perform various abrasion tests. She also developed a test matrix with mix designs and curing environments. Emily plans to graduate in May 2012 and is considering graduate school.



STUDENT SHOWCASE



AMIT KUMAR

Amit Kumar is a doctoral student studying transportation and infrastructure systems at Purdue University. He holds a master of technology degree in civil engineering (2006) from the Indian Institute of Technology Bombay (Mumbai, India) and a bachelor's degree in civil engineering (2003) from the Muzaffarpur Institute of Technology (BRA Bihar University, India).

Amit's main research interests include the areas of traffic assignment techniques, intelligent transportation systems, urban transportation system planning, economic and financial evaluation of transportation projects, disaster management, econometric modeling, and sustainability and transportation. His dissertation focuses on traffic assignment techniques to enhance

convergence, stability and consistency.

Amit is currently working with Dr. Srinivas Peeta on several NEXTRANS-funded projects related to quantifying the benefits of real-time travel information, and techniques to enhance the reliability of static traffic assignment.

In addition to his research duties, Amit has been a mentor to undergraduate summer interns at NEXTRANS, instructed workshops on optimization and MATLAB at Purdue University, served as the vice president of the Purdue Student Chapter of the Institute of Transportation Engineers (ITE), and actively participated in community service activities organized by ITE.

ZONGZHI LI RECEIVES 2011 ARTHUR WELLINGTON PRIZE



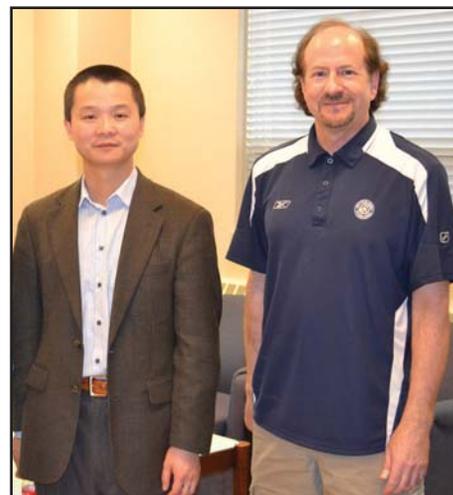
Zongzhi Li, associate professor of civil, architectural and environmental engineering at the Illinois Institute of Technology (IIT) and NEXTRANS faculty affiliate, received the 2011 Arthur M. Wellington Prize from the American Society of Civil Engineers (ASCE). The Wellington Prize recognizes a paper on transportation

on land, on the water, in the air or on foundations and closely related subjects.

Dr. Li's paper, co-authored by Ph.D. student Sunil Madanu, "Highway Project Level Life-Cycle Benefit/Cost Analysis under Certainty, Risk and Uncertainty: Methodology with Case Study," was published in the Journal of Transportation Engineering, August 2009.

NEXTRANS HOSTS SEMINAR BY YU (MARCO) NIE

The NEXTRANS Center hosted a seminar by Yu (Marco) Nie at Purdue University on Friday, April 1, 2011. Dr. Nie is an assistant professor of civil and environmental engineering at Northwestern University. Dr. Nie's research covers a variety of topics in the areas of transportation systems analysis, traffic simulation and traffic flow theory.



Yu (Marco) Nie and Fred Mannerling, Charles Pankow Professor of Civil Engineering (Purdue), are pictured following Dr. Nie's seminar on Friday, April 1.

This seminar, "Modeling Heterogeneous Risk-Taking Behavior in Route Choice: A Stochastic Dominance

Approach," explored reliability in transportation systems. A unified approach was proposed to model heterogeneous risk-taking behavior in route choice based on the theory of stochastic dominance (SD). Also, two applications of the SD approach were introduced. In the first, the first-order SD is used to solve the percentile user-equilibrium traffic assignment problem, in which travelers are assumed to choose routes to minimize the percentile travel time. For each application, a formulation was given, followed by a brief discussion of solution algorithms.

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