



MID-AMERICA TRANSPORTATION CENTER

Volume 4 Issue 2

IMPROVING SAFETY AND MINIMIZING RISK ASSOCIATED WITH INCREASING MULTI-MODAL FREIGHT MOVEMENTS

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MATC Intern Program: Alumni in Action



National defense demands individuals with a wide range of skills, from commanding a ship to, yes, managing traffic safety on base. Practical experience is key to developing any skill set. US Navy Ensign John Parizek is part

of the Civil Engineer Corps (CEC) and serves as the assistant public works officer for the Naval Facilities Engineering Command Mid-Atlantic Region Public Works Department in Newport, Rhode Island—he is also a 2006 alumnus of the MATC intern program. Ensign Parizek attributes a well-rounded undergraduate experience, including an internship at the Olsson Associates consulting firm in Lincoln, with providing him the background needed to succeed in the Navy.

After graduating from the University of Nebraska—Lincoln with a degree in civil engineering, Parizek earned his Navy commission at Officer Candidate School and continued on to the Navy’s Civil Engineer Corps Officer School.

of the Civil Engineer Corps (CEC) and serves as the assistant public works officer for the Naval Facilities Engineering Command Mid-Atlantic

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MATC Students Network, Present Research at TRB Annual Meeting

MATC was well-represented by students at the 90th Annual Meeting of the Transportation Research Board, the largest event of its kind, with hundreds of sessions and workshops and over 10,000 attendees. The theme this year was “Transportation, Livability, and Economic Development in a Changing World.”

MATC students attended meetings, presentations, networking events and several students presented posters. Post-doctoral researcher associates Bhaven Naik and Justice Appiah (former MATC students) and Remigiusz Wojtal, a MATC PhD student at the University of Nebraska—Lincoln, presented a poster for their project, “Safety Effect of Dilemma Zone Protection

Using Actuated Advance Warning Systems.” Missouri S&T PhD student Mojtaba Ale Mohammadi presented a poster on his MATC project with Dr. Ghulam Bham, titled “Vehicle Speeds in Work Zones: An Objective and Subjective Analysis.” Additionally, MATC PhD Student of the Year Cody Stolle presented on his project, “Improving the Performance of Cable Median Barrier.”

...continued on page 16



Pictured above: MATC students from KSU, KU, UI, MS&T and UNL



THE UNIVERSITY OF IOWA



MATC Intern Program: Alumni in Action



At Naval Station Newport, he is assisting with the largest renovation and infrastructure overhaul on the base since World War II. Parizek is responsible for space management, traffic safety and construction project management, and he also serves as a member of the anti-terrorism team. His internship experience contributed to his ability to "adapt and embrace leadership opportunities in the Navy Civil Engineer Corps." His Navy career has been very rewarding, Parizek says, and he is grateful for the opportunities provided by his education.

More MATC Internship Program News:



At the University of Kansas, several students participated in an internship with the Kansas Department of Transportation (KDOT) during the spring 2011 semester. Aaron Boehmler, a senior in civil engineering; Hilary Urkevich, a graduate student in transportation; and Jessica Peat, a senior in civil engineering, gained on-the-job experience this semester working in the Roadway Design Office. KDOT has been a key part of the MATC intern program by offering opportunities to student interns from the University of Kansas and Kansas State University.

For more information on the MATC intern program, please visit: <http://matc.unl.edu/internship.php>



Rolla High School Students Experience Engineering

On January 27th and 28th, 2011, Missouri University of Science and Technology graduate student Laura Rathe visited Rolla High School, in Rolla, Missouri, to present information on civil engineering to students in Principles of Engineering classes and at the Science Olympiad. The purpose of the presentation was to get students interested in possible careers in the field of civil engineering. Rathe discussed the goals of civil engineers, technology used in practice, the many potential career options, and graduate student research. Rathe also led students in an interactive project to get them engaged and excited about engineering.

First, students built a structure out of spaghetti noodles and mini marshmallows. The objective was to build the strongest structure possible within the time limit. This tested the students' ability to problem-solve as well as their ability to be creative with the given materials. The part they enjoyed the most was, of course, testing and destroying the structures. While the marshmallows didn't make for strong structures, the high school students had fun making and demolishing their creations.

Another activity Rathe engaged the students with was testing which shape produced the strongest column. Students were given small columns made out of cardstock shaped into a square, rectangle, triangle, hexagon, and circle. The students put weights on top and found that the more sides that a column had, the stronger it became. They even ran out of weights before the circle and hexagon shapes were crushed! Overall, the students were very excited to see the columns held a significant amount of weight despite the fact that they were made from paper.

MATC applauds the efforts of graduate students, like Laura Rathe, for reaching out to the next generation of students.



school teachers are invited to bring their students to campus in order

Letter from the Director



Dr. Laurence Rilett

It has been five years since we were successful in the USDOT Region VII University Transportation Center competition and I am happy to report that the state of the Mid-America Transportation Center (MATC) is excellent. To date, we have awarded nearly \$4 million in research funding for 115 research projects. The total amount of matching funds from

our 35 public and private sector partners is \$7.7 million and this translates into an over 11 million dollar research program—a historic milestone for MATC. This newsletter will highlight a number of our research projects that were completed within the past year. As befitting our theme of reducing risk and increasing safety on the transportation system, the projects include everything from improving safety barriers to mitigating bridge scour, which is a leading cause of bridge collapse in the US.

An 11 million dollar plus research program is impressive, but more important, I think, is the positive impact we have had on the students of our consortium partners, and the transportation system in Region VII. Over 140 graduate students and more than 40 undergraduate students have been employed on our research projects. These students ultimately will bring their experiences and the knowledge gained through their tenure at MATC consortium universities to a wide range of public agencies and private companies. In this issue we are highlighting some of these students and their activities. For example, 32 of our students recently attended the Transportation Research Board Annual Meeting in Washington D.C. where they presented their research, participated in technical sessions, and attended the annual MATC student dinner.

This issue also highlights some of our kindergarten through grade twelve initiatives including our after school program known as "Roads, Rails and Racecars", which we use to foster in middle school students an appreciation for transportation careers. Our goal is to encourage them to take math and science classes in high school so they will have the option of a technical degree in college. This program is particularly exciting as it represents a partnership between the UNL engineering and education colleges. In addition, we continue to provide outreach to middle and high school teachers and students through our fifth annual summer institute, for which we are currently recruiting.

to learn more about transportation as a career option. We plan to host nearly 100 students for the event this summer.

Equally important, the 72 MATC faculty researchers, who should receive full credit for the success of our research programs, are busily implementing and disseminating their results. To give but one example, Dr. Dean Sicking and Ph.D. student Cody Stolle recently presented the impacts of their research on cable median barriers at the University Research Technology Transfer day at the U.S. Department of Transportation. Their research indicated a need to change national crash-testing standards to identify barrier performance under impact conditions found to produce serious injury and fatal crashes accident conditions. Within a decade as many as 500 motorists will die each year in cable barrier crashes. They estimate that by adjusting impact standards they will be able to eliminate 75% of these fatalities.

As most of you are aware, US public academic institutions face significant challenges related to unprecedented budget shortfalls in many states—and the MATC consortium partners in Region VII are no exception. However, it is my experience that challenges, when considered carefully, often illuminate opportunities. As you read through this newsletter you will find ample evidence that we are successfully navigating these financial challenges and have leveraged the USDOT resources in developing a world-class research, education, and technology transfer program that is impactful to our students, the states of Region VII and the nation.

I hope that in this issue you will find many reasons to join me in my enthusiasm for MATC's transportation research and education initiatives. I look forward to the coming months as we get ready for our next research selection process, and, as always, I welcome your feedback and suggestions. Thank you for your interest and continued support.

Sincerely,
Larry



"ROADS, RAILS, AND RACE CARS": MATC'S AFTER SCHOOL SPECIAL

In the fall of 2010, MATC graduate students helped launch an after school program focused on transportation engineering at Culler Middle School in Lincoln, Nebraska. With support from the US Department of Transportation and in partnership with the University of Nebraska-Lincoln's Center for Children, Youth, Families and Schools, the program introduces middle school students to engineering with hands-on activities. Students learn from lessons plans developed with input from NTC faculty and graduate students, which complement their STEM curriculum and bring transportation research into the classroom.

Transportation systems engineering graduate students, Quinton Rodgers and Scott Sorenson, act as mentors—providing engineering expertise, answering questions, and supporting students in completing lesson activities. In addition, they have presented engaging presentations including, "What is an Engineer?" and a speech on the dangers of distracted driving. Their energetic presence engages the junior high students and encourages them to consider studying engineering in college. Culler science teacher Mary Herrington, who provided the initial inspiration for the program, leads many activities and coordinates the curriculum.



On February 28th, program participants showcased all that they learned in a celebration of the successful first quarter of the program. Students demonstrated their knowledge by presenting their favorite activities and the most memorable concepts to their parents and school administrators. Dr. Steven Joel, the superintendent of Lincoln Public Schools, was on hand to welcome parents and praised the Roads, Rails, and Race Cars program for providing "opportunities for students to connect what they learn with what they want to become." Mr. Gary Czapala, principal of Culler Middle School, also welcomed parents and thanked the engineering graduate students for helping to show "new worlds" to the students.

As part of the program's goal to help students begin thinking of their post-secondary plans, Niko Aguirre, Diversity and Community Outreach Coordinator for the UNL Admissions Office, talked to students about not letting any obstacles stand between their dreams of attending college. Aguirre discussed resources available to both students and parents, and spoke about his own path to college.

Graduate students Rodgers and Sorenson also talked about what had led them to study engineering in college and answered questions from parents and students about their experience. Reflecting on the experience of working with the students,



Sorenson noted: "It was a challenge to find different ways of explaining things to make sure [the students] understood and could explain it to their friends. This is great practice for the professional world where explaining things to a non-technical audience is a major component of a successful project."

After the positive reception from students, parents, teachers and administrators alike, another student showcase is being planned for the end of the school year and plans for a possible expansion of the program to other middle schools in the fall of 2011 are currently underway.

Lessons in Leadership at IRF "Road Scholars" Program



The International Road Federation (IRF) Road Scholars Program is a prestigious program for future professionals in the roadway industry. MATC PhD student Thiago Aragão was nominated by the University of Nebraska-Lincoln to represent the institution as an IRF Executive Fellow at the 2011 program, held in Washington, D.C. from January 19-28. The

program provides a unique opportunity for an elite group of graduate students to meet with IRF members, interview with potential employers, gain exposure to many public and private organizations within the road industry, and hear from executives about how to become a leader in the industry. Reflecting on the experience, Aragão expressed his new appreciation of the many facets of the transportation industry that the program illuminated, ranging from economics to safety to legal issues. The program spanned a wide range of perspectives on the most current and pressing issues within the field and the overall structure of the nation's transportation organizations. Aragão noted that the unique aspects of the program

included the opportunity to network with professionals from various sectors and the overall emphasis on leadership. Also noteworthy was the respect with which the fellows were treated and the hospitality of their hosts, who arranged the schedule to accommodate students presenting at the TRB (Transportation Research Board) Annual Meeting.

The International Road Federation (IRF) is a non-governmental, not-for-profit organization with the mission to promote development and maintenance of better, safer and more sustainable roads and road networks. For more information on the International Road Federation and the Road Scholars program, please visit: <http://www.irfnet.org/>

Workforce Development Initiative at Kansas State University Keeps Going Strong



Since 2009, MATC has supported the Workforce Development Initiative at KSU. Mustaque Hossain, MATC associate director and a professor of civil engineering, oversees this effort. Currently, this initiative consists of the Transportation Certificate Program, the Superpave Field Laboratory Technician Certification Training Program, and a Kansas Department of Transportation (KDOT)-KSU Summer Internship Program.

Superpave Field Laboratory Technician Certification Training is a four day course offered jointly by KSU and KDOT. This course is intended to certify engineers, technicians and other personnel who will be involved in the construction of Superpave Hot-Mix Asphalt (HMA) pavements using Quality Control and Quality Assurance (QC/QA) specifications in the state of Kansas. Successful completion of the course and certification (subjected to a combined passing score on two written tests and a laboratory proficiency test given at the end of the course) is required for all KDOT and contractor personnel performing tests on Superpave projects. On three occasions this winter, KSU campus in Manhattan hosted four-day Superpave training sessions. Sixty-six participants from KDOT, HMA industry and consulting companies attended these classes.

Instruction was provided by a select group of instructors from KDOT, HMA industry, and KSU. This year's successful program resulted in the total number of participants completing this program since 1997 reaching close to 1,500.



Above: Glenn Fager, P.E., District I Materials Engineer of KDOT lectures during the Superpave Technician Training Program at KSU.
Below: Glenn Fager, P.E., District I Materials Engineer of KDOT demonstrates the Indirect Tension Test during the Superpave Technician Training Program at KSU.



Transportation Initiatives Shared at INDO-US and ITS India Conferences



Arabinda Mitra, Executive Director of the Indo-US Science and Technology Forum



During the month of February, MATC received international attention as Director Laurence Rilett travelled to India to attend and present at the INDO-US and the Intelligent Transport Systems conferences.

Uniting professionals from the United States and India, the 2011 Indo-US Workshop on "Transportation and Greenhouse Gas Emissions," held in New Delhi on February 10-11 at the Central Road Research Institute (CRRI), merged the public and private sector, universities and research agencies for a two day event. The goal of this workshop was to discuss current trends and research in the area of transportation and greenhouse gas emissions, and to identify research needs and potential areas of collaboration between India and the US. The principal investigators for this year's workshop were Anuradha Shukla of CRRI and Josias Zietsman of Texas Transportation Institute (TTI). The event consisted of a series of technical sessions, which addressed such topics as broad policy overviews, inventory methods, sources and mitigation strategies, technological solutions, as well as modeling approaches, policies and programs. Like last year's workshop, the two day INDO-US event highlighted the capability of the United States and India to work together to solve global transportation issues through collaborative efforts.

The Intelligent Transport Systems India conference took place on February 21-22 in Delhi, and featured industry experts as speakers, including professionals from the National Highways Authority of India, the Bureau of Indian Standards and MATC Director Laurence Rilett. This conference was designed to address the implementation of ITS technology in India by discussing its use, benefits and the challenges of application. The two day conference featured presentations on topics such as the role of government in implementation, optimizing highway traffic management with this technology, current trends in ITS and scaling the growth of ITS. With professionals from public and private sectors, academia and research groups, this event highlighted many ITS perspectives and offered insight from an array of experts.

After returning from the conferences in India, Dr. Rilett received the great news that the INDO-US Science and Technology Forum (IUSSTF) has agreed to support a student exchange proposal—a collaborative project conceived at last year's INDO-US conference. Under this program, India students would travel to the US and US students would travel to India to learn at transportation facilities in the respective countries. Once implemented, the student exchange program will enact the kind of collaboration that the INDO-US conference strives to create through its annual meeting of transportation professionals.



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MATC Research News

Roundabout Recommendations in Drivers Manual

Drivers who have encountered a roundabout and felt uncertain about the correct course of action are not alone, it seems. At the University of Nebraska-Lincoln, Dr. Aemal Khattak, associate professor of civil engineering, with Karen Schurr, civil engineering lecturer, and Dr. Ram Bishu, professor of industrial and management systems engineering, conducted a survey of five Nebraska cities in order to determine roundabout elements and identify characteristics of drivers who are more likely to incorrectly navigate roundabouts. This project, titled "Investigation and Mitigation of Driver Confusion at Modern Roundabouts," was sponsored by the Nebraska Department of Roads.

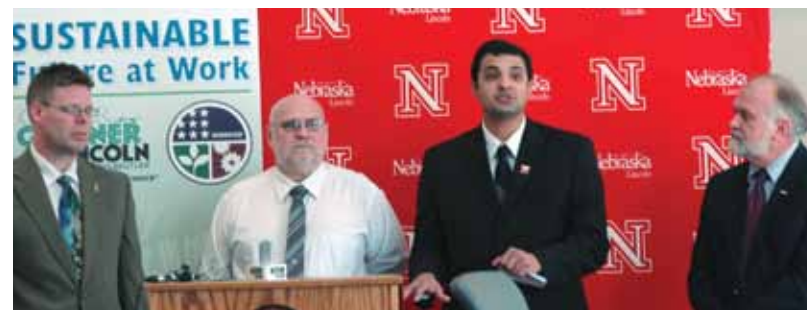
Survey respondents indicated that, to mitigate confusion at roundabouts, they would like to receive information on proper negotiation via the Nebraska Driver's Manual. The researchers submitted recommendations based on the survey results, which were recently incorporated into the revised Nebraska Driver's Manual. One



NDOR design engineer called the updates a great improvement. MATC applauds Dr. Khattak, Ms. Schurr and Dr. Bishu for effectively producing results that will help drivers operate their vehicles more safely and sends gratitude to NDOR for their support.

The revised manual is available online (<http://www.dmv.ne.gov/examining/pdf/engdrivermanual.pdf>) with the new information on roundabouts featured on pages 44-45.

MATC Energy Research Focus of Mayoral Press Conference



Left to Right: Greg McLean, Director of the City of Lincoln Public Works and Utilities; Steve Young, Supervisor of Street Light Design for Lincoln Electric Systems; Anuj Sharma, Assistant Professor of Civil Engineering at UNL; Kevin Wallis, CEO of Lincoln Electric Systems

The City of Lincoln spends over \$72,000 annually on energy to power the city's traffic signals. MATC researchers are working to change that, however, by testing a solar/wind hybrid power generator installed on existing traffic signal infrastructure. Assistant Professor Anuj Sharma, Associate Professor Libby Jones, Assistant Professor Wei Qiao and Professor Larry Rilett's project, sponsored by the US Department of Transportation and the Mid-America Transportation Center, is an initiative to move toward "energy-plus" roadways that generate more energy than is needed to power the signal.

At a special press conference on Thursday, March 3, in the Whittier Research Center at the University of Nebraska-Lincoln, Mayor Chris Beutler discussed the city's initiatives to implement

sustainable energy systems through partnering with university researchers. Dr. Sharma explained the benefits of the technology and his hopes for advances in energy-plus roadways in the future. He discussed the need for using alternative energy sources to power traffic infrastructure not only to save taxpayer dollars and move toward sustainability, but as necessary back-up in the event of disruptions to the electrical supply.

The next phase of the project involves installation of four more wind generator-solar panel hybrid units and the researchers will continue collecting data on the reliability of the hybrid system in all types of conditions. Mayor Beutler praised the potential inherent in the project and said it will "help to further Lincoln's growing reputation as the green capital city of Great Plains."

Completed Research Projects



University of Nebraska Projects

Project Title: Computational Design Tool for Bridge Hydrodynamic Loading in Inundated Flows of Midwest Rivers

The hydraulic forces experienced by an inundated bridge deck have great importance in the design of bridges. The proper estimation of loading exerted by the flow on the structure is important for design plans and is pertinent for evaluating its vulnerability. During a flood or hurricane, highway bridges over the sea or other waterways may become partially or completely submerged. Flood flows add significant hydrodynamic loading on bridges, possibly resulting in the shearing or overturning of the bridge deck and failure of the bridge superstructures.

The overall objective of the study was to establish validated computational practices to address research needs of the transportation community in bridge hydraulics via computational fluid dynamic simulations. The reduced scale experiments conducted at the TFHRC hydraulics laboratory establish the foundations of validated computational practices to address the research needs of the transportation community. The simulations in this study were completed by using the supercomputers at the Argonne National Laboratory. The results of the study showed that the critical values of the drag coefficient occur when the bridge is well inundated, but the critical values of the lift and moment coefficients occur near the transition from partially to fully inundated. The critical lift coefficient is negative, which corresponds to a pull-down force.

"Climate change increases frequency of bridge inundation. This research provides a computational tool to determine drag, lift and moment on a bridge deck and improve the national bridge safety."

The CFD results match the experimental data in terms of the relationship between the inundation ratio and force measured at the bridge. The CFD methodology is used to transfer the recent supercomputer models of bridge inundation flows from laboratory scales to small scale and large scales, and analyze the effect of scaling on turbulent flow and hydrodynamic forces obtained based on the Froude number similarity method. The results of the present research provide a tool for designing new and retrofitting existing bridges so that they are able to withstand the forces and moments that may result from partial or complete inundation.



Bridge Hydraulics - US 90 - Biloxi (2005)



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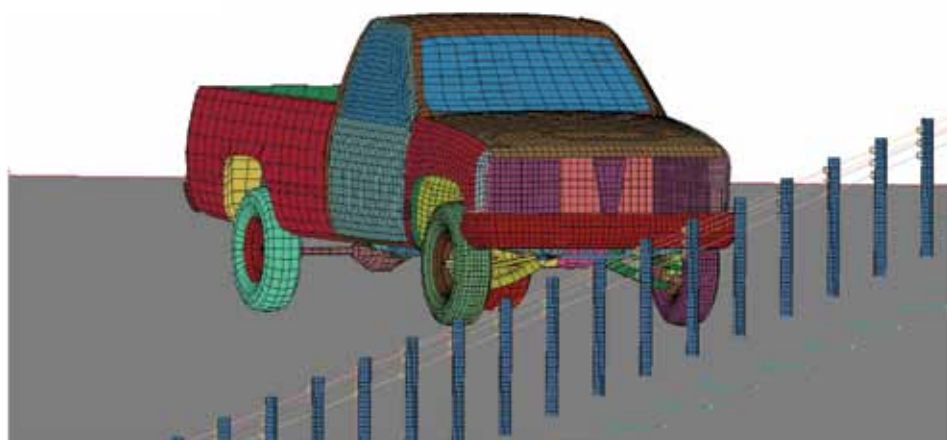
UNIVERSITY OF
Nebraska
Lincoln **University of Nebraska
Projects**

Project Title: Development of Advanced Finite Element Material Models for Cable Barrier Wire Rope

Cable barriers are a common safety device used on the nation’s highway system. While the design of cable barriers has advanced and their usage has increased over recent years, no research has been done to investigate or improve the wire rope used as the most critical component of the cable barrier system. The current 3/4-in. diameter 3x7 wire rope design dates back to the late 1960’s and has remained unchanged even as the design of other cable barrier elements has advanced. Realization of new, innovative cable barriers and their accompanying safety benefits hinges on the development of advanced tools for analysis and design of wire rope used in these types of systems.

“This research greatly enhances the accuracy of wire rope modeling, which is a critical component in simulations used to design cable barrier systems.”

An improved LS-DYNA model of ¾-in. (19-mm) diameter 3x7 wire rope commonly used in roadside cable guardrail installations has been developed. Dynamic component tests were conducted on wire rope to determine material properties. These tests were simulated and the results compared to the physical tests. The new proposed wire rope model more accurately simulated the wire rope tension and bogie vehicle motion than other previously-developed wire rope models. The wire rope was also modeled in full-scale crash test models using a Chevrolet C2500 pickup model, consistent with NCHRP Report No. 350 TL-3 impact conditions. Results of the crash test and simulation were compared, and the wire rope response was determined to be accurate. Therefore, the new wire rope model was determined to be an improvement over existing models of wire rope and is recommended for use in cable guardrail simulations.



Modeled System

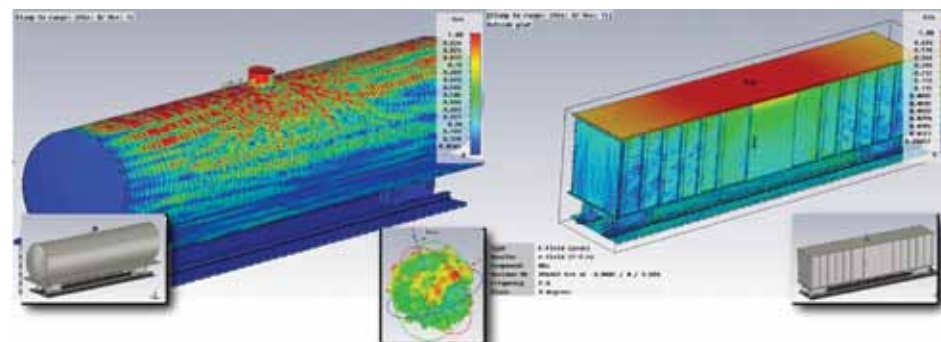
UNIVERSITY OF
Nebraska
Lincoln **University of Nebraska
Projects**

Project Title: Study of RF Propagation Characteristics for Wireless Sensor Networks in Railroad Environments

This project focused on studying the characteristics of Wireless Sensor Networks (WSN) onboard freight trains. In North America, freight railroad companies are searching for ways to improve their monitoring capabilities and the fault detection of individual railcars. Small battery operated wireless sensor nodes can easily be installed onboard freight railcars to monitor a variety of systems from wheel imbalances and brake failures to refrigerator units, boxcar doors and much more.

This study first evaluated the propagation characteristics at the physical layer of wireless sensor nodes deployed onboard railcars and found that placement of these nodes significantly impacts the radio wave propagation characteristics. In addition to placement, the effectiveness of the nodes is further complicated by the materials used in railcar construction and their design. This in turn drastically impacts the requirements upon the wireless communication protocols at the medium access control (MAC) and routing layers.

“Providing safe, secure, and efficient freight transportation through advanced onboard wireless sensor technologies for real-time monitoring and alerting.”



EM Field for a tanker car (left) and box car (right) with top-center mounted antenna, with corresponding antenna pattern (center insert)

In our second research effort for this project, we studied the performance of ZigBee, a communication protocol stack commonly used in traditional wireless sensor networks. This protocol was found to be inadequate for the requirements placed upon freight train wireless sensor networks. We therefore proposed an alternative method using a multi-tiered approach that leverages a long-distance communication technology added to the wireless sensors, and studied its performance in an effort to overcome the limitations of ZigBee for freight car WSNs.

The proposed solution has been shown in our simulation study to be very promising in overcoming the observed problems and provides significant performance, energy efficiency and network lifetime improvements over the traditional approach.



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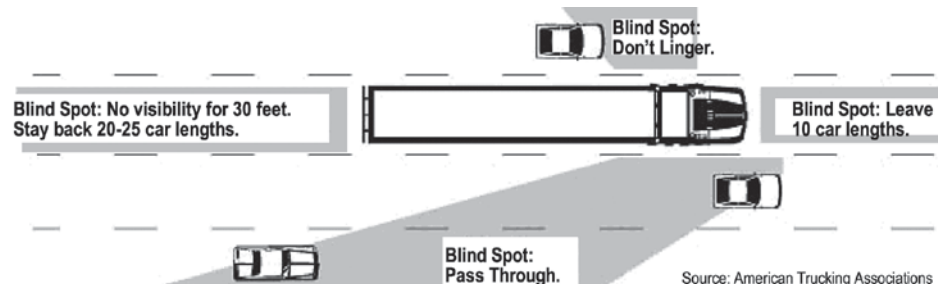
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KSTATE Kansas State University
Projects

Project Title: Characteristics and Contributory Causes Related to Large Truck Crashes (Phase I)

One-ninth of all traffic fatalities in the United States have involved large trucks in the past five years, although large trucks contributed to only 3% of registered vehicles and 7% of vehicle miles travelled. This contrasting proportion indicates that truck crashes in general tend to be more severe than other crashes though they constitute a smaller sector of vehicles on the road. To study this issue, fatal crash data from the Fatality Analysis Reporting System (FARS) was used to analyze characteristics and factors contributing to truck-involved crashes. Driver, vehicle, and crash-related contributory causes were identified, and, as an extension, the likelihood of occurrence of these contributory causes in truck-involved crashes with respect to non-truck crashes was evaluated using the Bayesian Statistical approach.

“This study provided a very good idea of the factors that contribute to, and are associated with, fatal truck crashes in the US.”



No Zones or Blind Spots around a Large Truck

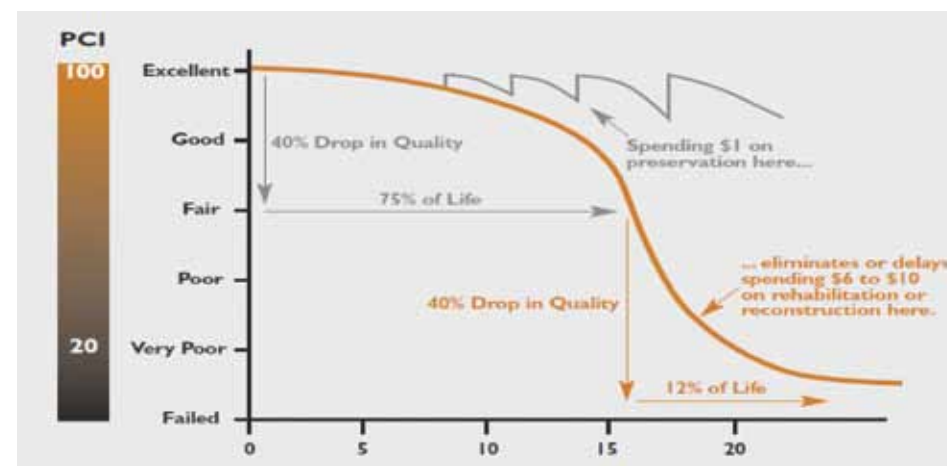
Likelihood ratios indicated that factors, such as stopped or unattended vehicles and improper following, have greater probability of occurrence in truck crashes than in non-truck crashes. Also, Multinomial Logistic Regression was used to model the type of fatal crash (truck vs. non-truck) to compare the relative significance of various factors in truck and non-truck crashes. Factors such as cellular phone usage, failure to yield right of way, inattentiveness, and failure to obey traffic rules also have a greater probability of resulting in fatal truck crashes. Among several other factors, inadequate warning signs and poor shoulder conditions were also found to have greater predominance in contributing to truck crashes than non-truck crashes. By addressing these factors through the implementation of appropriate remedial measures the truck safety experience could be improved, which would eventually help in improving overall safety of the transportation system.

KSTATE Kansas State University
Projects

Project Title: Extending Pavement Life Using Thin Surfacing to Counter the Effect of Increased Truck Traffic Due to Freight Movements on Highways

The highways in the Midwest are experiencing a considerable amount of truck traffic due to increased freight transportation. There is clearly a risk to the highway infrastructure caused by this additional truck traffic that will also have an increasingly detrimental effect on the safety of the citizens, the traveling public in terms of congestion, and the economy of the entire region. Traditionally, the life of pavements has been extended by a variety of rehabilitation techniques. Kansas Department of Transportation (KDOT) uses route and crack seal, chip seal, thin overlays, inlays, hot-in-place recycling, cold in-place recycling, and cold milling in the rehabilitation of asphalt pavements.

“The research results will be helpful in selecting cost-effective thin surface treatments.”



Pavement Option Curve (PCI-Pavement Condition Index) (TR News, 2003)

Recently, due to a tight maintenance budget, thin surfacing, like the ultra-thin bonded bituminous surface (Nova chip), and modified slurry seal (micro-surfacing), is being used increasingly. The thin-surfacing strategy is one of the cost-effective measures that can extend pavement life, improve ride quality, correct surface irregularities (leveling), improve safety characteristics, enhance appearance, and reduce road-tire noise. This study was done on the performance of pavements treated with two commonly used thin surfacing types: ultrathin bonded bituminous surface (UBBS) and microsurfacing. The average service life of microsurfacing was found to be close to 5 years—that was comparable to thin overlays up to two-inch thickness. Initially after treatment, there was a significant reduction in roughness, rut depth, fatigue and transverse cracking due to UBBS and microsurfacing, but a sharp drop-off in effectiveness was observed after a couple of years in service. The Equivalent Uniform Annual Cost of micro-surfacing is about the same as the two-inch overlay.



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IMPROVING SAFETY AND MINIMIZING RISK ASSOCIATED WITH INCREASING MULTI-MODAL FREIGHT MOVEMENTS

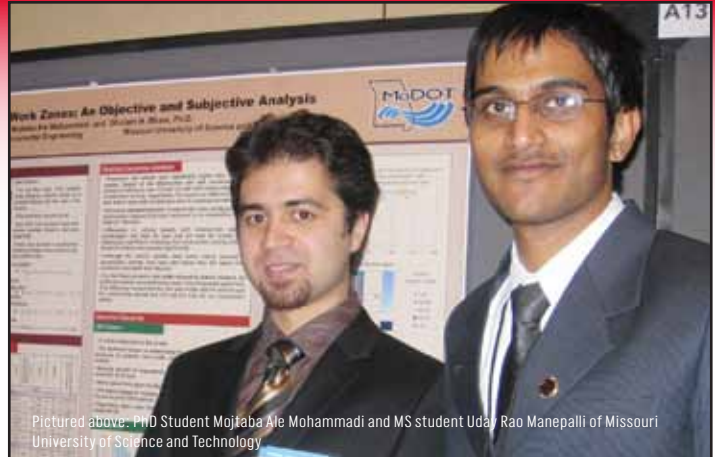
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TRB CONFERENCE

University of Kansas undergraduate students Tiffany Brown and Sarah Thompson were selected to attend the meeting as "Jayhawk Transportation Scholars" with travel expenses funded by MATC. This was a great opportunity for these two students as they had a chance to network with faculty from potential graduate schools. At the conference, Ms. Brown met Dr. Seth Young, chair of TRB's committee of Aviation System Planning, and was invited to be a "young member" of the committee. She hopes to pursue her interest in airport planning and design by applying for graduate study with Dr. Young at Ohio State University. Congratulations to Ms. Brown and Ms. Thompson for a successful conference experience!

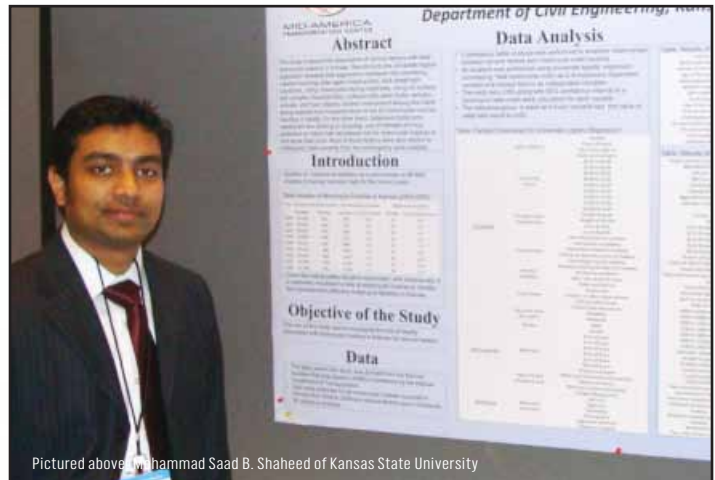
Here's what MATC students had to say after the conference:



Pictured above: PhD Student Mojtaba Ale Mohammadi and MS student Uday Rao Manepalli of Missouri University of Science and Technology



Pictured above: MS Student Scott Sorenson, RITA Administrator Peter Appel, and MATC MS Student of the Year Ben Grone



Pictured above: Muhammad Saad B. Shaheed of Kansas State University

Scott Sorenson – MS Student, University of Nebraska–Lincoln: During the 90th Annual Meeting of TRB this year, I enjoyed attending meetings the most because they were interactive and I was able to participate in discussions. Participating in the discussions helped me explore my interests and gain more knowledge about those topics. After attending the conference, I now have a better understanding of different research organizations and the way they function, as well as discovering new areas of interest for my own research.

Ben Grone – MS Student, University of Nebraska–Lincoln: Attending the Transportation Research Board 90th Annual Meeting opened my eyes to the large community of professionals that are passionate about advancing the way we approach transportation. It was overwhelming to be in the midst of 10,000 people with expertise in a diverse array of transportation specialties from port security to bicycle routes. The highlight of the conference was being able to hold one-on-one conversations with various experts in my area of research.

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