NEXTRANS GOES GLOBAL

Countries around the world are facing similar mobility, safety, and infrastructure challenges. At the same time, increased globalization has created a need for more efficient intermodal connections where international transportation networks meet. These challenges provide innovative pathways for transportation research programs to take advantage of the abundant opportunities available for international collaboration.

As a Regional University Transportation Center, NEXTRANS is committed to the USDOT’s goal of improving global connectivity (Strategic Plan 2006 - 2011), in order to facilitate international trade and world economic growth. By promoting technology, information, faculty, and student exchange, as well as joint research initiatives, the Center works to meet domestic transportation challenges, while at the same time helping to achieve a more efficient global marketplace. This type of global thinking makes sense because:

- Technology transfer on best practices and deployment experiences leverages resources and provides synergies for potential collaborations.
- Institutional linkages make technology transfer more efficient, creating a higher value for research results.
- We live in a global economy, and therefore have shared interests.

In a global economy, it is desirable for technology transfer to be a priority at the global level, since it provides an effective conduit to disseminate best practices. International collaborations among research organizations around the world through shared knowledge, information, and technologies also serve to leverage scarce resources while avoiding duplication of effort, or “reinvention of the wheel.” Further, from a practical standpoint, the deployment experience of one entity can be a learning experience for others.

Institutional linkages can play an important role in fostering international collaborations. Programs such as the Transportation Research Board’s International Information Sharing Project (NCHRP 20-30) and the FHWA’s Office of International

Continued on Page 3
Recent economic crises remind us that we live in a global economy, one that depends on the efficient movement of people and goods. At the same time, the American Recovery and Reinvestment Act has granted us a rare opportunity to improve America’s aging infrastructure through a massive financial investment.

As public agencies vie for stimulus funds to repair their ailing highways, bridges, and transit systems, transportation research programs should provide leadership in promoting holistic solutions to U.S. infrastructure challenges. This is an opportunity not only to improve on past projects, but to invest in the future by making America’s transportation systems more efficient, technologically-leveraged, multimodal, and ultimately, sustainable.

As we improve our nation’s highways, we can create an advanced infrastructure built to leverage new technologies. These “intelligent” transportation systems can address societal goals of improving mobility and safety, while allowing the private sector to move products more efficiently. If we upgrade our rail, air, and sea transportation systems and foster more intermodal connections, we can further reduce congestion on highways and lower freight transportation and energy costs. Such integrated solutions do more than repair damage and give our economy a one-time jump start through job creation; they foster lasting solutions that will reap economic benefits for decades to come.

Because the $80.5 billion promised in the stimulus package can finance only a miniscule of these needs, public-private partnerships and international collaborations will be essential to making this vision a reality. If we are to remain globally competitive, we need private sector investment as well as international partnerships that foster the free exchange of information, and recognize shared economic interests. To illustrate the benefits of global collaborations to the future of U.S. transportation, the NEXTRANS Center has made international partnerships the theme of this newsletter.

As our Center begins to think globally through a variety of international collaborations, we are continuing with our mission in research, education, and technology transfer. The NEXTRANS Center’s second-round of research projects have been awarded, and our faculty and students have promoted technology transfer at a number of recent conferences. We have also launched two new educational programs: the NEXTRANS High School Writing Contest and the Undergraduate Summer Internship in Transportation.

I hope you enjoy this issue of the NEXTRANSporter. Please visit www.purdue.edu/dp/nextrans for more information about our Center.
NEXTRANS GOES GLOBAL (Continued from Page 1)

Programs (OIP) have underlined a strong need for a systematic exchange of information at an international level. Through memorandums of understanding and other structured plans for technology transfer, the U.S. can leverage the most innovative technologies and practices from around the globe.

Transportation research programs can potentially expand their resources by leveraging the interest U.S. trading partners have in the safe and efficient movement of goods into and around our nation. As the world’s largest importer of goods, the U.S. plays a central role in the efficiency of the global supply chain. The USDOT’s 2006 – 2011 Strategic Plan indicates that unless the U.S. adopts new technologies and operating procedures soon, rising shipping and travel costs will make it difficult for U.S. businesses to compete in international markets.

In an effort to boost our nation’s economy, Congress has called for a massive investment in U.S. infrastructure. However, the American Society of Civil Engineers (ASCE) estimates that it will cost $2.2 trillion just to repair America’s neglected highway, transit and water projects, a number that greatly exceeds the $80.5 billion committed by the 2009 stimulus package. This disparity makes it clear how necessary public-private partnerships and global collaborations are to financing these needs.

The NEXTRANS Center is dedicated to improving intermodal connectivity, and developing innovative strategies to overcome the congestion that bogs down domestic and international trade. Whether our research is advancing the state of the art in Vehicle Infrastructure Integration (VII), or studying travel-time reliability in Indiana, the NEXTRANS Center’s projects all possess elements that are relevant on an international level, either through the development of new knowledge/technologies, or the innovative application of current ones.

In addition to sharing the results of independent research, the NEXTRANS Center promotes international partnerships through its Visiting Scholars Program, international joint research initiatives, and visits to other nations. In March 2009, Director Srinivas Peeta travelled to a number of universities in Taiwan and India, allowing him to network on an international level and create future opportunities for research collaborations. In June 2008, Dr. Peeta also visited the Koc-IBM Supply Chain Research Center at Koc University in Turkey. There he interacted with Professor F. Sibel Salman, who is currently collaborating with NEXTRANS Research Associate Lili Du.

These programs create institutional linkages that allow for the systematic exchange of information and technologies. They also move us one step closer to a new breed of international partnerships, in which research programs from around the world pool their resources to solve global challenges together. As you will see throughout this issue, the NEXTRANS Center is making a concerted effort to “go global.” In doing so, the Center hopes to maximize its resources, leverage the world’s most innovative technologies and practices, and help to create new paradigms for international partnerships and efficient technology transfer.
VISITING SCHOLARS PROVIDE OPPORTUNITIES FOR FUTURE COLLABORATION

The NEXTRANS Visiting Scholars Program is an integral part of the Center’s international activities. Rather than collaborating remotely, international scholars are invited to participate in a one-year residency, providing valuable networking opportunities and the ability to work closely with NEXTRANS researchers. In addition to undertaking research projects with faculty members, visiting scholars are asked to interact weekly with graduate research assistants, involving visitors in all aspects of the Center’s research activities.

NEXTRANS is currently hosting its second visiting international scholar, Dr. Hillel Bar-Gera, a Senior Lecturer in the Department of Industrial Engineering & Management at Ben-Gurion University of the Negev in Israel. Dr. Bar-Gera’s primary areas of interest include models and algorithms for travel forecasting and transportation systems planning, traffic safety, intelligent transportation systems, and operations research in general. Currently, he is collaborating with NEXTRANS affiliated faculty Dr. Andrew Tarko and Dr. Fred Mannering on a model to predict hospital severity categories of crash injuries from police crash report data.

Dr. Bar-Gera received his Ph.D. in Civil and Materials Engineering from the University of Illinois at Chicago, specializing in transportation. His dissertation on “Origin-based algorithms for transportation network modeling” was acknowledged by the Transportation Science Section of INFORMS as the best Ph.D. Thesis in transportation for the year 2000. Variants of the algorithm he developed in his thesis are currently used by the majority of travel forecasting software vendors.

The NEXTRANS Center’s previous visiting scholar was Dr. Jin-Long Lu from Chang Jung Christian University in Taiwan. An Assistant Professor at the Department of Aviation and Maritime Management, Dr. Lu visited Purdue from September 2007 to August 2008. Dr. Lu’s major area of interest is exploring the behavior of travelers using econometric models and multivariate analysis techniques. His current research includes examining the attitudes of business travelers toward the information and communication technologies deployed at public transportation stations/depots, and analyzing the impact of price on travelers’ choices.

Dr. Lu’s collaborative work with NEXTRANS aimed to explore the relationship between business air travel and videoconferencing, using Taiwan’s technology industry as a case study. According to Dr. Lu, “This type of mutual collaboration not only provides a practical analysis of this issue, but also presents an opportunity to conduct future cross-cultural comparative research.” It is the Center’s hope that the Visiting Scholars Program will continue to cultivate international partnerships and collaborative research opportunities well into the future.

My stay at NEXTRANS deepens the roots for future work, and will provide a great basis for collaborations in the years to come.

Hillel Bar-Gera
Ben-Gurion University, Israel

This international partnership helps me, and even my colleagues, to enhance our research capacity.

Jin-Long Lu,
Chang Jung Christian University, Taiwan
INTERNATIONAL PARTNERSHIP HELPS MEET SHARED GOALS

Congestion is an ever-increasing phenomenon, especially in large urban areas and key corridors of medium/small towns. This problem is not unique to the U.S., and is experienced acutely around the world.

Integrated corridor management is one strategy being considered for tackling congestion. While previous efforts to reduce congestion have focused on individual facilities, corridors offer an opportunity to operate and optimize the entire system (RITA). This effort is aided by vast amounts of data available today due to advances in sensor and information technologies, as well as the realization that transportation goals are interdependent.

While the benefits of the intelligent infrastructure have been highlighted for more than a decade, most promise for novel paradigms in the near future rests on developing practical constructs and holistic architectures that can exploit both technological advances and the intelligent infrastructure deployed. National Cheng Kung University in Taiwan shares the NEXTRANS Center’s focus on research related to transportation safety, mobility, economics, and intermodality. Because their goals are closely related, they have agreed to collaborate on the development of joint research initiatives that can alleviate congestion in major corridors. This will be achieved by using an integrated corridor management framework, which will leverage technology to optimize the performance of existing transportation infrastructure through process innovations.

One such joint research initiative is already underway, a collaboration between Srinivas Peeta, Director of NEXTRANS and Professor of Civil Engineering at Purdue University; and Shou-Ren Hu, Assistant Professor at National Cheng Kung University (See “International Research” on page 6). Dr. Peeta and Dr. Hu presented their research findings at the 2008 INFORMS and the 2009 TRB Annual Meetings, and in 2009 jointly published a paper in Transportation Research Part B. In March 2009, Dr. Peeta visited four national universities in Taiwan, and interacted with faculty, students, and university officials from ten universities as a Visiting Distinguished Scholar. The series of lectures and interactions provided revealing insights into the commonalities and differences in the transportation needs of the U.S. and Taiwan. It led to the development of new collaborations on the lines of the successful one between the NEXTRANS Center and the National Cheng Kung University. Future possibilities for this thriving partnership include visiting faculty and post-doc researchers, graduate student exchange, and conducting comparative research amongst different countries.

Through this international collaboration, we are not only benefiting from information and technical exchange, but also playing one of the leading roles in integrated corridor management framework. We believe through collaborative research and personnel exchanges, both entities will have opportunities to learn about traffic heterogeneities in different parts of the world, and cutting-edge traffic management skills.

Shou-Ren Hu, National Cheng Kung University, Taiwan
MANAGING CONGESTION WITH LIMITED RESOURCES


Investigated by Srinivas Peeta (Purdue University, USA) & Shou-Ren Hu (National Cheng Kung University, Taiwan)

In typical road traffic corridors, freeway systems are generally well-equipped with traffic surveillance systems. These systems, including vehicle detector (VD) and/or closed circuit television (CCTV), are typically used for traffic management purposes and to gather timely information for traffic control. However, other facilities in the same traffic corridor, especially arterials and surface streets in the vicinity of the freeway, often lack detector/sensor systems.

If we are to ensure full corridor system monitoring for traffic and congestion management, all links in the corridor should be equipped with detectors. This is, however, an expensive proposition, at least in the near future. Despite this practical reality, most traffic management and control methods/foundations in the literature assume the availability of time-dependent traffic measures (counts, flows, speeds, etc.) on all links of the corridor. This begs the question: How can state and local agencies obtain enough traffic data to manage congestion when there is not enough money available to equip all roads with detectors? One strategy is to implement “optimal” locations for detectors on non-freeway facilities, so that, in conjunction with the detectors already on freeways, agencies can obtain the maximum amount of information on traffic conditions for the least amount of money. However, there is limited work on how to identify these optimal locations.

The aim of this research is to develop a new mathematical programming framework to identify optimal locations for vehicle detectors (VDs) in a long-term transportation planning context. This strategic installation of VDs will not only aid traffic monitoring, but also provide information to infer network origin-destination (OD) patterns. Though agencies will not have traffic counts for every link of the network, they can potentially infer OD demand patterns by using strategically placed detectors.

This ability to infer traffic flow states for the entire network with limited resources will greatly aid congestion and infrastructure management. The project team intends to share their findings with both public and private agencies. Thus, this project will enable new models for public-private partnerships, in addition to promoting further international collaboration.
SALVADOR HERNÁNDEZ NAMED STUDENT OF THE YEAR

The NEXTRANS Center is pleased to announce its selection of Salvador H. Hernández as its 2008 Student of the Year. Salvador is a Ph.D. candidate in Civil Engineering at Purdue University, where he was awarded the Gerald I. Gilbert Memorial Scholarship and a fellowship for talented minority students. His research involves developing collaborative Less-Than-Truckload (LTL) carrier-carrier operational paradigms that take advantage of operational synergies amongst small-to-medium sized carriers to increase capacity utilization. He also seeks to identify the potential factors that will lead to a successful collaborative effort.

In addition to research, Salvador mentors undergraduates for the transportation center and the Minority Engineering Program (MEP) at Purdue University, and mentors the NEXTRANS Center’s first intern, Jim Caraher. Salvador has also served in leadership positions for the Institute of Transportation Engineers (ITE), Institute for Operations Research and Management Science (INFORMS), and the Society of Hispanic Professional Engineers (SHPE). Salvador was selected because of his strong leadership skills, professional achievements, and determination to excel in the field of freight transportation systems and logistics. Salvador was formally honored on January 10, 2009 at the Council of University Transportation Centers (CUTC) Annual Banquet and Awards Ceremony in Washington, D.C. Congratulations Salvador!

STUDENT SHOWCASE

HAO WANG

The NEXTRANS Center would like to recognize exemplary student Hao Wang. Hao is currently a Ph.D. student in the Department of Civil and Environmental Engineering at the University of Illinois at Urbana-Champaign, where he serves as a NEXTRANS Research Assistant under the advisory of Executive Committee member and Founder Professor of Engineering Imad Al-Qadi.

Hao holds a B.S. Degree (Southeast University, China, 2001), and two M.S. Degrees (Virginia Tech, 2006; Southeast University, 2004), all in Civil Engineering. In 2008, he won First Prize in the FAA Design Challenge in Airport Operations and Maintenance and was awarded the Dwight David Eisenhower Graduate Fellowship by the Federal Highway Administration (FHWA). He also co-authored a paper with Dr. Al-Qadi, Pyeong Jun Yoo, and Samer H. Dessouky titled “Dynamic Analysis and In-Situ Validation of Perpetual Pavement Response to Vehicular Loading,” which was the runner-up for the 2008 K. B. Woods Award for Best Paper in the area of Design and Construction (Transportation Research Board).

Hao is currently working with Dr. Al-Qadi on a NEXTRANS-sponsored project titled “Pavement Damage Due to Different Tire and Loading Configurations on Secondary Roads.” The main objective of this research is to quantify pavement damage on secondary roads due to different tire configurations and loading conditions. Wide-base tires offer the trucking industry significant economic advantages over traditional dual-tire systems; however, researchers have yet to evaluate the type of damage they may cause on secondary roads. This research seeks to quantify this damage utilizing full-scale testing and instrumentation, three-dimensional finite element analysis, and measured tire-pavement contact stresses. These research findings will help state agencies implement appropriate load regulations and pricing for the growing number of trucking operations using wide-base tire systems.
ANUJ SHARMA WINS PIKARSKY AWARD

On January 10, 2009, recent Purdue graduate Anuj Sharma was awarded the Milton Pikarsky Award for Outstanding Ph.D. Dissertation in Science & Technology during the 12th Anniversary CUTC Awards Banquet in Washington, D.C. Dr. Sharma’s dissertation, titled “Integrated Behavioral & Economic Framework for Improving Dilemma Zone Protection Systems,” was co-chaired by NEXTRANS Director Srinivas Peeta and NEXTRANS Executive Committee Member Darcy Bullock.

There are approximately 68 million instances per day of signal change to yellow phase at high speed isolated intersections, where an erroneous decision to stop or go can often lead to a crash. Dr. Sharma’s dissertation seeks to unify the concepts of existing dilemma zone protection systems (green extension and green termination) and traffic conflict theory using enhanced radar based sensors. Since enhanced radar sensors can simultaneously sense the speed and distance of vehicles, they are more efficient than traditional point sensors at capturing if a vehicle accelerates or decelerates in the dilemma zone. Dr. Sharma’s approach borrows the concept of trade-off between safety and efficiency from green termination systems and recasts it as an economic framework, weighing the safety benefits of extending the main street green against the cost of delay incurred to the waiting queue. By operating within the boundaries of existing sensor and hardware technology, this approach not only helps to improve the safety and efficiency of rural signalized intersections, but also avoids the need for expensive hardware configuration changes.

NEXTRANS Indiana High School Essay Contest
First Prize $500
Deadline May 15, 2009

www.purdue.edu/dp/nextrans/contest.php
UIUC FACULTY AND STUDENTS PARTICIPATE IN T.H.E. CONFERENCE

Each year, hundreds of transportation engineers, officials, technicians, faculty and students gather at the Transportation and Highway Engineering (T.H.E.) Conference to discuss issues critical to the safe and economical movement of people and goods across Illinois, the U.S.A., and beyond. This year marked the 96th Anniversary of the T.H.E. Conference, which was held at the University of Illinois at Urbana-Champaign on February 24-25, 2009, attracting nearly 1,000 attendees.

A number of NEXTRANS students and faculty members from UIUC were involved in this year’s conference. NEXTRANS Investigator William Buttlar served as Chairperson of the event, in addition to presiding over Wednesday’s Luncheon Program. Executive Committee Member and ICT Director Imad Al-Qadi updated attendees on current Illinois Center for Transportation (ICT) research during Wednesday’s General Session. Tuesday afternoon’s technical breakout sessions featured NEXTRANS affiliated faculty member Jeff Roesler, who delivered a presentation titled “Concrete Pavement Solutions for Low Volume Roads.”

Local, state, and federal officials provided perspectives at this year’s conference. Presenters included representatives from State DOT’s (Illinois, Wisconsin, Michigan) and Toll Highway Authorities; engineers and planners from local districts; the Federal Highway Administration (FHWA) and National Asphalt Pavement Association; as well as private sector construction and engineering corporations.

During the 2009 T.H.E. Exhibit and Mixer, participants were given the opportunity to network with colleagues and visit exhibits in order to keep up with the latest industry trends. They also mingled with ASCE, ITE, and ACI student members as well as NEXTRANS students.

The T.H.E. Conference was started in 1914 as a training school for County Superintendents of Highways, and has since evolved with state and national needs. NEXTRANS investigator and UIUC professor William Buttlar has served as T.H.E. Conference Director since 2002. UIUC, the Illinois Center for Transportation (ICT), and NEXTRANS look forward to continuing their involvement next year as T.H.E. begins preparations for its 100th anniversary.

Please visit http://www.theconf.com/ for more information about T.H.E.

NETWORKING OPPORTUNITIES ABUNDANT AT PURDUE ROAD SCHOOL

The NEXTRANS Center was pleased to participate in the non-profit exhibition at the 95th Annual Purdue Road School. Held at Purdue since 1914, the Road School consistently attracts well over 1,000 Indiana local and state officials, consultants, and suppliers each year. Important updates on pertinent transportation issues, as well as sessions on topics of general interest, are provided in the two-day conference. Road School also hosts regional meetings of several affiliated professional groups, such as the County Surveyors Association and the Indiana Chapter of the Institute of Transportation Engineers.

This year’s conference provided numerous opportunities to network with local and state officials during exhibits, sessions, and luncheons. Hundreds of participants visited the NEXTRANS Center’s booth, where they were updated on the Center’s current research, education, and technology transfer activities. Staff members publicized upcoming educational projects such as the NEXTRANS Undergraduate Summer Internship and Indiana High School Essay Contest, and worked to forge partnerships in support of the Center’s regional goals.

The Purdue Road School is coordinated by the Joint Transportation Research Program (JTRP), and chaired by former NEXTRANS Executive Committee Member and JTRP Director Kumares Sinha.
NEXTRANS SHOWS STRONG PRESENCE AT TRB

On January 11, 2009, the NEXTRANS Center co-hosted a successful reception at the 88th Annual Transportation Research Board Meeting in Washington, D.C. Sponsored by NEXTRANS, Purdue, and the Joint Transportation Research Program (JTRP), this year’s Purdue University Civil Engineering Reception enjoyed record attendance, offering participants the opportunity to interact with transportation professionals, as well as NEXTRANS partners, faculty, and students.

The Center’s lively reception was just one of the many highlights from this year’s meeting. A number of NEXTRANS faculty members and students were honored for co-authoring award-winning papers. Erol Tutumluer won the TRB Geology and Properties of Earth Materials Section Best Paper Award; Jeffery Roesler, and Glaucio Paulino received the 2009 Bryant Mather Best Paper Award; NEXTRANS student Hao Wang and Executive Committee Member Imad Al-Qadi co-authored a paper that was the runner-up for the 2008 K. B. Woods Award for Best Paper in Design and Construction; and Anuj Sharma received the Milton Pikarsky Award for Outstanding Ph.D. Dissertation during the CUTC Awards Banquet, for a project chaired by Director Srinivas Peeta and Executive Committee Member Darcy Bullock. In addition to winning these awards, NEXTRANS investigators presented cutting-edge research on dozens of topics, and participated in meetings for a number of TRB committees.

Each year, the TRB Annual Meeting attracts more than 10,000 transportation professionals from around the world. With more than 3,000 presentations in nearly 600 sessions, the program addresses topics of interest to policy makers, administrators, practitioners, researchers, and representatives of government, industry, and academic institutions. This year’s spotlight theme was “Transportation, Energy, and Climate Change.”

Please visit www.trb.org for more information about TRB’s Annual Meeting, committees, programs, and publications.
ROBERT J. BERNHARD

Robert J. Bernhard’s long-time affiliation with Purdue University and the UTC Program allowed him to play an influential role in the NEXTRANS Center’s inception. Dr. Bernhard provided valuable institutional support to the transition team that facilitated NEXTRANS Center’s early operations. In addition, he served as a member of the Executive Committee, and provided valuable guidance in developing the NEXTRANS Strategic Plan based on his own experiences as a UTC Director (1998 – 2007). Currently, Dr. Bernhard is the Vice President for Research and a Professor of Aerospace and Mechanical Engineering at the University of Notre Dame, and continues to support NEXTRANS as a member of the Advisory Council.

Dr. Bernhard holds a B.S.M.E. from Iowa State University, a M.S.M.E. from the University of Maryland, College Park, and a Ph.D. in Engineering Mechanics from Iowa State University. Upon completion of his Ph.D. in 1982, he joined the faculty of the School of Mechanical Engineering at Purdue University. There he served as the Director of the Ray W. Herrick Laboratories (1994 – 2004), the Director of the Institute for Safe, Quiet, and Durable Highways (1998 – 2007), and the Associate Vice President for Research (2004 – 2007). Dr. Bernhard’s research activities at Purdue included investigations of tire noise, traffic noise, numerical noise control design methods, noise source identification, active noise and vibration control, and machinery noise control applications. He has directed the research of 49 engineering graduates and co-authored more than 170 journal and conference publications on various aspects of noise control engineering, numerical methods, vibrations, and design.

In addition to continuing his research on tire/pavement noise, Dr. Bernhard is currently the Secretary General of the International Institute of Noise Control Engineering (since 2000). He is a past President of the Institute of Noise Control Engineering (USA), a Fellow of the American Society of Mechanical Engineers and the Acoustical Society of America, and was named a Distinguished Noise Control Engineer by the Institute of Noise Control Engineering in 2003.

NEXTRANS thanks Dr. Bernhard for the substantial contribution he has made to our Center, and looks forward to his future involvement in Center activities.

FACULTY PROFILE: PREM GOEL

Prem Goel received his Ph.D. from Carnegie Melon University in 1971. Currently, Dr. Goel is a Professor in the Department of Statistics at The Ohio State University (OSU), where he actively collaborates with OSU faculty in Transportation Engineering and Remote Sensing. Dr. Goel’s research interests in transportation include statistical image processing, pattern recognition, and transportation networks modeling and estimation. The applications of this work include developing space-time models for combining information on traffic counts from remote-sensed satellites, airborne sensors, and ground data, with the goal of reducing costs and/or errors in estimating transportation planning parameters. This also involves image processing for automatic pattern recognition of vehicles in airborne and high-resolution satellite images.

Dr. Goel is currently applying these methods to four multidisciplinary NEXTRANS projects, in collaboration with Mark McCord (Professor of Civil Engineering, OSU) and Rabi Mishalani (NEXTRANS Executive Committee Member, Professor of Civil Engineering, OSU).