TranSearch

DELAWARE CENTER FOR TRANSPORTATION

YOUR MAIN RESOURCE FOR TRANSPORTATION EDUCATION, RESEARCH & TECHNOLOGY TRANSFER

WINTER 2013 VOL. 13, NO. 1

Dare to be first.

UNIVERSITY OF DELAWARE

DELAWARE CENTER FOR TRANSPORTATION

Delaware Center for Transportation

Department of Civil and Environmental Engineering

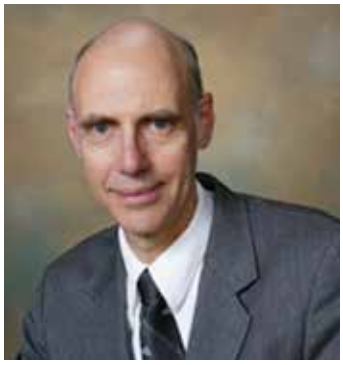
355 DuPont Hall
Newark, DE 19716

P: 302-831-1446
F: 302-831-0674
www.ce.udel.edu/dct

Looking for the table of contents?

Use the interactive bookmark bar—it's on the upper left of your Adobe Acrobat window.

Dr. Allan M. Zarembski Joins the University of Delaware as the Director of the Railroad Engineering and Safety Program



The Department of Civil and Environmental Engineering at the University of Delaware started a new Railroad Engineering and Safety Program on August 1, 2012. Its Director is Dr. Allan M. Zarembski, Research Professor, and until recently President of ZETA-TECH Associates, Inc. an internationally known consulting company in the areas of railroad and transit engineering, safety and operations. Dr. Zarembski is an internationally recognized authority in the fields of railway and transit rail track and vehicle/track system analysis, railway component failure analysis, track strength, and maintenance planning. Dr. Zarembski is an Honorary Member of the American Railway Engineering and Maintenance-of-Way Association (AREMA), and a Fellow of the American Society of Mechanical Engineers (ASME). He served as Deputy Director of the Track Train Dynamics Program and was the recipient of the ASME's Rail Transportation Award in 1992 and the US Federal Railroad Administration's Special Act Award in 2001. Dr. Zarembski has authored or co-authored over 170 technical papers, over 120 technical articles, and two books "The Art and Science of Rail Grinding" and "Tracking R&D" both published by Simmons Boardman Books.

Dr. Zarembski's activities at the University include teaching of senior/graduate level courses in railroad engineering, research, and development of a short course education activity for professionals working in railway or related areas. His initial course on Railroad Engineering in the Fall of 2012 drew over 25 students including professionals from throughout the US and overseas (taking the course via the internet). His first professional short course on Rail Problems and Maintenance attracted engineers and professionals from such organizations as New York City Transit, SEPTA, Washington Metro, Baltimore MTA, etc. His Spring 2013 course focuses on Safety and Derailment Prevention, a long time area of expertise and research.

Dr. Zarembski's railway related experience, spanning over 35 years encompasses such diverse activities as derailment investigations, both in the US and overseas, development of safety standards and derailment prevention, understanding of the failure mechanisms of key track components and the corresponding extension of the lives of these key components and the dynamic interaction between the railway vehicles and the track structure.

Among the many projects he has worked on was assisting Amtrak in the selection of the high speed Acela trainsets to reduce dynamic wheel/rail impact forces, helping the Federal Railroad Administration analyze the safety implications of the takeover of Conrail by the Norfolk Southern Railroad and CSX Transportation, working with Network Rail (formerly British Rail) in the UK in helping prevent the reoccurrence of their infamous Hatfield Derailment, and working with US and European Railway in improving overall efficiency of operations by increasing axle loads for freight cars.

In the latter case, Dr. Zarembski worked with such rail systems as BNSF in the US, Canadian National railways in Canada, Banverket in Sweden, Hamersley Iron Railways in Australia, and others in looking at both the engineering (and safety) impacts of making railway freight cars heavier, analyzing both the costs and the economic benefits associated with this major change in operations, and then working with the railways in implementing this change which

continued on page 2

Message from the Director

Ardeshir Faghri, Director

First, I would like to take this opportunity to wish all of our readers a prosperous 2013. Last year was a good year for all of us at DCT, but unfortunately ended on a sad note. Dr. Shinya Kikuchi, the first director of our center, passed away on December 6, 2012 after a long and courageous battle with cancer. Dr. Kikuchi set high standards for conducting research projects, and worked incredibly hard to give visibility to our center on a regional, national and international level. His legacy for the center includes the creation of our state-of-the-art Intelligent Transportation Systems (ITS) laboratory. He was a valued member of our community and will be greatly missed.

2012 also brought two major incidents close to home – Hurricane Sandy, and the collapse of Paulsboro Bridge in New Jersey. Hurricane Sandy affected local coastal areas from Ocean City, MD north through Lewes, Delaware. Sections of Route 1 including the Indian River Inlet Bridge and the road between Rt 54 and Rt 26 had to be closed for a few days. Perhaps most noticeable was the damage in areas of Bethany Beach and Fenwick Island. Delaware Emergency Management Agency (DEMA) and DelDOT worked diligently around the clock to protect lives and property. I send them my deepest gratitude. The Paulsboro Bridge in New Jersey collapsed after a train derailed carrying highly flammable and carcinogenic vinyl chloride into Mantua Creek. Many residents experienced breathing problems and some had to be hospitalized. Many more were evacuated from their homes for several days. These two latest incidents underscore the importance that infrastructure plays in our daily lives and many other important issues those professionals in the engineering, planning, and disaster preparedness disciplines should learn and apply. These include better planning, design, construction, maintenance, evacuation and preparedness.

As I hope many of you know by now, we have a day-long forum scheduled in November 2013. The forum has been named Transportation Infrastructure to more accurately reflect the broad range of issues which will be covered. This event will address and identify the most important topics affecting our transportation infrastructure, including many of those discussed above. This year I am happy to report that two of our Civil and Environmental Engineering faculty members, Professor Rachel Davidson and Professor Allan Zarembski, have been invited to attend and actively participate in the Forum. Professor Davidson's areas of expertise include natural disaster risk modeling and civil infrastructure systems. She is also a core faculty member in the University of Delaware's Disaster Research Center. Professor Zarembski is the director of our railroad engineering and safety program, and can bring his more than 40 years of experience in the rail industry to our Forum. Other than the traditional areas of planning, design, construction, maintenance and operations and control, the Forum will also cover many contemporary topics such as transportation and economy, transportation and employment, energy, environment, sustainability and livability. Experts from the federal, state, and local governments as well as private firms and consulting companies, academia and many other groups will participate and share their experience with all the attendees. We are expecting close to 400 participants.

Maintaining a safe, clean and efficient transportation infrastructure system is everyone's responsibility. Our 2013 Transportation Infrastructure Forum will be open to all; we hope to see you there.

As always, the Center has many useful and exciting programs scheduled for the next few months. Please check our web-site at www.ce.udel.edu/dct/ for all of our ongoing programs and contact me if you have any questions. ■

continued from page 1

represented a major innovation in railroad operations.

Recently, Dr. Zarembski has been working with the International Union of Railways (UIC) based in Paris investigating techniques and technologies to reduce freight train derailments in Europe and worldwide.

Dr. Zarembski is considered to be an international expert in the area of rail grinding; a technique that is successfully used worldwide to reduce the development of rail defects and prevent broken rail failures (and derailments). He literally wrote the book on rail grinding, with his textbook, the "Art and Science of Rail Grinding" used by railway systems around the world. In fact, in his first months at the University, he already attracted a PhD student from China, sponsored by the Government of China, to study rail grinding under his direction.

He sees railway and transit safety as a "hot topic", particularly in light on the increased interest in high speed passenger rail. He sees his work on risk-based safety analysis for rail failure, serving as the basis for future research in risk-based safety management and inspection. He also sees a critical need in professional education for transits and rail systems, as many of the experienced engineering and maintenance personnel retire and a new generation needs to be trained to take their place.

Dr. Zarembski views railways and transit systems as a vital and growing part of the world transportation network with numerous opportunities for research and education. ■

In memoriam: Professor Shinya Kikuchi

Professor Shinya Kikuchi, the first director of the Delaware Center for Transportation died December 6, 2012 after a long battle with cancer. Shinya, as he was known in the University of Delaware community, was born and raised in Kobe, Japan and obtained both his bachelor's and master's degrees from Hokkaido University. In 1970 he was admitted to the University of Pennsylvania and successfully obtained his Ph.D. degree in Transportation Engineering in 1974 under the supervision of distinguished professor Vukan Vuchic. He started his academic career at UD as an assistant professor in 1982 after spending 8 years in private industry. During his 23 years at UD, he served as the director of the Delaware Center for Transportation for nearly 7 years from 1988 to 1995. During this time he sponsored and advised many U.S. and international graduate students, many of whom are serving in leadership positions in government, academia and the private sector. From 2005 until his passing, Shinya served on the faculty of Virginia Tech as the Charles Via Distinguished Professor of Civil & Environmental Engineering and the director of the department in Falls Church, Virginia.

Shinya was passionate about Transportation Engineering. But he was even more passionate about Fuzzy Set and Uncertainty Theories. He was the first academician who successfully applied the theory of fuzzy set to some of the most complex problems in transportation planning, traffic engineering and traffic flow theory. His more than 100 journal publications appear in some of the most prestigious tier I journals in the world. He was the co-founder of the Annual Helsinki Summer School of Transportation at Aalto University in Finland, where he received an honorary doctoral degree in 2010, among many other honors and awards that he received during his nearly 40 years of professional career.

Shinya is survived by his wife of 37 years, Laura, her extensive family in the U.S., as well as several in Peru; siblings Mari Yamada and Rinya Kikuchi and their families in Japan. Shinya was 69.

Engineering Circuit Rider Assists Local Agencies

The Delaware T²/LTAP Center's Circuit Rider is a resource for municipalities and other local agencies. Since our last newsletter, the program has assisted several agencies, examples of which follow.

Over the summer, the Circuit Rider oversaw an engineering intern for the University of Delaware's Parking Services as he assessed pavement condition for over 100 parking lot areas. Parking Services will use the data and analyses to develop a more strategic approach to pavement condition management. Read more about this project in the recent T²/LTAP newsletter - http://www.ce.udel.edu/dct/T²Newsletter.html.

Delaware City is also embarking on a more strategic look at transportation infrastructure. As an outgrowth of their program to enhance and expand their commercial and retail district, they want a comprehensive plan for pavement, curbs, sidewalks, and signage throughout the city-maintained streets. They have recently asked the Circuit Rider to assist them with data collection and analyses and they hope to hire an intern this summer to accelerate the project. As with other projects, the Circuit Rider will train and oversee the intern for Delaware City.

Finally, an advisory committee has been established in Lewes to evaluate resident concerns such as speed limits, parking policies, and pavement signs and markings. Newly formed at the end of 2012, they have reached out to the Circuit Rider for advice on some initial locations and concerns.

These are just a few examples of how the Delaware T²/LTAP Center's Circuit Rider can assist municipalities and other local agencies. If you think your agency might benefit from this free resource, contact Matt Carter at (302) 831-7236 or at matheu@udel.edu and he'll be happy to come meet with you to better understand your challenges and goals.

LTAP / T² Center Hosts Training on Roundabouts and New Safety Programs

In December, 2012, the Delaware LTAP / T² Center hosted Dr. Hillary Isebrands, PE for two workshops. Dr. Isebrands is a Safety Engineer for the Safety and Design Team at Federal Highway Administration Resource Center, in Lakewood, CO and is a nationally recognized expert in both roundabout and safety programs.

The first workshop, Modern Roundabouts: Safer and More Efficient Design, highlighted the benefits of modern roundabouts and gave participants the fundamental knowledge needed to plan and consider applying roundabout intersection projects in their area. This course blended technical and non-technical planning, design and operations considerations. The course brought insight from roundabout installations nationwide, while including Delaware specifics from the Delaware MUTCD for signing and pavement markings as well as DelDOT DGM 1-26 on Roundabouts. Participants were also able to examine case studies on using roundabouts based on Delaware specific locations and data. The course was attended by representatives of FHWA, DelDOT, the City of Newark and consultants. Feedback received after the course was extremely positive, especially due to the course having been made Delaware specific, and not based solely on national practices.

The second workshop, Systemic Approach to Safety Management, is a new tool in a comprehensive safety management program and intended to complement traditional site analysis techniques. In the past, most state safety programs have focused on looking at the contributing factors to severe crashes at the specific locations where they occur. Following these analyses, specific improvements are made at those locations. However, in most years, crash locations follow no specific pattern. The systemic approach looks at the contribution causes for severe crashes but then proposes solutions that are implemented system wide. Instead of working on where last year's crashes occurred, a systemic approach works to prevent crashes at locations with similar characteristics. The workshop highlighted how systemic safety analysis is being implemented at the state, county and municipality level and the types of analysis that are being done. ■

PI/PM Meeting

The annual principal investigator/project manager meeting was held on the University of Delaware campus on November 5, 2012. During this meeting UD investigators had an opportunity to give an overview of the newly funded projects for the coming academic year and meet with the DelDOT project managers who will coordinate the research. The projects this year include research in the environmental, planning, bridge, transit, and traffic areas.

We extend our thanks to those from DelDOT, the Federal Highway Administration, the Transportation Management Center, and the Delaware Transit Corporation who attended the meeting. ■

Researcher Paul Imhoff(left) discusses the Stormwater Management project with DelDOT Project Managers, Marianne Walch (left), Mike Kirkpatrick and Latanya Gilliam (right).

Dr. Rusty Lee reports on the progress of his project, "Pavement Markings and Signing to Support Senate Bill 120"

UD Researchers Monitor Structural Health of Indian River Inlet Bridge

ARTICLE BY KAREN B. ROBERTS
PHOTOS BY DOUG BAKER

In the wake of Hurricane Sandy, University of Delaware researchers are studying the structural health of the Indian River Inlet bridge (IRIB), which sustained 56 mile per hour winds during the storm and even greater wind gusts.

According to Michael J. Chajes, professor of civil and environmental engineering, the hurricane was an "unplanned calibration test of a wind event" that allowed sensors embedded in the bridge to capture data 125 times per second over a two day period before and during the storm.

While they are still analyzing the data, researchers were encouraged by the bridge's performance and consider it an example of useful data the bridge's structural health monitoring system can provide.

"Officials faced with inclement weather need to make decisions about whether or not to close a bridge and as we build up our data sets, they may help officials define parameters for what wind speeds are safe for bridge traffic, a major concern on the IRIB," Chajes said.

Near midnight on Wednesday, Nov. 28, six trucks weighing roughly 30 tons each crawled across the bridge, collecting additional data from the nearly 150 sensors embedded in the 1,750-foot cable-stayed

structure. The trucks were driven in pre-determined patterns across the bridge. Data samples, collected 125 times per second, measured the strain, vibrational response, movement, temperature, wind speed and pitch of the bridge deck.

It is the second of four calibration tests UD researchers Harry (Tripp) Shenton, Gary Wenczel and Chajes will perform over the next two years, in collaboration with the Delaware Department of Transportation (DelDOT).

"It's sort of like a physical for the bridge, and will create a baseline for the bridge's structural health," explained Chajes. If the bridge endured significant stress, due to, say, an overloaded truck, it can evaluate whether or not any damage may have occurred.

"Fifteen or 20 years down the road, you could perform this test again and compare the results to the initial data set. If the bridge were damaged, we believe analyzing the data would reveal some detail about the cause," added Shenton, professor and chair of civil and environmental engineering.

While adding a structural health monitoring system may enable a bridge owner to more effectively manage and maintain the structure, thereby extending the bridge's designed life span, according to Wenczel, the technology has yet to be widely accepted or adopted in the United States because it carries a cost — approximately one percent of the cost of the bridge.

"Similar monitoring systems are already used in the automobile industry and the petroleum industry where production problems are both costly and environmentally undesirable," said Wenczel, project manager. "We're working to prove the system's effectiveness and value in the bridge industry."

After a storm, DelDOT engineers typically visit and inspect the bridge for signs of wear or damage. Structural health monitoring systems can capture hourly snapshot data to determine environmental effects, temperature changes and other steady state bridge behaviors that fluctuate over time; as well as event data, such as wind or a large vehicles, where the system triggers itself and records for a pre-determined length of time.

One of the current challenges is incorporating this new data into traditionally accepted bridge assessment methods. The UD research team, which helped design and install the system, is now working to educate DelDOT engineers and the bridge owners about how to understand and make use of the data.

"We are the bridge between the technology and the bridge owners and engineers — no pun intended," concluded Shenton. ■

IPA Researches Complete Communities

BY MARCIA SCOTT,
IPA ASSOCIATE POLICY SCIENTIST

In the last half-century, conventional land-use and transportation planning have focused more on vehicle movement and auto-centric community design over livability objectives. Streets were designed primarily to maximize traffic flow. Sprawling land use patterns favored travel by car over other forms of transportation. As a result, compartmentalized, built environments have limited transportation choices, heightened traffic congestion, contributed to inactive lifestyles, diminished a sense of place and community identity, and directed economic activity away from central business districts.

To address the need for local governments to plan more prosperous and livable communities, a new integrated approach to transportation planning, land use planning, and community design—called Complete Communities—is gaining momentum at the state and local government levels. The Institute for Public Administration (IPA), a center within UD's School of Public Policy & Administration, is currently working on a project to develop an initiative to plan for Complete Communities in Delaware in collaboration with the Delaware Department of Transportation (DelDOT) and the Office of State Planning Coordination (OSPC).

The first phase of IPA's Complete Communities project included a focused literature review of Delaware planning initiatives and national best practices, work with two pilot communities in Delaware, and the development of a comprehensive outreach strategy—including launch of a Planning for Complete Communities website.

The public service component of this project involved working with two pilot communities—the Town of Elsmere and the City of Milford, Delaware. Stakeholders were selected to attend three workshops in each community that focused on building consensus on what constitutes a complete community, determining preferences related to community design, and identifying town-specific complete community objectives. Social media, an online visual preference survey, and website prompts were among the outreach tools used to garner broader public input and disseminate workshop outcomes.

A November 2012 Complete Communities Delaware Summit, culminated the project. This event brought together pilot community stakeholders and local, regional, and national private- and public-sector leaders to discuss opportunities and issues related to complete communities in Delaware. Among the featured speakers were Edward McMahon, an expert on sustainable development at the Urban Land Institute; James Tischler, director of the Michigan State Housing Development Authority and placemaking specialist; and Linda Pruitt, co-founder and president of the Cottage Company that is a leader in building pocket neighborhood communities of compact homes. Proceedings from the Summit may be found on the website.

In the project's second phase, IPA plans to expand the website by developing an online Delaware Complete Communities Planning Toolbox and conduct workshops to gain input on regulatory barriers to development in Delaware. The Toolbox will provide Delaware local governments with resources to develop complete communities planning approaches, implementation tools, and community engagement strategies. This online toolbox will advance a framework that will help Delaware communities plan for and manage growth, consider benefits of better community design, spur reinvestment in older communities, protect natural and environmental resources, understand the connection between land use and transportation planning, promote economic development and placemaking strategies, combat sprawl, and make more efficient use of limited funds for growth-related needs. ■

Pilot community stakeholders engaged in facilitated planning exercises during Complete Communities workshops

ASHE@ UD's Recent Activities

BY MATT CARTER

The University of Delaware student chapter of the American Society of Highway Engineers (ASHE@UD) was active again this past fall. In addition to their on-campus meetings, they started out by hosting the First State Section ASHE members to a barbeque at the White Clay Creek Park in late September. This has become a popular tradition, replacing First State Section's September professional dinner meeting with a more casual evening in the park where students and practitioners can get to know each other better.

In October, the students joined an inspection of the Route 9 Bridge over the Leipsic River. DelDOT's

Matthew Mortensen took each student in the Under Bridge Inspection Vehicle (UBIV) to inspect structural members and demonstrate how they are evaluated. This is the second time that the students have visited with the UBIV team and they came away energized about transportation engineering.

Next, the ASHE students toured the Rinker Materials concrete pipe plant in Middletown. Rinker's Bob Perrone made a brief presentation and then, after Gary Kutsch's safety briefing, led the students on an in-depth tour of the plant, covering all aspects of the manufacturing, from the mixing of concrete to welding of steel reinforcement to concrete forms and curing. Students were particularly struck by the amount of quality control and automation within the process.

The students closed the year by electing new officers. Taking office in February will be Matt Galenas (President), Kelly Fearon (VP of Events), Claire McGinnis (VP of Recruitment), Ben Fisher (Secretary), and Calvin Esham (Treasurer). Kelly has promised that the next year will continue to include great site visits and speakers to expose students to the practitioner side of engineering and generate enthusiasm for the transportation field.

Research

Following are the projects funded for our FY13 Annual Research Program beginning on September 1, 2012 and ending August 31, 2013:

REVIEW OF EXISTING PAVEMENT CONDITION RATING SYSTEM

This project will analyze the accepted level of variation among the various measurement methods. This would allow the agency to switch between methods (and vendors) with more confidence that the results are valid.

Principal Investigator:
Nii Attoh-Okine, Department of Civil and Environmental Engineering

Project Manager:
Jennifer Pinkerton, Materials and Research

INTEGRATING ZERO-VALENT IRON AND BIOCHAR AMENDMENTS IN GREEN STORMWATER MANAGEMENT SYSTEMS FOR ENHANCED TREATMENT OF ROADWAY RUNOFF – PHASE II

This project is a continuation which will evaluate two technologies involving the addition of biochar and/or zero-valent iron to existing and new stormwater facilities which will reduce nutrients from DelDOT stormwater discharges.

This phase will be the field demonstration.

Principal Investigators:
Dan Cha and Paul Imhoff, Department of Civil and Environmental Engineering

Project Manager:
Marianne Walch, Maintenance and Operations

PAVEMENT MARKINGS AND SIGNING TO SUPPORT SENATE BILL 120

The various treatment options and signing to assist with safer bike lanes and intersections as mandated by state code will be evaluated through a survey instrument and test sites.

Principal Investigator:
Rusty Lee, Department of Civil and Environmental Engineering

Project Manager:
Mark Luszcz, Traffic Management Center

EVALUATION OF SMART GROWTH DEVELOPMENT PATTERNS AND EFFECTS ON TRANSPORTATION

This project will identify and evaluate the effects of: 1) alternate locations in Delaware for hypothetical residential and mixed-use communities, and 2) alternate street forms and interconnectivity levels for these hypothetical communities in Delaware.

Principal Investigator:
Rusty Lee, Department of Civil and Environmental Engineering

Project Manager:
Mike DuRoss, Division of Planning

VERIFICATION OF DESIGN OF A NOVEL MECHANICALLY STABILIZED EARTH (MSE) WALL AT THE CHRISTIANA INTERCHANGE

During the construction of the Christiana Interchange, instrumentation donated by an Italian company will be utilized in an abutment to measure readings which will help DelDOT with future designs and specifications.

Principal Investigator:
Dov Leshchinsky, Department of Civil and Environmental Engineering

Project Manager:
Barry Benton, Bridge Management

ABANDON, REPAIR OR IMPROVE ROADS IN THE FACE OF CLIMATE CHANGE?

The objective of this research is to provide DelDOT with a defensible strategy for determining road repeatedly damaged by flooding.

Principal Investigator:
Sue McNeil, Civil and Environmental Engineering

Project Manager:
Rob McCleary, Transportation Solutions

DEVELOPMENT OF A COMPREHENSIVE, MULTI-MODAL TRAVEL ACCESSIBILITY INDEXING SYSTEM AT THE TAX PARCEL LEVEL

This research will result in Trip Origin Locations (tax parcels by land use) able to be assigned an "Accessibility" measure indicating multi-modal proximity to potential Trip Destinations.

Principal Investigator:
David Racca, Center for Applied Demography and Survey Research

Project Manager:
Mike DuRoss, Division of Planning

CAPACITY OF REINFORCED CONCRETE MOMENT FRAME CULVERTS

This research project will assess the latest bridge analysis procedures and conduct full-scale laboratory experiments to develop a new evaluation methodology specifically for concrete moment frame culverts.

Principal Investigator:
Thomas Schumacher, Department of Civil and Environmental Engineering

Project Manager:
Ping Jiang, Bridge Management

IMPROVING ACCESS TO TAXI SERVICE – DELAWARE'S "MISSING" TRANSIT MODE

The focus of this project will be on the identification and prioritization of fiscally viable alternatives that can remove barriers and transform taxi service from Delaware's "missing" transit mode to a truly affordable, available, and accessible transportation alternative.

Principal Investigator:
Doug Tuttle, Institute for Public Administration

Project Manager:
Cathy Smith, Delaware Transit Corporation

CONTINUING ACTIVE RESEARCH PROJECTS SPONSORED BY DELDOT

As each project is completed, a final technical report will be available on the DCT website: http://www.ce.udel.edu/dct.

FY13 GPS TRAVEL TIME AND DELAY DATA COLLECTION AND ANALYSIS

This project entails data collection during peak travel times on roadway segments throughout the state. Each segment will be traveled at least four times for maximum accuracy. Once data collection is completed, data will be transformed into the GIS database and transported to the ARCGIS software.

Principal Investigator:
Arde Faghri, Department of Civil and Environmental Engineering

Project Manager:
Mark Eastburn, Division of Planning

FY13 DELAWARE SIGNAL TIMING ENHANCEMENT PARTNERSHIP (DSTP)

The goals of the DSTEP project are to involve students in traffic engineering services for DelDOT, to develop a continuous research program that addresses DelDOT's needs while minimizing the use of DelDOT's resources, and to maintain a high level of quality so that DelDOT may apply the results to improve intersection operations across the state.

Principal Investigator:
Rusty Lee, Department of Civil and Environmental Engineering

Project Manager:
Gene Donaldson, Transportation Management Center

FY13 LAB BASELINE SERVICE

The objectives of this project is to establish the Delaware Center for Transportation ITS Lab as a state of the art facility with three main focus areas: 1) service to DelDOT; 2) training for DelDOT and support classroom instruction; and 3) research for faculty and students

Principal Investigator:
Rusty Lee, Department of Civil and Environmental Engineering

Project Manager:
Gene Donaldson, Transportation Management Center

FY13 TRAVEL DEMAND MODELING SUPPORT

Support for this project will assist DelDOT with the development, maintenance, application and evaluation of a travel demand forecasting model. The model supports planning studies for Delaware's MPOs and various DelDOT sections on an as-needed basis.

Principal Investigator:
Rusty Lee, Department of Civil and Environmental Engineering

Project Manager:
Mike DuRoss, Division of Planning

DESIGN AND CONSTRUCTION OF A GEOSYNTHETIC REINFORCED SOIL (GRS) INTEGRATED BRIDGE SYSTEM (IBS) IN THE STATE OF DELAWARE

This demonstration project will provide the necessary technical expertise to the design, construction, and long-term inspection process that can be used to enhance implementation of this technology in Delaware.

Principal Investigator:
Chris Meehan, Department of Civil and Environmental Engineering

Project Manager:
Jim Pappas, Materials and Research

DELAWARE SIGNAL TIMING ENHANCEMENT PARTNERSHIP (DSTP) – CORRIDORS 3 & 4

The goals of the DSTEP project are to involve students in traffic engineering services for DelDOT, to develop a continuous research program that addresses DelDOT's needs while minimizing the use of DelDOT's resources, and to maintain a high level of quality so that DelDOT may apply the results to improve intersection operations across the state. This project will involve data collection and analysis on SR4 and SR273.

Principal Investigator:
Rusty Lee, Department of Civil and Environmental Engineering

Project Manager:
Gene Donaldson, Transportation Management Center

NON-DESTRUCTIVE TESTING METHODS TO EVALUATE THE INTEGRITY OF CONCRETE BRIDGE DECKS

This research project will evaluate non-destructive testing procedures to help assess the current condition and quantify the extent of deterioration of concrete bridge decks.

Principal Investigators:
Thomas Schumacher and Dennis Mertz, Department of Civil and Environmental Engineering

Project Manager:
Jim Pappas, Materials and Research

TRAVEL DEMAND MODELING SUPPORT FY12

Support for this project will assist DelDOT with the development, maintenance, application and evaluation of a travel demand forecasting model. The model supports planning studies for Delaware's MPOs and various DelDOT sections on an as-needed basis.

Principal Investigator:
Rusty Lee, Department of Civil and Environmental Engineering

Project Manager:
Mike DuRoss, Division of Planning

2011-2012 GPS TRAVEL TIME AND DELAY DATA COLLECTION AND ANALYSIS

This project entails data collection during peak travel times on roadway segments throughout the state. Each segment will be traveled at least four times for maximum accuracy. Once data collection is completed, data will be transformed into the GIS database and transported to the ARCGIS software.

Principal Investigator:
Arde Faghri, Department of Civil and Environmental Engineering

Project Manager:
Mark Eastburn, Division of Planning

CROSS-FRAME FORCES IN SKEWED STEEL I-GIRDER BRIDGES, YEAR 2

This research will assess the ability of bridges in Delaware to withstand strikes by overheight trucks and also identify critical bridges that need immediate reinforcement to prevent catastrophic failure if hit by a truck.

Principal Investigator:
Jennifer McConnell, Department of Civil and Environmental Engineering

Project Manager:
Jim Pappas, Materials and Research

ITS LAB BASELINE SERVICE FY12

The objectives of this project is to establish the Delaware Center for Transportation ITS Lab as a state of the art facility with three main focus areas: 1) service to DelDOT; 2) training for DelDOT and support classroom instruction; and 3) research for faculty and students

Principal Investigator:
Rusty Lee, Department of Civil and Environmental Engineering

Project Manager:
Gene Donaldson, Transportation Management Center

BASELINE MONITORING AND TESTING OF THE INDIAN RIVER INLET BRIDGE (IRIB)

This project is phase 2 of the long-term structural health monitoring (SHM) system on the Indian River Inlet Bridge. These funds will be used to conduct various baseline tests, studies, and analyses to characterize the baseline performance of the bridge as a permanent record for the future. DelDOT will be able to understand how the as-built bridge is functioning and through long-term monitoring, will be in a better position to efficiently and effectively manage this significant resource. (Ending 6/30/2014)

Principal Investigators:
Tripp Shenton and Michael Chajes, Department of Civil and Environmental Engineering and College of Engineering

Project Manager:
Barry Benton, Bridge Management

Research Pays Off: Safety Effectiveness of the HAWK or Pedestrian Hybrid Beacon

KAY FITZPATRICK

The author is Senior Research Engineer, Texas Transportation Institute, Texas A&M University, College Station, and chair of the TRB Operational Effects of Geometrics Committee.

The number of people who choose to walk or to ride a bicycle instead of driving has increased in recent years, because of the cost of transportation, the desire for healthier lifestyles, and for other reasons. Pedestrians and bicyclists, however, encounter serious risks—a large number are killed in traffic accidents every year in the United States.

PROBLEM

Many roadway crossing treatments are available to address concerns about the safety of pedestrians (1), but only a few are appropriate for high-speed conditions or for wide crossings. In the late 1990s, Richard Nassi, then transportation administrator for the City of Tucson, Arizona, developed the High-Intensity Activated Crosswalk, or HAWK, pedestrian beacon; the 2009 Manual on Uniform Traffic Control Devices (MUTCD) calls the device the pedestrian hybrid beacon (2).

The HAWK is designed to assist in pedestrian crossings, especially at major arterials with minor street intersections (3). The HAWK stops vehicles so that pedestrians can cross the roadway and then permits the drivers to proceed as soon as the pedestrians have passed. Because signal control on a side street could encourage unwanted additional traffic through the neighborhood, the HAWK was designed with stop control on the side streets.

At a HAWK crossing, drivers receive multiple cues for the possible presence of a pedestrian. The cues include

- A unique beacon configuration—two red lenses over a single yellow lens;
- High-visibility crosswalk markings, in a ladder style distinct from two transverse white lines;
- A stop bar approximately 50 ft from the cross- walk;
- Solid lane lines, 8 in. wide, between through- travel lanes; and
- Signs—sometimes illuminated—that read "Pedestrian Crossing" or "School Warning."

When activated, the HAWK provides a red indication requiring drivers to stop for pedestrians crossing the major roadway. In Tucson, the HAWKs reduce pedestrian waiting time with "hot button" or instantaneous service. The HAWK can be designed to provide synchronization of signals on the arterial street.

Anecdotal experience indicates that the HAWK device improves safety. A comprehensive evaluation was needed, however, to establish the beacon's effectiveness.

SOLUTION

The Federal Highway Administration (FHWA) sponsored a study that used a before-and-after, empirical Bayes approach to evaluate the safety effectiveness of the HAWK device (4, 5). The empirical Bayes method is a statistical approach that determines the effectiveness of a treatment from external factors—such as increases in traffic volumes—and from the randomness of crashes. Data were collected on crashes and traffic volume at 102 unsignalized intersections that served as the control sites and at 21 HAWK sites, typically 3 years before and 3 years after the installation. The number of observed crashes that occurred after the installation of a HAWK was then compared with the predicted number of crashes if the treatment had not been installed.

PHOTO: MICHAEL J. CYNECKI

Example of a HAWK treatment in Tucson, Arizona. (Note: The pedestrian is Richard Nassi, developer of the HAWK)

PHOTO: MICHAEL J. CYNECKI

The researchers found the following changes in crashes after installation of the HAWK:

- A 69 percent reduction in crashes involving pedestrians, statistically significant at a 95 percent confidence level;
- A 15 percent reduction in severe crashes that result in injury; this was not statistically significant at a 95 percent confidence level, probably because of the low number of these types of crashes; and
- A 29 percent reduction in total crashes, statistically significant at a 95 percent confidence level.

APPLICATION

The 2009 MUTCD provides the information needed to make decisions about the installation and operation of pedestrian hybrid beacons. According to the guidance, "When an engineering study finds that installation of a pedestrian hybrid beacon is justified, then . . . the pedestrian hybrid beacon should be installed at least 100 feet from side streets or driveways that are controlled by STOP or YIELD signs" (2, Section 4F.02).

All 21 HAWKs in the safety study were located at a minor intersection, with the minor street controlled by a stop sign, or at a major driveway controlled by a stop sign. In June 2011, the National Committee on Uniform Traffic Control Devices, which proposes revisions and interpretations of the MUTCD, recommended removal of the directive specifying installation at a 100-ft distance.

This study showed that the HAWK beacons provided significant reductions in total crashes and in crashes involving pedestrians. Compared with a traffic signal, the HAWK beacon provides faster service to pedestrians and less delay to motorists—drivers are allowed to proceed on the flashing red after pedestrians have crossed their half of the roadway; moreover, the beacon costs about half as much as a traffic signal. As a result, the pedestrian hybrid beacon is rapidly gaining acceptance; in addition to Tucson, more than 14 cities have installed the device. The Tucson area currently has more than 100 installations.

The pedestrian hybrid beacon is a proven countermeasure that increases pedestrian safety at crossings with high volumes, that have wide streets, or that have high operating speeds. ■

For more information, contact Kay Fitzpatrick, Senior Research Engineer, Texas Transportation Institute, State Headquarters Research Building, Texas A&M University Research Park, College Station, TX 77843-3135; phone 979-845-7321; kfitzpatrick@ tamu.edu.

REFERENCES

1. Fitzpatrick, K., S. Turner, M. Brewer, P. Carlson, N. Lalani, B. Ullman, N. Trout, E. S. Park, D. Lord, and J. Whitacre. TCRP Report 112–NCHRP Report 562: Improving Pedestrian Safety at Unsignalized Crossings. Transportation Research Board of the National Academies, Washington, D.C., 2006. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_ 562.pdf.

2. Manual on Uniform Traffic Control Devices. Federal High- way Administration, Washington, D.C., 2009. http:// mutcd.fhwa.dot.gov/kno_2009.htm.

3. Nassi, R. B., and M. J. Barton. New Traffic Control for an Old Pedestrian Crossing Safety Problem. APWA Reporter, June 2008, pp. 44–49.

4. Fitzpatrick, K., and E. S. Park. Safety Effectiveness of the HAWK Pedestrian Crossing Treatment. FHWA-HRT-10-042. Federal Highway Administration, Washington, D.C., 2010. http://www.fhwa.dot.gov/publications/research/safety/ 10042/10042.pdf.

5. Fitzpatrick, K., and E. S. Park. Safety Effectiveness of the HAWK Pedestrian Treatment. In Transportation Research Record: Journal of the Transportation Research Board, No. 2140, Transportation Research Board of the National Acad- emies, Washington, D.C., 2009, pp. 214–223.

Identifying Important Issues Related to the Transportation Infrastructure in Delaware and the Surrounding Region

Admission is free but seating will be limited.

Continental breakfast and lunch Provided.

Registration for this event will begin September 2013

Exhibitor space is now available, contact Sandiw@udel.edu for information how your company can obtain a booth.

Delaware Center for Transportation invites you to attend the

2013 Delaware Transportation Infrastructure Forum

Wednesday, November 13, 2013
8:00 am—3:30 pm
Clayton Hall
University of Delaware
Newark, DE

Approximately 400 participants from State DOTs, FHWA, FTA, WILMAPCO, MPOs, DNREC, University of Delaware and other governmental transportation infrastructure agencies as well as representatives from private firms, local towns, economic institutions and civic groups will congregate in one place to identify the most importation issues related to transportation infrastructure in Delaware and the surrounding areas.

THE FORUM WILL COVER A BROAD ARRAY OF MULTI-MODAL TRANSPORTATION ISSUES INCLUDING:

Bridges & Structures • Planning and Multi-Modal • Administration, Government & Policy • Maintenance • Traffic & ITS • Construction, Pavement & Materials • Transit & Public Transportation • Environment • Local (Towns) Issues • Design • Asset Management • Transportation Economy & Employment • Transportation & Livability • Transportation & Energy • Transportation & Sustainability • Extreme Events and Emergencies

Check our website for upcoming information on how you can register to attend and /or be an exhibitor.
www.ce.udel.edu/dct or contact Sandi Wolfe
302-831-4094

The mission of the Delaware Center for Transportation is to improve the movement of people, goods, and ideas, and be viewed as a valuable resource for transportation-related issues and challenges within the state, the mid-Atlantic region and beyond.

Delaware Center for Transportation Staff

Ardeshir Faghri,
Director
faghri@udel.edu

Ellen Pletz,
Business Administrator II
ebourett@udel.edu

Sue McNeil,
Director UTC
smcneil@udel.edu

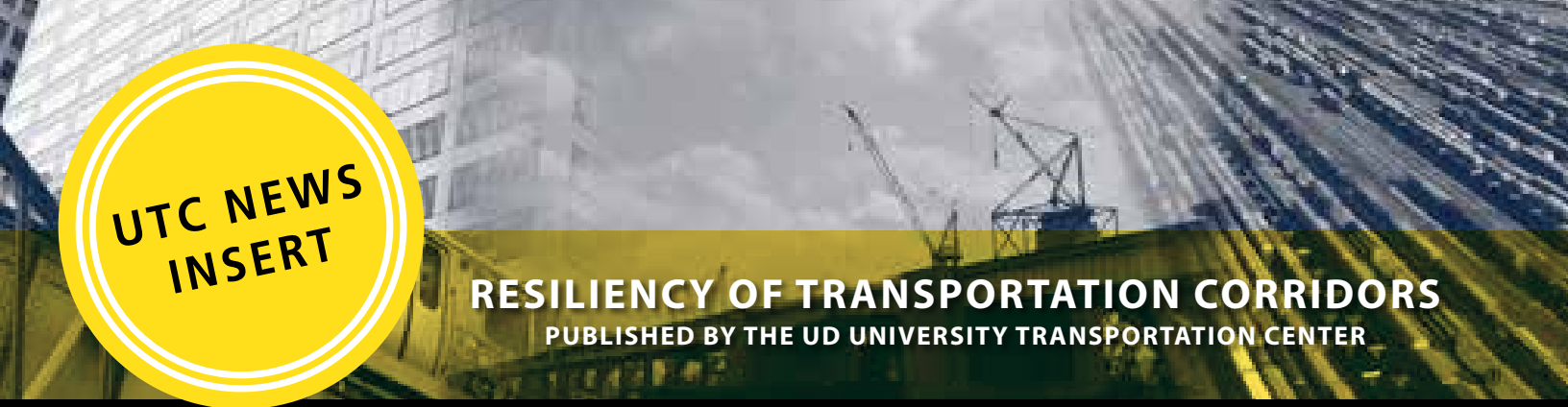
Mingxin Li
Postdoctoral Research Fellow
mlx@udel.edu

Jerome Lewis,
Associate Director
jlewis@udel.edu

Matheu Carter,
T² Engineer
matheu@udel.edu

Earl Rusty Lee,
T² Program Coordinator
elee@udel.edu

Sandra Wolfe,
Event Coordinator
sandiw@udel.edu



UTC NEWS INSERT

RESILIENCY OF TRANSPORTATION CORRIDORS

PUBLISHED BY THE UD UNIVERSITY TRANSPORTATION CENTER

WINTER 2013

Dare to be first.

UNIVERSITY OF DELAWARE

University Transportation Center

Department of Civil & Environmental Engineering

355 DuPont Hall
Newark, DE 19716

P: 302-831-1446
F: 302-831-0674
www.ce.udel.edu/dct

Director and Managing Editor
Sue McNeil

Design
University of Delaware College of Engineering communications team

Director's Message

The Fall 2012 semester included a partnership meeting at CAIT with other consortium members in late September, and a site visit from the Research and Innovative Technology Administration (RITA) in early October. These activities are energizing as they highlight research opportunities, creative educational initiatives and innovative strategies for dissemination and technology transfer. The site visit gave us an opportunity to present our accomplishments over the last five years. UDUTC has delivered:

- ***30 Projects***
- ***34 Reports***
- ***59 Papers***
- ***102 Students participating/participated in research***
- ***20 graduates in transportation, 20 graduates in related fields, and***
- ***57 outreach events involving 2137 people***

As we transition from UDUTC to CAIT at UD we will continue to focus on students. This includes delivering a rigorous graduate program, engaging undergraduate and graduate students in research, disseminating our research through research, papers, conference presentations, and brown bag seminars and providing opportunities for the larger transportation community to learn about new innovative ideas. We will also continue to collaborate with Delaware Department of Transportation and WILMAPCO.

This newsletter highlights both UDUTC and CAIT at UD activities including the accomplishments of our students, the papers presented at the 2013 Transportation Research Board Annual Meeting, and the seminars and lectures presented in the second part of 2013. Please watch our website for future events.

Sue McNeil
Professor, Department of
Civil & Environmental Engineering

CAIT at UD Projects

Five projects have been selected for funding as part of the 2012-2013 CAIT at UD research program. In addition collaborative research proposals with other CAIT consortium members are being negotiated.

MATHEMATICAL AND EXPERIMENTAL INVESTIGATIONS OF MODELING, SIMULATION AND EXPERIMENT TO PROMOTE THE LIFE-CYCLE OF POLYMER MODIFIED ASPHALT

Principal Investigators: Nii Attoh-Okine (Civil and Environmental Engineering) and Pam Cook (Mathematics)

Abstract

General polymer modified asphalt in highway and airport pavements results in the modification of certain properties such as a) elasticity, b) tensile strength, c) high and low temperature susceptibilities, d) viscosity, and e) adhesion and cohesion. The proper modification of the asphalt can have a major influence on the performance and the age of the pavement. Various laboratory studies has demonstrated that the same asphalt with different polymer imbedded may have different properties. In an ideal case the polymers form a continuous (entangled) network, and in less desirable cases discontinuity properties (phase separations) are exhibited between the asphalt and the polymer leading to poor physical properties. The future application of polymers may entail matching polymer properties with anticipated in-service physical requirements (e.g., thin overlays, full depth pavements). Issues such as; a) how does the aging of polymer modified asphalt affect the durability, b) what changes in chemical composition with aging cause reduction in pavement performance, are important.

The purpose of this work is to use tools from across disciplines, mathematical science and pavement engineering, to carry out experiments and modeling,to use results from one to motivate the other ; to understand and allow modifications of the properties of polymer modified asphalts; and to develop comprehensive rheological models for polymer modified asphalts under different physical and environmental conditions. Graduate students will be cross trained in understanding both the mathematical and the experimental nature of polymer modified asphalts.

MULTI-RESOLUTION INFORMATION MINING AND A COMPUTER VISION APPROACH TO PAVEMENT CONDITION DISTRESSES

Principal Investigator: Nii Attoh-Okine (Civil and Environmental Engineering)

Pavement evaluation is an essential part of a good pavement management system for effective maintenance, rehabilitation and reconstruction (MR&R) decision making. Pavement evaluation involves condition surveys to monitor the overall health of the pavement network, and recommendations made regarding maintenance actions. Traditionally, pavement condition surveys are visual surveys whereby a crew is sent out to visually inspect sections of pavement for various types of distress. Apart from the method being subjective and depending on the expertise of the inspector, it is also quite expensive. This procedure is gradually giving way to a more robust, efficient, consistent and objective method called the Digital Image Processing (DIP). The DIP automatically collects distress images and analyze them using feature selection methods such as edge detection techniques for distress detection and identification. Various tasks within the field of image-processing such as fuzzy set theory, neural networks, and Markov methods have been used to analyze cracking in the road pavements. These tasks are however critically sensitive to external real world elements such as scene illumination, pavement texture characteristics and system noise from acquisition devices. As a result the efficiency of most automated distress systems is dependent of environmental factors and type of acquisition device. A well-controlled environment for distress image analysis is not always available in practice. Therefore, a more robust system is required. These challenges call for image analysis techniques which are data dependent, adaptive and straightforward; presenting no special requirements for the source image. This research work will develop a robust vision system addressing key challenges of traditional pavement distress detection systems.

This research outlines three primary goals:

1. Develop a robust vision system addressing three key challenges of traditional pavement distress detection systems

   a. Pavement distress image enhancement in noisy environments (pavement markings, oil paint and rough textures) using the bi-dimensional empirical mode decomposition.

   b. A multiresolution image information mining approach to crack feature extraction using principal component pursuit and active contours models or snakes.

2. Integration of the vision system on to a GIS platform for crack classification and quantification. GIS will be used to generate real time road condition maps and provide recommendations regarding maintenance actions

3. A real-time implementation of the system through parallel processing on current generation of multi-core CPUs.

QUANTITATIVE ACOUSTIC EMISSION MONITORING OF FATIGUE CRACKS IN FRACTURE CRITICAL STEEL BRIDGES

Principal Investigators: Thomas Schumacher and Jennifer McConnell (Civil and Environmental Engineering)

Despite decades of active research on the topic of fatigue cracks in steel bridges , this remains a common problem. With the increasing use of skewed and curved bridges, and the aging of the existing population of this bridge type, distortion-induced fatigue in particular is a growing problem. Similarly, there are ongoing concerns regarding fatigue cracks in fracture critical bridge members, which can have disastrous consequences to the infrastructure and public safety. One common solution to stop a detected crack is to drill a so-called crack-stop hole at the end of a crack. However, the optimum size for this hole has not been entirely certain, as the minimal size to ensure a crack is indeed locked was recently re-evaluated. Furthermore, detecting fatigue cracks can be difficult because of their small size and tendency to develop in locations that are difficult to inspect such as gusset plate connections or web gaps .

Because detecting fatigue cracks can be difficult, methods for stopping fatigue cracks can be uncertain, and questions remain in understanding the micromechanics of fatigue crack propagation , there is the potential for these situations to be better understood and remedied through the application of a promising technique that has been applied for a variety of applications: Acoustic Emission (AE) monitoring. AEs are the result of sudden strain releases

CAIT at UD Projects (continued)

within a body and directly related to energy release due to fracture processes. The method is thus especially well-suited to monitor crack initiation and progression and can provide quantitative real-time feedback of fracture critical details, for example, on steel bridges.

For detection of fatigue cracks, typically qualitative AE methods have been employed that attempt to establish empirical relationships between AE parameters and crack growth based on measurements from a few sensors. These methods may work for a specific tested geometry but may not be transferable to a real bridge. Also, noise discrimination can be a problem since these methods are not event-based, i.e. they do not attempt to locate the source. Additionally, resonant sensors are typically used resulting in recorded signals that are heavily distorted by the sensor characteristics. i.e. the real source characteristics are lost. Quantitative AE methods attempt to explain the source mechanisms (or fracture mode) employing a sensor network with at least eight sensors. The analysis method proposed for this project is called moment tensor inversion and was originally developed in the geosciences. This method is capable of inferring on the source mechanism and give estimates of the source magnitude similarly to earthquake magnitude . With the recent availability of true high-fidelity AE sensors, quantitative AE analysis methods are finally becoming a feasible means for monitoring and characterizing of fracture processes. These quantitative AE methods for monitoring and characterization of fatigue cracks in steel bridges have tremendous potential for addressing problems such as detecting fatigue cracks in fracture critical steel bridges, assessing the effectiveness of distortion-induced fatigue retrofits, and understanding the micromechanics leading to crack propagation in structures subjected to variable multi-axial loadings.

BETTER STATE-OF-GOOD-REPAIR INDICATORS FOR THE TRANSPORTATION PERFORMANCE INDEX

Principal Investigator: Sue McNeil (Civil and Environmental Engineering)

The Transportation Performance Index was developed for the US Chamber of Commerce to track the performance of transportation infrastructure over time and explore the connection between economic health and infrastructure performance (see http://www.uschamber.com/sites/default/files/lra/files/LRA_Transp_Index_Technical_Report_100919.pdf). The index has been computed for the period 1990 to 2009 and shown to influence economic health. In constructing the index, our objective was to develop a transparent process that uses publicly available data to capture infrastructure performance.

State of good repair and safety are important elements of transportation performance. In the current version of the index, state of good repair is directly represented by 2 of the 21 performance indicators and indirectly represented by another seven indicators, or 10% and 37% of the performance index based on weight. Three indicators capture safety. These indicators represent 22% by weight.

This project revisits performance indicators related to state of good repair and safety, and their relative weights to be sure that state of good repair is adequately captured in the transportation performance index (TPI). This includes evaluating the TPI for 2010 and 2011 using both the original method and the new method, and understanding the relationship among the estimates, as well as the relationship with economic health.

Brownbag Discussions

This Fall the UDUTC hosted two brownbag discussions. The first, held on September 5, was led by Professors Thomas Schumacher and Nii Attoh-Okine, and civil engineering graduate student Andrew Chen. The discussion centered around their project "Development of Rapid Assessment Tools for Structural Parts after Extreme Events Using Stress Wave Methods". In this project, they use laboratory experiments to understand how stress waves are impacted by defined flaws in structural elements and then options for processing the signals from these stress waves. The flaws are intended to mimic distresses that may occur due to extreme events. The early results are promising but there are still many unanswered questions that will be addressed during the coming year.

Andrew Chen presents a brown bag discussion

The second brownbag was held on October 18. Professor Sue McNeil and Disaster Science and Management graduate student Erik Archibald (2011-2012 UTC Fellow) presented the results of their analysis of traffic data from Delaware from before, during and after Hurricane Irene in August 2011. The analysis showed that a significant portion of the visitors and permanent beach population heeded the mandatory evacuation order and left coastal Delaware. The results also showed that few of the evacuees followed the designated evacuation routes. Finally the results also showed the volume of traffic is very similar to the volume of traffic on a summer beach weekend, as had been previously asserted by Delaware Department of Transportation. The analysis has been published in the following paper: Archibald, Erik and Sue McNeil, "Learning from Traffic Data Collected Before, During and After a Hurricane," published online July 28, 2012, DOI: 10.1016/j.iatssr.2012.06.002, IATSS Research in 2012.

Distinguished Lectures and Traveling Lecture

UDUTC and CAIT at UD hosted two lectures during the fall semester. The lectures were also jointly sponsored by Delaware Center for Transportation and the Inspection, Monitoring, and Maintenance of Civil Infrastructure (IMMCI) Research Group.

On September 17, John Popovics, associate professor with the Department of Civil and Environmental Engineering at the University of Illinois, presented "Nondestructive Evaluation using Air-coupled Impact-Echo Scanning for Bridge Decks" as part of the CAIT Traveling Lecture Series: State of Good Repair. This lecture was broadcast to other sites that participate in the CAIT Consortium. For more information see http://www.cait.rutgers.edu/cait/webinar-sogr-sept-2012.

On November 5, Chris Higgins, Professor and Slayden Construction Faculty Fellow in the School of Civil and Construction Engineering at Oregon State University presented a UDUTC Distinguished Lecture titled "New Methods For Inspection And Evaluation Of Steel Gusset Plate Connections". Evaluation of gusset plate connections has become important for many transportation agencies in the US after the collapse of the I-35W Bridge in Minnesota. According to the Federal Highway Administration, there are approximately 13,000 steel truss bridges within the National Bridge Inventory. Many of these bridges are undergoing additional scrutiny because the load paths are non-redundant, thus failure in a truss member or connection may cause the structure to collapse. Connection evaluations require complete and accurate as-built drawing sets and condition reports. Most connection evaluations use design drawings and traditional design methods to conduct ratings. Current methods to measure, collect, and archive field data are time consuming as illustrated below and subject to errors at all stages. Such approaches may not best reveal the available connection capacity. Additionally, field data need to be archived to monitor and evaluate changes over the life of the structure. Sketches, notes, and qualitative photographic images may not be sufficient to provide definitive answers to time-dependent changes.

Tools that can effectively capture field data to provide analysis inputs hasten the complex and time consuming task of steel truss bridge evaluations. This presentation reports on research that developed methods to create orthographic digital photographs (orthophotos) of steel truss bridge gusset plate connections. Using the orthophotos, true-scale geometric measurements are made of the plate and fasteners. The geometric data are compared with design and fabrication drawings and used to assess connection capacity. Data extraction from the images is imported directly to CAD and scripted Finite Element Analyses (FEA) to determine connection ratings. These combined techniques enable rapid and accurate quantitative field geometry acquisition, evaluation of connections, and the full integration of these tasks. The techniques have been deployed in the field and are finding broad acceptance. The advent of economical and high-fidelity quantitative imaging offers new opportunities for enhanced management of infrastructure assets.

In addition faculty, staff and students at Univesrity of Delaware listened to other CAIT speakers via videoconference. These included:

- Failure to Act (October 2012) - Blaine Leonard, a Utah Department of Transportation (UDOT) program manager and 2012 president of ASCE, describes scenarios in which healthy infrastructure thrives on regular maintenance and investment--and what could be if we do not.
- Intersection Safety (July 2012) – John McFadden, FHWA Resource Center safety and design engineer.

Student of the Year

UD UTC's 2012 Student of the Year is Mindy Laybourne. Mindy is an MS in the Department of Civil and Environmental Engineering at University of Delaware. She holds a Bachelor of Civil Engineering in Civil and Environmental Engineering from the University of Delaware (UD).

Mindy currently serves as a mentor for CIEG 461 Senior Design, a lecturer in CIEG 451 Transportation Engineering Laboratory, and a teaching assistant in CIEG 467 Traffic Engineering and Modeling. She oversees the Delaware Signal Timing Enhancement Project (DSTEP). This requires morning and evening intersection data collection, followed by data review, modeling, and reporting and presentation of results to Delaware Department of Transportation. Mindy manages about 40 undergraduate students for the data collection effort including training and supervision.

Mindy's master's thesis focuses on developing a hybrid performance measure for signalized intersections that uses both delay based and volume based levels of service.

Mindy was the recipient of a UD UTC Graduate Student Fellowship in 2011.

Mindy Laybourne – 2012 UDUTC Student of the Year

International Road Federation Scholar

PhD student Sekine Rahimian has been selected as a 2013 International Road Federation (IRF) Scholar. Sekine joined 27 other students for a week long program that was held in Washington, DC in January. The program includes opportunities for participation in the Transportation Research Board Annual Meeting.

The Road Scholar Program identifies promising international students currently enrolled in graduate programs at IRF Member Universities in the United States. These students are invited to participate in the Road Scholar Program, which is designed to provide the Fellows with a better understanding of the process of doing business in the transportation industry in the United States, the importance of leadership, and the benefits and merits of the International Road Federation. The Road Scholar Program will allow IRF members to make contact with some future international leaders before they return to their home countries.

The Road Scholar helps the IRF's Educational Program accomplish its mission to apply current transportation technology and management techniques to improve infrastructures around the world. It allows IRF members an additional opportunity to make contact with future international leaders before they return to their home countries. And it ultimately expands the IRF's network of road-industry professional and public officials.

In her application for the program Sekine said "…one of my priorities is to understand the environment of transportation industry in United States. I need to know the world I am going to be a part of after my graduation. During the 5 years of graduate study in University of Delaware I have been taught and mentored by great professors that make me confident of the knowledge I have gained and the research methods I have learned and used. Now it is time for me to explore the world beyond the academia; get familiar with organizations and active groups and agencies, understand the relations between different stakeholders in transportation industry, investigate the regulations, and in summary know the structure of the new society I want to spend the rest of my professional life in."

Congratulations to Sekine!

Upcoming Events and Opportunities

Brown bags for Spring 2013 and DCT/UTC Distinguished Lectures for Spring 2013

See http://www.ce.udel.edu/UTC

Research Showcase
May, 2013 – Research Showcase, Dover, DE

Annual Interuniversity Symposium on Infrastructure Management (AISIM)
June 6, 2013 – University of California at Berkeley

Deadlines
February 15, 2013 – CAIT at UD proposals are due see http://www.ce.udel.edu/UTC
March 1, 2013 - Summer undergraduate research applications see http://www.ce.udel.edu/UTC/Undergraduate.html

Participation in TRB Annual Meeting

Again University of Delaware faculty and students are participating in the Transportation Research Board annual meeting to be held in Washington DC in January 2013. Scheduled speakers are listed in the following table.

University of Delaware Presentations at the Transportation Research Board Annual Meeting, Washington DC, January 2013.

Session	Data and Time	Presentation Title	Presenter
Workshop: Assessing the Future of Freight: Energy and Environmental Modeling in the Freight Sector	Jan 13 2013 1:30PM- 4:30PM	The Geospatial Intermodel Freight Transportation (GIFT) Model: Case Studies on the Use of Geospatial Network Optimization for Evaluating Performance Tradeoffs in the Freight Sector	James J. Corbett, and James J. Winebrake (RIT) (also workshop organizers)
226 – Bus Rapid Transit and Automated Vehicle Location Systems	Jan 14 2013 8:00AM- 9:45AM	Simulation-Based Planning Framework for Choosing Where to Implement Bus Signal Priority in Mixed-Mode Operations	Morteza Tabatabaie Shourijeh, ,Ardeshir Faghri, and Aleksandar Stevanovic (Florida Atlantic University)
322 - Track Support Assessment	Jan 14 2013 1:30PM – 3:15PM	Re-creating Track Support for Combined High-Speed and Freight Line	Allan M. Zarembski
342 - Current Research on Marine Environmental Issues	Jan 14 2013 2:00PM – 3:45PM	Marine Highway Stakeholders and Their Relations	Amit Mokashi (University of Wisconsin, Superior), and James J. Corbett,
337 - Freeway Incident Management and Impact of Freeway Traffic Congestion	Jan 14 2013 2:00PM – 3:45PM	Adaptive Freeway Incident Detection Algorithm Using Hilbert-Huang Transform	Sampson Kwasi Asare, (University of Virginia), Yaw Adu-Gyamfi, Nii Attoh-Okine, Hyungjun Park, (University of Virginia)
418 - Recent Research in Mega-Regions	Jan 14 2013 4:15PM – 6:00PM	Identifying Resiliency Performance Measures for Mega-Regional Planning: Case Study of BosWash Transportation Corridor	Michelle Oswald, (Bucknell University) Sue McNeil, David Ames, Rebekah Gayley, (Ayers Saint Gross)
514 - Evolving Practice and Planning in Evacuation Transportation	Jan 15 2013 10:15AM – 12:00PM	Roundabout Performance Evaluation in a Network Evacuation: Case of Intelligent Decomposed Network Simulations	Sepideh Eshragh, Ardeshir Faghri, and Michael DuRoss, (Delaware Department of Transportation)
611 - Applying New Methodologies and Practices to Decision-Making Challenges	Jan 15 2013 2:00PM – 3:45PM	Vulnerability Analysis of Degrading Roadway Networks	Mohammadsaied Dehghanisanij and Gerardo W. Flintsch (Virginia Polytechnic Institute and State University), and Sue McNeil
Workshop 838 - Status of Long-Term Bridge Performance Program	Jan 17 2013 8:00AM – 12:00PM	LTBP Data Analysis Plan	Dennis R. Mertz
		Reference and Cluster Bridges	Dennis R. Mertz, and Franklin L. Moon, Drexel University

Contact Us

Want to learn more about the UTC?
See our website— www.ce.udel.edu/UTC/index.html.

Want to be notified by email when UDUTC is sponsoring transportation related events? Want to be notified by about UDUTC funding opportunities or graduate fellowships?

To be added to the email distribution list,
send an email to Marikka Beach (marikka@udel.edu).