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Mack Nuggets, Fall 2010

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Mack Nuggets

NEW DHS-FUNDED PROJECTS FOCUS ON SUPPLY CHAIN RESILIENCY AND INLAND WATERWAYS

Featured Stories

- New DHS-Funded Projects Focus on Supply Chain Resiliency and Inland Waterways
- Research Spotlight: Automated Survey of Pavement Distress Based on 2D and 3D Laser Images
- Advisory Board and Student Poster Session



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MBTC is in its third year of research as a member of the DHS National Transportation Security Center of Excellence (NTSCOE). In this year's competitive funding round, DHS selected two new MBTC projects related to supply chain resiliency and inland waterways. The first, *Mitigating Dynamic Risk in Multi-Modal Perishable Commodity Supply Chain Networks*, focuses on developing models that can help decision makers allocate scarce resources over time to fortify transportation infrastructure. The project goal is to mitigate risk and maximize resiliency when disruptions of the supply chain are caused by (1) natural disasters, (2) an adversary whose objective is to cause the greatest economic loss, or (3) an adversary with an unknown, adaptive objective, i.e., a

terrorist that changes his tactics/targets in response to fortification efforts. The principal investigators on this project include Drs. Ed Pohl, Ashlea Bennett and Chase Rainwater from the Department of Industrial Engineering, and Dr. Scott Mason from Clemson University.

The second new project, *Supporting Secure and Resilient Inland Waterways*, will develop a prototype decision support system that integrates GIS technology with freight movement models to provide emergency planning support in the event of natural disasters or terrorist attacks that disrupt commerce on inland waterways. This system will identify infrastructure or regions of the waterways that exhibit low resiliency based on multi-model capacities and accessibility.

If a catastrophic disaster causes a shutdown on an inland waterway transportation system, the prototype system will address (1) how should waterborne cargo be prioritized for offloading, based on primary and secondary economic impacts and societal requirements and (2) how should prioritized freight be offloaded and transported via rail and truck, based on freight capacities. This project is a collaborative effort with Rutgers University, who is a partner in the NTSCOE. The University of Arkansas team includes Drs. Heather Nachtmann, Justin Chimka, and Ed Pohl from the Department of Industrial Engineering and Dr. Tish Pohl from the Department of Civil Engineering.



Dr. Heather Nachtmann

Message from the Director

I always enjoy pausing a moment to reflect on what MBTC has accomplished during the semester. As always, I am proud of our researchers' accomplishments and our strong relationship with the Arkansas State Highway and Transportation Department. Some of these efforts are highlighted in this issue. We have kicked off nine new research projects including two new DHS National Transportation Security Center of Excellence projects that are featured in our cover story.

We enjoyed two outstanding Distinguished Lectures this fall including our annual Evening with the Pros which focused on career guidance for our students and a great presentation about the rebuilding and repair of the War Eagle River Bridge.

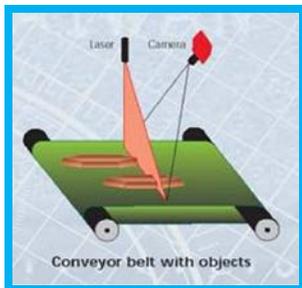
In November, we held a successful and productive Annual Advisory Board meeting including a planning session focused on strategic marketing. I am extremely pleased to welcome three new Advisory Board members to

our team: Rebecca Brewster, American Transportation Research Institute; Ann Gilbert, Arkansas Transit Association, and Jerry Henderson, TSA-Arkansas. We appreciate the expertise shared by all of our Board members.

On behalf of MBTC, I wish you a joyous holiday season. Our Razorbacks are on their way to the Sugar Bowl. Go Hogs!



“This research has the potential to pave the way to establish a new technological platform that would produce several key pavement surface distresses at highway speed.”



Automated Survey of Pavement Distress Based on 2D and 3D Laser Images

Dr. Kelvin Wang of the University of Arkansas (UA) recently started work on a study titled “Automated Survey of Pavement Distress Based on 2D and 3D Laser Images.” The objective of Department of Transportation-funded research project (MBTC DOT 3023) is to find information on pavement surface defects as this information is critically needed for pavement rehabilitation and preservation programs.

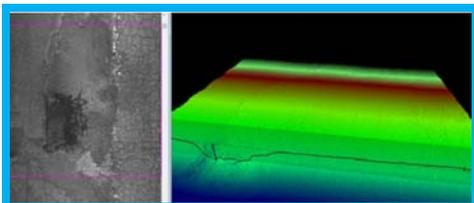
the potential to pave the way to establishing a new technological platform that would produce several key pavement surface distresses including cracking, rutting, pothole, patching, and several other defects at highway speed and in full automation.

It is anticipated that Arkansas State Highway and Transportation Department (AHTD) pavement management and design groups will evaluate the developed 3D software capabilities for possible application. Particularly, AHTD may choose to rely on 3D data collection in the near future for special projects as a means to generate reliable, consistent, and repeatable data sets. Dr. Wang states that “the research work conducted at the University of

Arkansas in the past 10 years is world-leading in automated cracking survey. Future work will include the capability of automatically finding nearly all pavement surface defects that have characteristics in the vertical direction.” Dr. Wang’s work in pavement research is currently funded by the Mack-Blackwell Rural Transportation Center (MBTC), AHTD, and the pavement technology office of Federal Highway Administration (FHWA).

For more information on this and other MBTC research, visit the research page at www.mackblackwell.org.

Pavement distresses become major parameters in predicting pavement performance for both design and management. The major element of pavement surface distresses is surface cracking, whose detection and classification are still not fully automated in the field. This research has



PaveVision3D Software

Distinguished Lecture Series

MBTC organized two outstanding lectures this fall. Our first lecture was our annual career orientation program, "Evening with the Pros" which is organized in conjunction with the Arkansas State Highway and Transportation Department (AHTD). This program was held on September 30, 2010 in the University of Arkansas (UA) campus. Our emcee for this year was Bob Walters, Chief Engineer, AHTD (retired), who did a wonderful job introducing our speakers and keeping everyone on time. The featured speakers for the evening were Bert Parker, Garver Engineering; Scott Bennett with AHTD; Marcus Hopkins, AFCO Steel and a recent graduate; and Larry Weir, Hawkins-Weir Engineers.

Several interesting topics were discussed including what to take away from an internship as this is one of the best ways for a company to evaluate students as an employee and how to prepare for advancement within your company. Mr. Hopkins, a recent UA graduate, shared his thoughts on what worked for him in his first job after school and what he wished he had learned while in school. Mr. Weir spoke of the benefits of being involved in professional societies

and the importance of professional licensure.

Our second lecture was held on November 18, 2010 in Engineering Hall on the UA campus. This year, Mr. Chris Wilbourn, Senior Project Manager and Project Engineer of Garver Engineers, spoke on the rebuilding and repair of the War Eagle River Bridge. The bridge was built in 1907, prior to the creation of the AHTD, by the Illinois Steel Bridge Company located in Jacksonville, Illinois at an original cost of \$4,930. It is the only Parker Truss bridge in northwest Arkansas and one of only seventeen steel truss bridges in the state. The bridge was originally built on a solid timber platform. When this was completed, the platform was removed. He gave an example that it was similar to a giant erector set.

The bridge was inspected by AHTD several years ago, and it was determined it needed to be replaced, which was a problem because the bridge is a historical landmark. The Benton County Grants Administration Office stepped in to help with funding and was very happy with the end result. This was an approximately \$900,000 project, and it came in on budget and on

time. The goals of the rehabilitation project were to do an independent inspection, increase the load capacity of the bridge and increase the longevity of the bridge.

It was important that the rebuilding and repair be completed by the first part of October as War Eagle Mill hosts an annual craft fair which brings hundreds of thousands of visitors to this area.

The bridge did open on October 1st, 2010, and a ribbon cutting ceremony was held to celebrate the completion of the project. Cars, trucks and motorcycles were lined up on both sides, eager to try out the bridge. With all new decking, runners and new concrete support, everyone who has driven across agrees that the new bridge feels as sturdy as it looks.



Marcus Hopkins, AFCO Steel



Principal Investigator W. Micah Hale, Associate Professor of Civil Engineering in the College of Engineering at the University of Arkansas was recently named the 2010 recipient of the Charles and Nadine Baum Faculty Teaching Award. "He is a remarkable teacher," wrote Kevin Hall, Department Head and Executive Director of MBTC, in nominating Hale for the Baum award. "He is an accomplished education scholar, and he is tireless in his service to the educational mission of his profession, his university and his department." This is the University of Arkansas' most prestigious teaching award.

Center for Training Transportation Professionals



Frances Griffith, Stacy Williams, Rita Parrish, Mary Fleck, Charles Steelman and Roselie Conley



Training classes at CTTTP

During 2010, Center for Training Transportation Professionals (CTTP) added two new members to their team. Rita Parrish joined CTTTP in April 2010 as the Administrative Specialist. Rita has efficiently put her experience and talent to use, quickly becoming an integral part of the CTTTP team. Also joining the CTTTP team is Charles Steelman, the CTTTP Online Products Specialist. Charles began in May 2010 with the tasks of reformatting the CTTTP website and developing web-based training modules.

Several online training courses are currently "under construction," including Basic Aggregates, Basic Math Skills, Math for Basic Aggregates, and Math for Concrete. The complete Basic Aggregates course will be released in

January. This release will be available on a trial basis only, with full access available in the summer of 2011. This training will be available for free access from the CTTTP website (www.cttp.org), and will be used as a refresher for Basic Aggregates certification. In addition, these modules may also be used by participants prior to an on-site Basic Aggregates certification course as preparatory material, or by certified individuals as post-course review. Certified laboratories may also find additional benefits by using the online modules to aid in providing in-house training to new employees.

Enrollment in standard CTTTP courses has remained steady, with most scheduled courses operating near capacity. This year, twenty-seven courses were held in the

primary topic areas of Basic Aggregates, Portland Cement Concrete, Concrete Strength Testing, Hot Mix Asphalt, and Soils. Six additional courses were conducted, including Roadway Construction Control and National Pollutant Discharge Elimination System (NPDES). Requests have been received for additional offerings in both of these courses, which will be scheduled as needed in 2011.

Laboratory certification has also displayed steady enrollment, with approximately 100 participating laboratories. July 1, 2010 marked the beginning of the sixth inspection tour. Additional equipment checks are being performed during this tour as an effort to further improve the quality of laboratory testing in the state of Arkansas.

SASHTO Comes to Little Rock

The Arkansas State Highway and Transportation Department (AHTD) recently hosted the 69th Annual Meeting of the Southeastern Association of State Highway and Transportation Officials (SASHTO) in Little Rock, Arkansas from August 28 to September 1, 2010.

One of the major events at SASHTO 2010 was the Trade Show and Equipment Expo, where

academic, government, and industry representatives have the opportunity to showcase materials, technology, professional services, and equipment. MBTC, with our CTTTP, co-sponsored an Expo presence with the Department of Civil Engineering at the University of Arkansas to highlight the Center's research, training, and professional development efforts. Conference attendees were able to

interact with Center staff, faculty researchers, and graduate students and see some of the field equipment used in research projects funded by MBTC. Overall the Expo was a success in providing exposure for MBTC to professionals from across the southeast U.S.



Member States of SASHTO

MBTC's Recently Completed Projects

Listed below are projects completed since our Spring 2010 newsletter. Full reports for these and all other completed MBTC projects are listed on our website at www.mackblackwell.org/web/research/all-projects.htm.

AUGUST 2010

MBTC DOT 3019
Network Design Analysis for Special Needs Student Services
Principal Investigators:
Scott J. Mason, Ph.D. and Edward A. Pohl, Ph.D.
University of Arkansas

MBTC DOT 3012
Examining the Effects of Mixer Type and Temperature on the Properties of Ultra-High Performance Concrete
Principal Investigator:
W. Micah Hale, Ph.D., P.E.
University of Arkansas



MBTC's New Projects

MBTC DOT 2239
The Development of Novel and Non-Invasive Germplasm Selections Native to Arkansas for Highway Re-Vegetation Projects
Principal Investigator:
Garry McDonald, Ph.D.
University of Arkansas

MBTC DOT 3020
Performance of Flexible Pavement Systems Containing Geosynthetic Separators
Principal Investigator:
Richard Coffman, Ph.D., P.E.
University of Arkansas

MBTC DOT 3021
Performance of Prestressed Girders Case with Lightweight Self-Consolidating Concrete
Principal Investigator:
W. Micah Hale, Ph.D., P.E.
University of Arkansas

MBTC DOT 3022
Nanotechnology-Based Improvements for Portland Cement Concrete – Phase 1
Principal Investigators:
Panneer Selvam, Ph.D., P.E. and Kevin Hall, Ph.D., P.E.
University of Arkansas

MBTC DOT 3023
Automated Survey of Pavement Distress Based on 2D and 3D Laser Images
Principal Investigator:
Kelvin Wang, Ph.D., P.E.
University of Arkansas

MBTC DOT 3024
Rail Transportation Models for Rural Populations
Principal Investigators:
Chase Rainwater, Ph.D. and Ashlea Bennett, Ph.D.
University of Arkansas

MBTC DOT 3025
Biodiesel Waste Products as Soil Amendments –

Evaluation of Microbial, Biological and Plant Toxicity
Principal Investigator:
Thomas Soerens, Ph.D., P.E.
University of Arkansas

MBTC DHS 1109
Mitigating Dynamic Risk in Multi-Modal Perishable Commodity Supply Chain Networks
Principal Investigators:
Edward Pohl, Ph.D., Ashlea Bennett, Ph.D. and Chase Rainwater
University of Arkansas
Scott J. Mason, Ph.D.
Clemson University

MBTC DHS 1110
Supporting Secure and Resilient Inland Waterways
Principal Investigators:
Heather Nachtmann, Ph.D., Justin Chimka, Ph.D., Edward Pohl, Ph.D., and Letitia M. Pohl, Ph.D.
University of Arkansas



The Mack Blackwell Transportation Center invites researchers from academic institutions to submit problem statements for our U.S. Department of Transportation funded program. Submission of problem statements related to our center theme "to improve the quality of rural life in America through transportation" is the first step in the selection process for projects to be awarded in fiscal year 2012. The center is accepting problem statements for one year projects to begin no earlier than July 1, 2011. All DOT funds expended in the MBTC program must be matched dollar-for-dollar from non-federal sources. Problem statement forms and instruction for the MBTC USDOT FY 2012 are available at the [Mack-Blackwell Rural Transportation Center website](http://www.mackblackwell.org/web/research/all-projects.htm). Complete problem statement forms must be emailed by February 7, 2011 to MBTC@uark.edu.

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The Research and Innovative Technology Administration (RITA) coordinates the U.S. Department of Transportation's (DOT) research programs and is charged with advancing the deployment of cross-cutting technologies to improve our Nation's transportation system and Mack-Blackwell is proud to be a participating university.



The Department of Homeland Security's National Transportation Security Center of Excellence (NTSCOE) is developing new technologies, tools and advanced methods to defend, protect and increase the resilience of the nation's multi-modal transportation infrastructure and education and training base lines for transportation security geared towards transit employees and professionals.

Kevin Hall, Ph.D., P.E.
Executive Director

Heather Nachtmann, Ph.D.
Director

Letitia M. Pohl, Ph.D.
Assistant Director
NTSCOE Program

Dana Williams, M.S.
Communications Director

Sandra Hancock CPS
Fiscal Support Analyst

We're on the Web!

See us at:

www.mackblackwell.org

About Mack-Blackwell...

MBTC recently added three new members to our Advisory Board.

Rebecca Brewster is the President and Chief Operating Officer of the American Transportation Research Institute in Marietta, Georgia. Ms. Brewster leads the research activities of the Institute in the areas of safety and human factors; environmental factors; technology; transportation security; and economic analysis. The American Transportation Research Institute conducts transportation research with an emphasis on the trucking industry's essential role in a safe, efficient and viable transportation system.

Ann Gilbert is the Executive Director of Arkansas Transit Association (ATA) in Little Rock, Arkansas. ATA provides technical assistance and training for Arkansas's public transit systems. From

the beginning, ATA has partnered with the Arkansas State Highway and Transportation Department to advance safe passenger transportation.

Jerry Henderson is the Federal Security Director for the Transportation Security Administration, Arkansas, with the U.S. Department of Homeland Security in Little Rock, Arkansas. Mr. Henderson retired after a 20-year career in the U.S. Navy. The former commander directed the Naval Reserve

Center Detroit, where he supervised and coordinated counter-terrorism training with the FBI for personnel deploying overseas. Henderson also served as the commander, Anti-Submarine Forces Pacific, where he directed threat assessment and intelligence operations.

Everyone at MBTC would like to welcome our three new members. We are all looking forward to working with you!



MBTC Advisory Board Members

Annual Advisory Board & Student Poster Contest

MBTC hosted its Annual Advisory Board meeting on November 4 and 5, 2010. The meeting began with the College of Engineering Dean Ashok Saxena giving a welcome address. Dr. Heather Nachtmann, MBTC Director, updated the advisory board on the Center events from the past year. Dr. Stacy Williams, CTPP Director, gave an overview of the classes taught and upcoming new courses that will be offered in the future. Two of our principal investigators, Dr. Kirk Grimmelsman and Dr. Manuel Rossetti, gave updates on their projects.

The afternoon included a planning session with the

advisory board members regarding the visibility of MBTC.

We held our fourth annual Jack Buffington Student Poster Session with twelve poster entries. This year's winner is Tom Potts, who is currently working on MBTC DOT 3018, The Production of Butanol Fuel from Renewable Systems Using a Membrane Assisted Fermentation System.

Other students who participated in the poster contest are Jason Herrman, Dia St. John, Jessica Spicer, Jingjing Tong, Leily Farrokhar, Jeremy Rawn, Daniel Byram, Danny Xiao, Shawn Griffiths, Behrooz



Heather Nachtmann, Director, Jack Buffington, Tom Potts, and Kevin Hall, Executive Director

Kamali, Jared Bymaster, Royce Floyd, Sayantan Bhadra, Jeff Gwaltney, and Emerson John.

We appreciate the efforts of all of our faculty and student researchers and enjoyed sharing these with our Board.