

The University of
Alabama

The University of
Alabama at
Birmingham

The University of
Alabama in
Huntsville

UTCA NEWS

University Transportation Center for Alabama

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Introduction to the UTCA

Since becoming a university transportation center (UTC) of the US Department of Transportation in 1999, The University Transportation Center for Alabama (UTCA) has conducted transportation education, research, and technology-transfer activities throughout the state and region. Faculty and students at The University of Alabama (UA), The University of Alabama at Birmingham (UAB), and The University of Alabama in Huntsville (UAH) have participated in all these service areas.

Our mission reflects the mission of the US Department of Transportation. Specifically, the UTCA seeks

to advance technology and expertise in the multiple disciplines that comprise transportation through the mechanisms of education, research, and technology transfer while serving as a university-based center of excellence (2006 *UTCA Strategic Plan*, p. 12).



The President's Mansion at The University of Alabama

Our theme – *Management and Safety of Transportation Systems* – reflects the transportation needs of Alabama and the expertise of The University of Alabama System faculty. In 2007 and 2010, the Advisory Board narrowed and sharpened the focus of the UTCA research program. Many projects now focus on sustainability, transit, and minimizing congestion.

The Director's Notes

In its 13th year, UTCA has reached another milestone. In February, we published our 200th research report. We look forward to many more years of education, research, and technology transfer.

Since our last newsletter, UTCA finished selecting our 2011 research projects. Of the ten projects authorized, four involve transit. Please see pages four and five for details.

In April, strong tornados ripped through the cities that house the three campuses of the University of Alabama System. We share the sadness of the families in those cities who lost homes and loved ones.

Sincerely,
Jay K. Lindly

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Nighttime Construction Quality

In recent years, federal and state transportation agencies have increasingly moved from daytime to nighttime construction operations to reduce traffic congestion and delays. Despite this increased emphasis on nighttime construction, little is known about the quality and safety of roadway and highway construction performed at night. Not only do we lack knowledge about how nighttime construction compares with daytime construction; we also do not know how quality varies with nighttime conditions. In **UTCA Project #11108, *Impact of Nighttime Construction on Work Quality***, Dr. David Grau, Assistant Professor of Construction Engineering at The University of Alabama (UA), and Dr. Edward Back, Associate Professor and Director of Construction Engineering at UA, seek to improve our understanding of how construction performed at night influences road durability and safety.

Dr. Grau and Dr. Back have teamed with the Alabama Department of Transportation (ALDOT) to answer these questions. They are drawing on ALDOT's practices and historical data and are collecting data at Alabama construction sites on several factors that may influence the quality of nighttime construction operations, such as the quality and uniformity of luminance; glare; worker fatigue, concentration, and pace of work; presence of a supervisor or quality inspector during construction; traffic volume; and temperature. Once the data are collected,

Dr. Grau and Dr. Back will use statistical methods to compare the differences between the quality of the work performed at night and the quality of the work performed during the day. They will also correlate nighttime factors with the quality of the performed work and will correlate traffic accidents with nighttime and daytime construction. Dr. Grau and Dr. Back will use these correlations to characterize root causes of construction quality and safety.



Despite the increasing use of nighttime work to deliver transportation projects, there is neither a uniform set of guidelines nor best practices at the national level to manage nighttime operations. This project will eventually help address these shortcomings by offering guidance to improve the quality of planning and construction work. It will also provide a solid base for future research into these issues.

Look for the final report on UTCA's website (<http://utca.eng.ua.edu/>) in 2012.

UTCA News is published twice a year by The University Transportation Center for Alabama at The University of Alabama campus. For more information about our education, technology-transfer, and research programs, please contact us at:

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Transit Evacuation Planning

Although many states have evacuation plans, those plans tend to focus on self-evacuating individuals. But as Hurricane Katrina showed, there is a need to plan for individuals who depend on transit to evacuate. Dr. Dan Turner, Professor Emeritus of Civil Engineering at The University of Alabama (UA), led a team of researchers from UA and the University of North Carolina at Charlotte (UNCC) to tackle some of the challenges associated with planning for the evacuation of the special-needs population. In **UTCA Project #08112 – Transit Evacuation Planning: Two Case Studies**, UA and UNCC researchers estimated the number of individuals who need help evacuating during a hurricane and learned how to improve communications with these individuals before, during, and after an emergency evacuation.

There are a number of complications to planning for the evacuation of special-needs populations. First, because special-needs individuals are diverse and mostly isolated, it is difficult to identify and locate them and to communicate emergency information to them. Second, there is no nationally accepted definition for this population group, making planning more difficult. Depending on the definition, the transit-dependent population may include the elderly, the disabled, individuals with limited English proficiency, and persons with low incomes. Each group has particular needs that need to be considered. Finally, some states use registries to record the location, number, and needs of transit-dependent individuals in extreme events, but federal privacy laws make it difficult to collect the necessary data from public records. Any effective evacuation plan needs to address these issues.

To estimate the number of transit-dependent individuals, Dr. Turner's team consulted numerous reports and guidebooks published by federal and state emergency-management agencies, as well as emergency-management experts and persons who work for the evacuation of special-needs populations. Using the 2000 US Census, 2006 American Commu-

nity Survey, and 2007 Harvard Telephone Survey, they counted the number of people over 80 or without a car. Based on these data sources, the authors estimate that 34,500 – 8.6% of the population – would require transportation assistance in an extreme hurricane. Although there were never more than 3,000 evacuees during several category 3 hurricanes, there were 25,000 people stranded at the Super Dome and 20,000 stranded at the New Orleans Convention Center after Katrina, suggesting the authors' estimates are plausible.



Airmen from Maxwell Air Force Base, Alabama, transport medical equipment from a veterans home to safety during a recent hurricane

To improve communication with special-needs groups during hurricanes, the authors identified a variety of communication systems that can be applied in an emergency situation. Unfortunately, no single communication system can meet all information needs in an evacuation. For example, the deaf and the blind may not be able to use the same technology. The authors suggest using multiple communication systems, including medical, religious, and service organizations. It is also important to clearly communicate the evacuation declaration, pickup locations, and amount of personal belongings evacuees are allowed to bring.

You can read this and other UTCA reports on evacuation planning at the UTCA webpage at <http://utca.eng.ua.edu>.



New Projects Funded in 2011

The UTCA funded ten projects with 2011 monies, including four transit projects. The funded projects are briefly described in the following pages.

Project #11101 – Advanced Transportation Institute 2011, Dr. Daniel Turner, Principal Investigator, UA. The objective of the Advanced Transportation Institute 2011 (ATI-11) is to increase diversity within the transportation profession by introducing junior and senior high-school students from under-represented groups to transportation careers. The UTCA and the Alabama Department of Transportation (ALDOT) Fifth Division will co-sponsor the Institute. The agenda for the 3-5 day program will include presentations on topics such as transportation careers, how to select and enter a university, and how to obtain scholarships. Practitioners will make additional presentations on various sectors of transportation, including planning, design, construction, maintenance, traffic engineering, and bridge design. The Fifth Division personnel office will recruit and select ATI-11 participants from local high schools.

Project #11103 – Role of Transit Service Providers in Land Development, Yingyan Lou, Principal Investigator, UA. The objective of this project is to investigate whether encouraging (and subsidizing) transit service providers to compete and invest in land development improves livability and sustainability. A comprehensive literature review and interviews with field experts will explore the policy implications and direct benefits of this strategy to the transit industry and the economy. A synthesis of this strategy and a summary of expert opinions will be prepared and insights for the transit-oriented development in US will be provided. The results of this study will contribute to the discussion over not only well-functioning and cost-effective transit systems but also more livable and sustainable communities.

Project #11106 – Alabama Transportation Strategic Vision, Steven Jones, Principal Investigator, UA. The objective of this project is to lead a group of stakeholders in developing a strategic vision for Alabama public transportation for the year 2030. The project will employ participatory scenario planning to build and document consensus for a sustainable role for public transportation in Alabama. Dr. Jones expects the results to form the basis of improved

public transportation in future local, regional, and state transportation-policy development and decision making and ultimately of a more sustainable transportation system for Alabama.

Project #11108 – Impact of Nighttime Construction on Work Quality, David Grau, Principal Investigator, UA. Despite an increasing demand for scheduling roadway and highway work at night, little research considers the impact of nighttime construction on the quality of work. Dr. Grau will use an experimental design not only to compare the quality of nighttime and daytime construction quality but also to determine the influence of varying nighttime factors on the quality of the finished work. He will investigate up to 10 similar construction operations for both daytime and nighttime conditions and use statistical methods 1) to assess the differences between the nighttime and daytime construction on the quality of the finished work and 2) to correlate the influence of nighttime factors with the quality of the performed work. See page 2 for more information.

Project #11113 – Advanced Patrol Routing with On-Call Response for Effective Resource Management, Burcu Keskin, Principal Investigator, UA. Effective public safety depends partly on effective resource allocation. Previous UTCA-sponsored research has considered where police should patrol to minimize crash hotspots (UTCA #09104), but it did not consider the full range of possible solutions. This project extends the previous research to include the integrated optimization of the selection of intermediate patrol locations and determination of trooper patrol routes with dynamic on-call capabilities.

Project #11202 – Effect of Increasing Truck Weight on Bridges, Christopher Waldron, Principal Investigator, UAB. The US House of Representatives proposed legislation (HR 1799, 2009) allowing a 17,000-pound increase in the maximum gross vehicle weight on the Interstate Highway System. This project's main goal is to quantify the effect of this weight increase on the internal forces to which typical slab-on-girder bridges are subjected. To investigate the longitudinal force effects in the girders and the transverse force effects in the deck slab, several configurations for these heavier trucks proposed in the literature will be evaluated and additional con-



figurations will be developed, as required to minimize the increased force effects.

Project #11206 – Impacts of Transit in a Complete Streets Context, Virginia Sisiopiku, Principal Investigator, UAB. This project will identify and summarize analytical methods appropriate for estimating transit's economic benefits as they relate to travel, economic development, society, and health. Using input from earlier studies, national and regional data, and available methods, the research team will quantify both health-related and economic impacts of transit integration in a complete-street environment and will present recommendations for incorporation locally and nationally.

Project #11301 – Transportation Engineering Advancement and Mentoring Program, Kathleen Leonard, Principal Investigator, UAH. The Principal Investigator will continue to work with local school districts to incorporate transportation engineering-related topics into the science curriculum. This year's summer program will have a concentration in energy technologies. Students will use real-world examples and new technologies in their activities.

Project #11305 – Analysis of Rural Public Transit in Alabama, Michael Anderson, Principal Investigator, UAH. As rural Americans grow older, access to basic necessities and health care will continue to strain rural transit providers. The goals of this project are to identify where rural transit needs to improve and what steps can improve performance to better serve the citizens of Alabama. The project will use a recently published guidebook to calculate performance measures for the transit providers in Alabama and may develop new performance measures that incorporate specific elements of Alabama.

Project #11306 – Student Funding to Attend TRB Conference, Michael Anderson, Principal Investigator, UAH. The objective of this project is to develop a student research symposium, possibly to be hosted by the Institute of Transportation Engineers (ITE) student chapter at the University of Alabama at Birmingham (UAB), and to select deserving students from each of the three University of Alabama System campuses to receive funding to attend the Transportation Research Board Annual Meeting in Washington, DC. See page 7 for an article about last year's awards.

TECHNOLOGY TRANSFER

Spring 2011 ALSITE Meeting

The Alabama Section of the Institute of Transportation Engineers (ALSITE) held its spring meeting at The University of Alabama (UA) campus in Tuscaloosa on March 3, 2011.

ALSITE's annual spring meeting combines technical engineering presentations with an organizational business meeting. This year's meeting featured presentations on sustainability and innovation in transportation engineering. Dr. Andrew Graettinger, associate professor at UA, spoke about increasing the environmental friendliness of Alabama's highways. Dr. Yingyan Lou, assistant professor at UA, discussed sustainability as it relates to transportation development, finance, and operations. Mr. Blair Perry and Mr. Kent Black, engineers at Gresham Smith & Partners, discussed diverging diamond interchanges, in which traffic temporarily flows on the opposite side to improve safety and efficiency. Mr. Scott Holladay, chief civil engineer for Shelby

County, described new standards for road sign visibility in the *Manual on Uniform Traffic Control Devices*. Finally, Dr. Steven Jones, associate professor at UA, spoke about engineering practices in Europe.

The newly formed UA chapter of the ITE (see UTCA's November 2010 newsletter) hosted the meeting. Between technical presentations, ALSITE's secretary-treasurer, Ms. Becky Malenke, presented the UA chapter officers and faculty advisor with their charter.



Dr. Lou discusses sustainability

ALSITE meeting will take place in Gulf Shores, Alabama, June 8-10, 2011.

UA Professors Present UTCA Research at 54th Annual Transportation Conference

Two University of Alabama (UA) professors presented UTCA research in February at the 54th Annual Transportation Conference, hosted by Auburn University's (AU) College of Engineering.

Dr. Steven Jones, associate professor of transportation systems engineering, talked about the *Scoping Study of Implementation of The Highway Safety Manual in Alabama (UTCA Project #10404)*. The *Highway Safety Manual* (HSM) is 950 pages of science-based safety policy and analysis that few departments of transportation have implemented. UTCA is working with UA's Center for Advanced Public Safety to investigate, test, and evaluate the overall HSM process to find an efficient way to implement it in Alabama.

Dr. Jay Lindly, professor of transportation systems engineering and director of UTCA, spoke about UTCA's *School Bus Seat Belt Pilot Project (UTCA Project #07407)*. Two years of careful data collection and analysis revealed that school buses are the safest form of transportation to school even without seat belts. Moreover, less than 62% of the students in the study used the seat belts. Using federal standards, UTCA researchers found that seat belt costs would likely exceed benefits by \$104 million to \$125 million.

EDUCATION NEWS

2010 UTCA Student of the Year

The University Transportation Center for Alabama is proud to recognize Ms. Frances Katalyn Lee Green as its *2010 Student of the Year*. Ms. Green, who grew up in Montgomery, AL, is pursuing a bachelor's degree in civil engineering with a minor in transportation engineering.

Ms. Green enrolled in the Department of Civil, Construction, and Environmental Engineering at the University of Alabama in 2007. Ms. Green demonstrated strong performance in the classroom, and in her junior year she was named a University of Alabama Scholar Student. She took an interest in transportation engineering, enrolling in graduate-level transportation-engineering courses as part of the Scholar Student program.



**Ms. Frances Green, 2010
UTCA Student of the Year**

Ms. Green was also active in transportation research. She worked as a research assistant to Dr. Yingyan Lou, and she wrote a literature review on contra-flow planning for hurricane evacuation for a project under consideration for funding.

In addition, Ms. Green served as a chair of the Society of Women Engineers Fundamentals of Engineering Review Committee from 2008 to 2010 and as Editor/Marshall for the UA chapter of Chi Epsilon from 2010 to 2011.

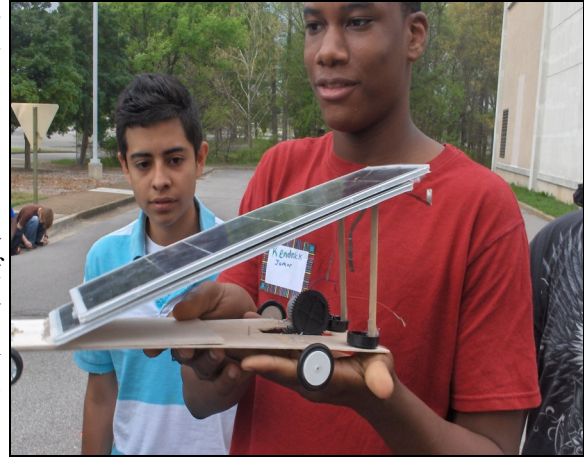
Ms. Green formally received the *Student of the Year* award in Washington, DC, during the Transportation Research Board's Annual Meeting. Accompanying Ms. Green to the awards banquet were Dr. Daniel S. Turner, UTCA's founding executive director; Dr. Jay K. Lindly, UTCA's current executive director; and Dr. Yingyan Lou, Ms. Green's advisor.

Ms. Green received her bachelor's degree in May 2011. She will continue transportation-related research as a full-time graduate student at the University of Alabama in the fall.

TEAM Program

In the past 11 years, over 400 middle-school students from the Huntsville area have enjoyed summer outreach programs organized by Dr. Kate Leonard from The University of Alabama in Huntsville (UAH). By providing fun learning experiences in an academic setting, Dr. Leonard hopes to encourage students from under-represented groups to consider careers in transportation engineering. **UTCA Project #11301** – the Transportation Engineering Advancement and Mentoring (TEAM) Program – continues this tradition by bringing female faculty members from UAH and professionals from the Society of Women Engineers together with young women to produce students who know “how to find out” and “how to examine and evaluate evidence.”

This year’s TEAM Program began in February during Engineers’ Week. Mentors (students and professionals) visited classes, gave presentations about transportation engineering, and introduced a design/build competition. Student teams took the next couple of months to design Popsicle-stick bridges and solar cars, then they competed at UAH on April 8. Tanner High School students won both competitions and their teacher, Mrs. Lydia Lagrone, was honored for her mentorship role.



A TEAM participant shows his entry to the solar-car competition

Students from participating schools will attend a week-long program held on the UAH campus in June, where they will learn about the role of transportation planning, management, safety, and design in modern society, with a focus on alternative-energy technologies. Students will use what they learn in the lectures and experiments to solve real-world transportation problems.

A recent survey of alumnae from the 2003-2005 programs suggests that the TEAM Program has had a positive impact. Just under 90% of respondents plan to attend college, and the majority will major in engineering.

5th Annual Student Awards Luncheon Celebrated the Achievements of Transportation Students

Students from the three campuses of The University of Alabama System are engaged in a variety of transportation-related research activities. Dr. Mike Anderson of The University of Alabama in Huntsville (UAH) headed **UTCA Project #10308**, which identified deserving transportation students and provided a forum in which they could present their research. Students were invited to present abstracts of their research to a panel of representatives from each campus, then winners were selected.

These students were invited to present their research at the 5th Annual Student Awards Luncheon on November 19, 2010. This award luncheon, held at The University of Alabama at Birmingham, was organized and hosted by the Institute of Transportation Engineers (ITE) Student Chapter at UAB.

Three students from each campus — UA, UAB, and UAH — presented technical papers to showcase their research activities. The following students made presentations: Ozge Cavusoglu (UAB), Mary Catherine Dondipati (UAH), Bharat Kallem (UAB), Tahmina Khan (UAH), Rong Li (UA), Gaurav Mehta (UA), Zack Ryals (UA), Nitin Sharma (UAH), Dong Wang (UAH), Brian Wysock (UA), and Cheng Zhong (UAB). All presenters received monetary awards allowing them to attend the 90th Annual Meeting of the Transportation Research Board (TRB) in Washington, DC, in January 2011.

UAB ITE Takes Third Place at 2011 SDITE Traffic Bowl

The Institute of Traffic Engineers (ITE) Student Chapter at the University of Alabama at Birmingham (UAB) enjoyed its best finish yet in the William Temple Scholarship Challenge Traffic Bowl, placing 3rd among 26 teams.

Under the supervision of Dr. Virginia Sisiopiku, UAB's team of Ozge Cavusoglu, Cheng Zhong, and Bharath Kallem first defeated a team from Auburn University in December for the privilege to represent the Alabama Section ITE at this year's Traffic Bowl. The team then traveled to Lafayette, LA, in April. They reached the finals by defeating teams from Mississippi and Louisiana before succumbing to eventual champion North Carolina State. UAB team members will split a \$750 scholarship they received from the SDITE for their strong finish.

The Traffic Bowl uses Jeopardy-style competition. Teams of three students answer questions based on transportation and traffic-related topics. The Southern District ITE has held the Traffic Bowl every year since 2005. The intent of the scholarship challenge competition is to bring together some of the leading ITE student members from the sections of the Southern District for a team competition at the Annual Meeting of the Southern District.



Members of UAB's Traffic Bowl team receive a scholarship from the SDITE for their 3rd-place finish. In the front (left to right): Cheng Zhong, Dr. Virginia Sisiopiku (faculty advisor), Ozge Cavusoglu, and Bharath Kallem. In the back (L to R): SDITE President Tim White; Forrest Temple, grandson of William H. Temple, after whom the competition is named; SDITE Secretary-Treasurer Martin Brether-ton; and ITE International President Robert C. Wunderlich.

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