



Vol. 8 No. 1 August 2014

## Technovations in Transportation

### In this issue:

- Featured Project: “Measures to Alleviate Congestion at Rural Intersections”
- Featured Project: “Security and Survivability of Real-Time Communication Architecture . . .”
- Faculty at a Glance
- NIATT’s Teams and Workforce Development
- Faculty Feature: Dr. Michael Kyte
- Thank You Victor

### Featured Project: “Measures to Alleviate Congestion at Rural Intersections”

#### Case Study at State Highway 55 / Banks-Lowman Highway Offers ITD Efficient Congestion Solutions

by Heloise Abtahi

There aren’t many drivers today who can say they’ve never had to endure holiday traffic. Cars can be backed up for miles, cutting heavily into precious holiday time. This type of congestion is especially noticeable at normally quiet rural intersections, which can go from seeing very little regular traffic to seeing thousands of cars around holidays like Memorial Day weekend or the Fourth of July. In an effort to help alleviate this congestion, Dr. Ahmed Abdel-Rahim, a professor in the Department of Civil Engineering and Interim Director of NIATT, and NIATT Research Assistant Chris Bacon conducted a case study focused on one intersection in particular: State Highway 55 and Banks-Lowman Highway. This area was identified by the Idaho Transportation Department (ITD) as experiencing typically low traffic volumes with a spike around holidays. In order to mitigate the problems drivers were experiencing at this and many other rural intersections around Idaho, Dr. Abdel-Rahim and Mr. Bacon worked to find the best way to meet not only the particular needs of the SH-55/Banks-Lowman Highway intersection, but also to discover the most efficient methods for limiting strain on all types of rural intersections during holiday periods.

Video Still of Normal Summer Weekend Traffic Volume (about 500 veh in Peak Hour)



Video Still of Holiday Weekend Traffic Volume (about 1000 veh in Peak Hour)



Using data from automatic traffic counters installed by ITD in 2006, the research team was able to establish a base count for the average daily traffic (ADT) for the peak season from past years. To collect the traffic data for 2014, the project team worked with ITD to get an accurate ADT through the use of both automatic traffic counters and cameras installed at the intersection. The result was an excellent

and very thorough data set that according to Dr. Abdel-Rahim, makes the study’s findings much

more universally applicable. “Because of the extensive data collection, we really were able to totally understand the problem and offer a solution.” Not only were the objectives of the project (collecting traffic data and offering a potential solution for peak congestion at the SH-55/Banks-Lowman Highway intersection) successfully achieved, other rural intersections will benefit from the case study. Though the SH-55/Banks-Lowman Highway intersection has somewhat unique geographical features, Dr. Abdel-Rahim believes that the study will be a great help in alleviating heavy congestion during these holiday periods at many types of rural intersections.

Chris Bacon worked as a research assistant for this project, helping to collect and analyze the data. From a student’s perspective, he says, this was an excellent opportunity to gain truly practical experience of what he’s learned in the classroom and to understand the value of using the actual technology. Working with ITD allowed him to get experience with their automatic traffic counters and to understand how to assemble a thorough and useful data set. Chris even went so far as to note that not only was the volume of traffic increasing during these peak periods—the types of vehicles and the people driving them were changing as well. Many of



these vehicles might not normally be classified as large or oversized, but in the hands of drivers who might be unpracticed in driving with a trailer and unfamiliar with the area, a truck with a small trailer can prove to be a rather large obstacle. It is this careful attention to detail that makes this study so useful not only to the SH-55/Banks-Lowman intersection, but also to rural intersections throughout Idaho and, on a larger scale, the country. After all, this congestion is something that effects not only holiday-makers in these areas, but also those who live and work there. This case study was able to define and provide a solution for an identified problem, and in doing so, it will offer very real results.

For more information: [http://www.webpages.uidaho.edu/niatt/Project\\_Detail.asp?Project\\_ID=206](http://www.webpages.uidaho.edu/niatt/Project_Detail.asp?Project_ID=206)

## Featured Project: “Security and Survivability of Real-Time Communication Architecture for Connected Vehicle Eco-Traffic Signal System Applications”

by **Heloise Abtahi**

Intelligent transportation systems (ITS) are an integral part of modern transportation. From collision avoidance systems to variable speed limits to emergency vehicle notification systems, the security and safety of these systems is becoming an increasingly relevant issue. ITS make the road a lot safer, but as the technology advances, so does the need to ensure their safety for drivers. Because ITS utilize wireless communications, they are vulnerable to a variety of external threats. Dr. Axel Krings, a professor in the Department of Computer Science, along with Dr. Ahmed Abdel-Rahim are looking at the reliability of the safety applications that defend ITS from “malicious behavior,” especially jammers. The project, now completed, examined in particular the reliability of these safety applications in the presence of jamming activities effecting one of the most important safety applications, the Basic Safety Message (BSM). Though the project is now completed, Dr. Abdel-Rahim says that there is room for expansion of this research, perhaps in the way of a field deployment.

In order to test the reliability of safety applications, researchers studied a range of different jamming types. The primary interest here was how the status of the “host” vehicle affected the status of “remote” vehicles. Using the Forward Collision Warning (FCW), an extremely vital safety application, as a test subject, the project proved to be successful in identifying potential threats. The FCW alerts the driver of a “host” vehicle when there is danger of a rear-end collision. This can be especially useful in low-visibility situations (i.e. fog, heavy rain, etc.). The project departs from other research in this vein by showing “an approach that uses BSM messages together with redundant messages from the existing standards to overcome BSM reliability issues.”

This project was multidisciplinary, utilizing the skills of both civil and computer engineers. A partnership with civil engineering helped with the development of different traffic scenarios, and it was a major success thanks to funding provided through TranLIVE by the University Transportation Centers US Department of Transportation award.

For more information: <http://www.uidaho.edu/engr/niatt/Copy%20of%20tranlive/projects/2012/security-and-survivability-of-real-time-communication-architecture>

## Faculty at a Glance

by Heloise Abtahi



### **Tim Frazier, Assistant Professor, Department of Geography**

Dr. Tim Frazier has been with the University of Idaho since 2009. He works with the Department of Geography, something some might consider a degree of separation away from transportation engineering, but according to Dr. Frazier, no less vital. With research focused on hazard mitigation and climate change, Dr. Frazier works to improve communities’ “resilience” through planning. His projects often straddle the gap between soft and hard sciences, but in this, NIATT provides an ideal platform for Dr. Frazier’s often interdisciplinary projects. For instance, Dr. Frazier is currently working on pedestrian evacuation planning strategies for areas affected by tsunamis. This project, though interdisciplinary and multifaceted, nonetheless focuses on the singular goal of making communities safer.

Dr. Frazier has long had a connection to transportation and evacuation even though he is not technically a transportation geographer, stretching back to his Master’s thesis (which looked at subdivision design that facilitated evacuation). It was this interest that led him to begin his work with NIATT shortly after he first started working at University of Idaho, and though he has not been affiliated for very long, he hopes that there will always be a future for a connection between his work and transportation engineering. Because NIATT has, as Dr. Frazier puts it, “a wider array in terms of research” in the the field of transportation, it is a perfect connection for his much more specific project.

### **Brian He, Associate Professor, Department of Biological and Agricultural Engineering**



Dr. Brian He has been at the University of Idaho since 2001. Originally trained as a chemical engineer, Dr. He is currently researching bioprocessing of biobased resources for renewable energy and biodiesel production technologies. He has worked on several projects through NIATT, mostly focusing on different aspects of biodiesel production. Recently, he worked on a two-phased project, “In situ transesterification of microalgal oil to produce algal biodiesel,” that looked at

methods to optimize the process of taking lipids from microalgae and processing them into biodiesel. He has also looked at producing renewable diesel from biologically-based feedstocks as well as methods to improve overall biodiesel quality.

Dr. He has worked with many students on these and other projects. When asked about his teaching strategies, Dr. He stressed his belief that students should “get their hands dirty.” It is important, he says, that what students learn from books and in the classroom prepares them to solve an actual project’s problems. With his undergraduate students, Dr. He emphasizes hands-on experience, but with his graduate students, he has higher expectations. “They are not only getting experience, they are also identifying other problems that might arise [during a project].” Dr. He says that this gives students confidence in their work and allows them to readily take on more complex problems.

## **NIATT’s Teams and Workforce Development**

### **How NIATT’s Competitive Teams Give Graduates Job Market Advantage**

**by Heloise Abtahi**

In today’s competitive job market, students are constantly searching out that little extra something to add to their resumes. “Resume-builder” is definitely the watchword these days, but projects done just for the sake of an extra line on a piece of paper rarely bring the notoriety potential candidates entering the job market want and need. Projects that students are passionate about and that teach them valuable skills are priceless experiences for both graduate and undergraduate students alike, and though NIATT has a multitude of ongoing research projects that can serve this need, they also sponsor and work with a number of student teams that allow students to not only research, design, and build, but also puts them in touch with industry leaders during statewide and national competitions. Indeed, after the Vandal Formula Hybrid Racing Team won some of the 2014 National Formula Hybrid Competition’s top awards, team members were asked to leave resumes with GM representatives and were invited by the Chrysler team for a site visit and a job interview, said the team’s faculty adviser, Dan Cordon in an email to Dean Larry Stauffer. Over the past 5 years, the team has had seven students go on to work in the automobile industry (typically, there are an average of 15 team members per year). NIATT’s Clean Snowmobile Team, too, has had three members go on to work in the automotive industry and ten go to work in the powersports industry in the last 5 years (their team is a bit larger than the Formula Hybrid Racing Team, averaging around 20 students).

One of the reasons NIATT’s team initiatives are such impressive and effective career builders is the fact that these aren’t simply a few weeks spent working on a project for a professor. Being on the Formula Hybrid Racing Team or the Clean Snowmobile Team means working with students and professors from multiple disciplines for a year or more. Many students become involved as undergraduates and then carry on working with the team as graduates. This kind of sustained and focused involvement means students become familiar not only with the technology they’re working with, but also with the tenor of the industry. NIATT student Andrew Hooper (’13, MS in Mechanical Engineering) was with University of Idaho’s Clean Snowmobile Challenge Team for 5 years. During an interview following his team’s win in 2013, Hooper, now a project engineer for Polaris, stated that working on the team was a “very big career-opportunity maker for a student.”

Working with a NIATT-sponsored team not only provides students with a “leg up” in the transportation industry, it also encourages them to carry on in that industry in the first place. Because of team members’ early and often in-depth instruction in the practical aspect of their field, students feel confident in taking on professional projects in their field. As a result, students feel

encouraged and confident entering the job market in their field rather than uncertain about their ability to perform.

As a Tier 1 center for transportation research, NIATT, as a member of TranLIVE, is already a boon for students interested in jobs in the transportation industry. But a student's involvement with a NIATT-sponsored team denotes a level of commitment to transportation that not only gives students the competitive edge as they enter the job market, but also promotes their desire to stay in the field in the first place, creating new hires that are experienced, knowledgeable, and passionate.

Funding for the Clean Snowmobile Challenge Team was provided by PacTrans Region X University Transportation Centers US Department of Transportation award. Funding for the Formula Hybrid Racing Team was provided by TranLIVE University Transportation Centers US Department of Transportation award.

## Faculty Feature: Dr. Michael Kyte

by Heloise Abtahi



Dr. Michael Kyte is and has been a key figure in NIATT's history since its start back in 1991. He served as NIATT's director from 1994 to 2009 and has seen NIATT grow from its initial group into a nationally recognized entity with an ever-broadening group of experts in multiple aspects of transportation engineering. Though he has seen a lot of change through the years, Dr. Kyte believes that NIATT still maintains itself as a remarkably close group of faculty and students that is, at its core, about the people who work there. "People [at NIATT] care about each other... it's a place people want to work." Dr. Kyte also cited NIATT's dedication to

working closely with students, noting the large number of projects allowing students to gain first-hand experience with research projects. This dedication pays off—according to Dr. Kyte, students involved with NIATT are seen as a great resource in the professional world, both locally as well as nationally.

After having worked with NIATT for so many years, Dr. Kyte has worked on more than his fair share of projects. But one of the projects he remains most proud of is his work on developing a commercial Controller Interface Device (CID) that provided a real-time interface between traffic controllers and a computer. The CID II was eventually licensed by a company in California.

This device made a lot possible, but one of its most impressive accomplishments was that it allowed the creation of a learning environment where students could gain experience with real traffic technology. Indeed, Dr. Kyte used the device during "Traffic Signal Summer Camp," a program that introduced students from universities around the United States and Canada to traffic systems technology. The program ran for about 7 years at University of Idaho with a total of 84 participants, some of whom are still in touch with Dr. Kyte. Some of the students say the program was a turning point in their education, "a big change in their life."

As he moves toward retirement, Dr. Kyte will be tapering down his time at University of Idaho to half-time starting this fall. He's looking forward to taking it a bit easier, though he still has some interesting and important projects in progress. Recently, Dr. Kyte's interests have turned towards the subject of transportation education. He's looking at new and different ways to develop curriculum for transportation engineering that takes the gap between academia and real-world application into account.



NIATT would like to extend a special thanks and well wishes to Victor House. After nearly 6 years working with NIATT and the Department of Civil Engineering, Victor is leaving for an opportunity to work with the Department of Computer Science. Best of luck Victor!

## University of Idaho

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