RESEARCH NEWS

A Publication of the Region 2, University Transportation Research Center *Fall 2006*

Estimation of Network Based Incident Delay in a Transportation Network Using Dynamic Traffic Assignment

Camille Kamga, UTRC's Assistant Director for Administration, recently completed his doctorate in Civil Engineering at the City University of New York. This article describes his dissertation research.

It is well recognized that traffic incidents contribute substantially to urban congestion. An incident is any non-recurring event that impedes the flow of traffic. Incidents can cause significant traffic congestion in directly impacted areas. Law enforcement organizations, emergency service providers, transportation agencies, and transportation information service providers are working to reduce the impacts of incidents. There has been increasing interest in the past few years into integrating public safety, emergency responses, and traffic management communications through incident management programs.

The estimation of incident delay is one of the indicators used to assess the performance of a traffic incident management (TIM) program and an essential component in a successful implementation. A TIM program cannot succeed without good estimation and prediction of prevailing traffic conditions. Non-recurring incident delay models found in the literature are either difficult to implement due to the non-availability of data and parameters used in the model or present difficulties to overcome in the finding of a comprehensible solution to the formulation of the problem. Current incident delay estimates are based on the impact of a single link that captures only the delay for travelers traversing a freeway segment upstream of the location of the incident.

The impact of an incident on a freeway in an urban area may have a network-wide effect. Most studies of **Continued on page 3**

Director's Message

Robert "Buz" Paaswell, Ph.D.

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The latest transportation legislation from Congress, SAFETEA –LU required that there be a new competition among academic institutions to be named the Regional University Transportation Centers. UTRC, the Center that serves USDOT Region 2 (NY, NJ, Puerto Rico and the Virgin Islands) submitted a proposal to be renamed the Region 2 Center and we are very pleased to tell our friends and colleagues that we were successful in being renamed.

The success arises out of the very many partnerships we have built over the last 18 years. These include partnerships with the transportation agencies throughout the region, partnership with many private firms and NGOs, partnerships with other Centers, and with the public. UTRC has worked to bridge the distance between academia and practice. In our proposal, posted on our website www.utrc2.org we strive to build new programs responsive to the needs of the early 21st Century. In the early days, UTRC was concerned with system growth and the use of micro computers in addressing transportation programs. Our new concern in 2006 and beyond demand that we address system - as - assets maintenance, quality of life, new approaches to finance, utilization of true space age technology (in 1988, there were no Google, ipod, ubiquitous cell phones, PDAs, GIS as a household tool and $300 computers with giga hertz speed), and modern and flexible approaches to management.

Our programs will add new and emerging research areas, including nanotechnology, the role of IT and computing, assessing infrastructure investments and risks, new materials and behavior of infrastructure, and complex transportation models. But the problems that these new methods will address continue to be familiar ones – congestion, infrastructure and the environment, as well as, land use, energy use, where to put the trucks and quality of transportation service. With disciplines drawn from the UTRC Institutions and partners, UTRC will provide new approaches towards solving some of these problems, while teaching and training the growing cohort of transportation professionals. Among our programs will be:

- Competitive white papers covering out of the box ideas towards solving critical problems,
- Round tables of academia, public institutions and private firms on selected topics such as the role of nanotechnology in infrastructure materials,
- A major initiative involving UTRC and Region 9 (California) to look at the rapidly growing role of freight and logistics,
- An enlarged program for workforce training, especially in areas of high technology,
- A cooperative effort with all of the regional UTCs to develop a premier transportation program via distance based learning,
- Continuation of our successful education and research programs,
- Revitalization of the Visiting Scholars Seminar series, and a discussion series on topical issues via our website.

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incident delay extrapolate the incident delay estimates by using only the vehicles that are severely affected by the incident. The existing methodologies that estimate the impact of incidents ignore the spatial and temporal characteristics of the transportation system. Furthermore, the traditional model for estimating delay ignores the changes in demand due to information provided to different roadway user groups (e.g., emergency vehicles, passenger vehicles, etc.) during the incident that may result in rerouting, destination change, postponement of departure time, or even total cancellation of the trip.

Camille Kamga's dissertation challenges the estimations of incident delay that were reported in the literature since they were not based on the totality of the trip. Dr. Kamga has developed a methodology that will produce estimates of network delay, origin-destination (OD) delay, user group delay and further explore the impacts of incident severity, incident duration, and demand on the incident-induced delay. A simulation based on the Dynamic Traffic Assignment (DTA) model was selected to analyze the impact of incidents on delay. DTA models produce the spatio-temporal trajectories of all vehicles from their origin to their destination under a simulated environment. The proposed empirical incident impact estimation methodology calculates the incident delay by taking the difference of average travel times under normal conditions and under incident conditions. The incident delay is the relative difference between the average travel time spent by a user group or individual traveler under incident conditions and the corresponding average travel time that would have been spent under non-incident conditions using DTA simulation software. This procedure avoids some of the problems in using the queuing diagram and directly provides the delay perceived by the motorists.

The overall approach in Dr. Kamga's study is to utilize the DTA capabilities. Unlike static assignment methods, which are based on average daily traffic and fail to capture the dynamic process of an incident, DTA is particularly appropriate for studying short-term planning applications such as evaluating various incident management options. In this study, a simulation-based DTA model is employed to assess the impacts of designed incident scenarios and to evaluate the effectiveness of candidate incident management plans, as well as the impacts of different traffic operation and control strategies, for the analysis period. Furthermore, the implementation of ITS technologies on the transportation network is evaluated.

DTA models have advanced considerably over the past 15 years and they are reaching an age of maturity that should provide incentives for transportation agencies, consultants and researchers to adopt them in place of traditional Static Traffic Assignment models. DTA offers many advantages of the traditional assignment methods by capturing better traffic flow dynamics for both freeway and surface street signalized systems. Dynamic Traffic Assignment models are used to estimate time-varying network conditions by capturing traffic flow and route choice behavior. A basic characteristic of these models is the utilization of a traffic simulator to emulate the traffic conditions especially for signalized systems where it is very difficult to capture the dynamics of traffic through analytical techniques. This is a

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very useful feature in modeling incident conditions and incident management strategies.

In this study, DTA principles were applied to the modeling of incident conditions in the Chicago, IL network using the Visual Interactive System for Transport Algorithms (VISTA), which is a network-enabled software that can perform dynamic traffic assignment. More specifically, the impact of incident duration on travel time and incident delay was examined through the simulation of incidents of varying duration, lanes blockage, and vehicle volume, with and without availability of incident-related traveler information. The main conclusions stemming from Dr. Kamga's study are as follows:

- ***Incidents are found to have a different impact on different OD pairs.*** By considering the OD pair distribution, one can determine the impact of the incident on vehicles depending of their departure origin, their travel path in the network, and their arrival destination. Impacts of incident on the network depend on the points of origin and destination of the vehicles.

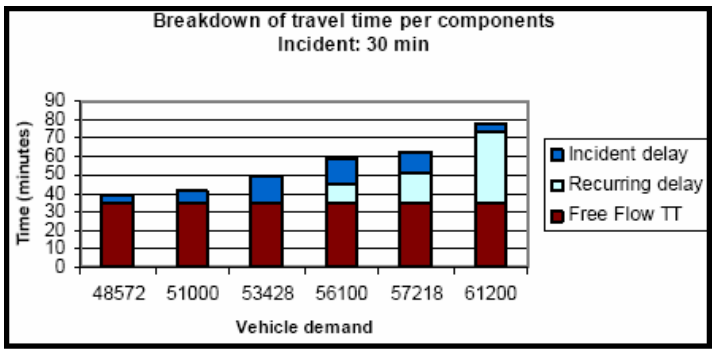
- ***The temporal distribution of the impacts of incident are important factors in the analysis of incident delay***. Delay that a vehicle will experience as a result of an incident depends on the time when the vehicle enters the affected transportation network.

- ***Incident delay has a network-wide impact on the transportation system.*** Incident delay often is reported only for the affected and upstream link. Most studies on incident delay extrapolate the incident delay estimates by using only the vehicles that are severely affected by the incident. Incidents may affect upstream traffic as well as downstream. Incidents may affect vehicles not traversing its location.

- ***The impact of the incident depends on prevailing traffic demand levels.*** Under non-congested conditions, the incident induced delay, for the overall section of the free-way, increases with the demand. However, under congested conditions, the incident delay decreases with the demand. In general, the incident delay is not proportional to the demand on the network. It is shown that when the network is operating near capacity conditions, the incident delay may be less than the corresponding delay if the network is operating on non-congested conditions.

Furthermore, availability of information on incident presence, along with availability of alternative routes with residual capacity that allow rerouting of vehicles around incident congested locations, could considerably assist in improving incident management practices. DTA could provide a powerful tool to transportation agencies to improve their existing incident management plans through the evaluation of route diversion strategies, variable message sign placement and content, construction management plans, and the production of more comprehensive estimates of incident delay. The current practice of the estimation of incident delay suffers from a major deficiency in that the network-wide effects are ignored as well as the impact of incidents to all OD pairs. DTA models could be used to produce such estimates in the absence of a comprehensive traffic monitoring system. The study of the effectiveness of providing the incident information to a selected number of drivers (e.g. those passing through VMSs or receiving information through a wireless phone service) rather than all or none is a natural extension of the work presented herein.

Breakdown of Average Travel Time Per Demand For The Overall Network



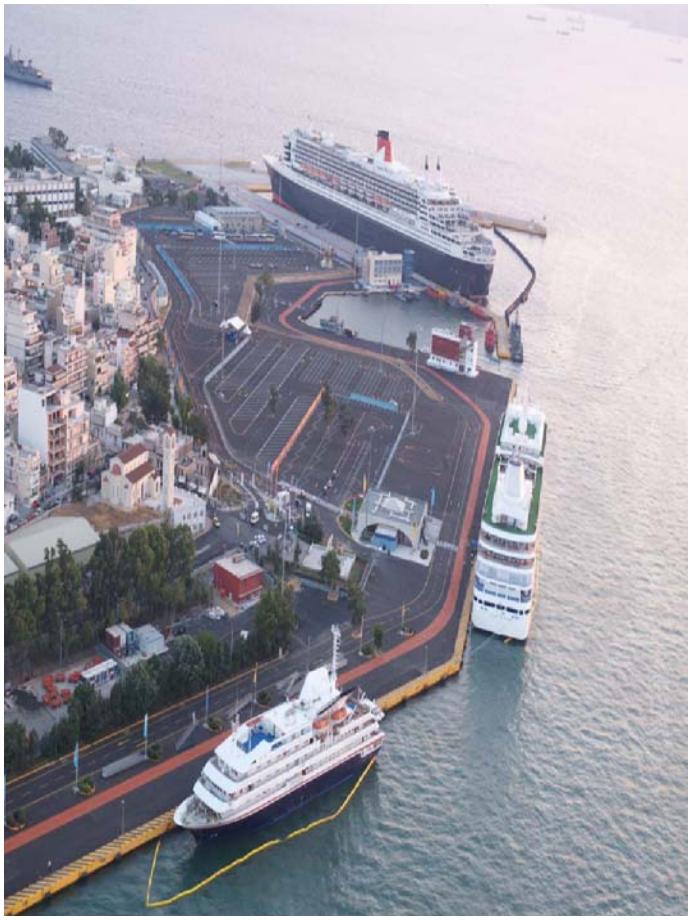
Maria Boilé Delivers Keynote Presentation at the Container Owners Association Meeting in Antwerp, Belgium

Dr. Maria Boilé , Assistant Professor of Civil Engineering at Rutgers University, and Co-Director of the Maritime Infrastructure Engineering and Management Program (MIEMP) at the Center for Advanced Infrastructure and Transportation (CAIT), delivered the keynote presentation at the 3rd Container Owners Association (COA) Members Meeting, which took place in Antwerp, Belgium on 22-23 June 2006.

The Container Owners Association is an international organization representing the common interests of all owners of freight containers. The association aims to provide global expertise, promote common standards and enhance co-operation between its members and other associated industry bodies in a number of fields.

The conference, was attended by delegates representing the ports and shipping industries and included representatives of the World Customs Organization, the European Conference or Ministers of Transport and EU DG TREN. The conference, celebrating the 50th anniversary of containerization, covered topics such as Container Positioning, Container Finance, Technology and Logistics Issues.

Professor Boilé's presentation was based on research performed by MIEMP, sponsored by the USDOT Region II University Transportation Research Center and NJDOT. The presentation focused on the issue of empty container logistics. Professor Boilé gave an overview of global container repositioning issues as well as challenges at a regional level, and presented a systems approach in optimal depot location and the feasibility of an Internet based platform for information sharing, known as a Virtual Container Yard.



Report on Visit to the IABTR Conference in Kyoto, Japan

By *Dr. Cynthia Chen*
Assistant Professor
University Transportation Research Center
Department of Civil Engineering
City College of New York /CUNY

My trip in August, 2006 from Shanghai to Kyoto, Japan was a surprisingly smooth one. It took me about two hours to fly from Shanghai to Osaka. At the Osaka airport, I transferred to the JR rail to go to Kyoto. Then at the Kyoto station, I took the subway straight to my hotel. Compared to Tokyo boasting a cosmopolitan flavor, Kyoto is a small and well-maintained historic city with a sense of peace and tranquility. Kyoto University, a top university in Japan is located in this city. It was also the location of the 11th International Association of Travel Behavior Research (IATBR) conference in August, 2006. The IATBR is an association of internationally linked

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researchers who are interested in understanding people's activity and travel patterns.

The conference started on August 16th and ended on August 20th, 2006 at Kyoto University. The conference was broken into a number of workshops with varying themes, including "dynamics of travel behavior", "data collection and analysis", "advanced travel models", "social networks and telecommunications", "accessibility analysis", "mobility and travel analysis in developing countries", "road pricing policies", "safety and security issues", and "group behavior".

Representing Region II University Transportation Research Center (UTRC) and City College of New York in the U.S., I made two presentations at the conference. The first presentation was titled "What Does it Take People to Change? A Time Question" and was the result of my collaborative work with Mr. Xiaoqiang Chen, a Ph.D. student at City College of New York. Instead of examining behavioral triggers on the activity and travel behavior change, we focused on the response lag of the time use behavior. We realize that behavioral response is not instantaneous and often has a response lag between the trigger and the response. In this work, we used the 1989-2002 Puget Sound Panel Dataset to examine how a response lag of a significant change in time allocation to discretionary activities and travel is affected by various factors after a home relocation change. To analyze these effects, we developed a survival model that accommodated left-censoring, partial observation, and multi-type event for this work. We included three types of variables in the model: the built environment variables (e.g., the number of discretionary activities around home), the temporal constraints related variables (the amount of mandatory time allocation), and the socio-economic variables. It was found that temporal constraints related variables play the most important role in affecting the response lag. We also found that as time progresses, the probability of having a significant change in the time allocation to discretionary activities and associated travel will decrease.

The second presentation I made was titled "The Evolution of Accessibility Over Time" by myself and Dr. Mei-Po Kwan of Ohio State University. In this study, we analyzed the relationship between integral accessibility and space-time accessibility, using the 1989-2002 Puget Sound Panel Dataset. Integral accessibility measures how accessible a place is. Transportation and urban planners are most familiar with this measure, as they often use it to measure the progress of an area. Space-time accessibility, on the other hand, measures an individual's ability to access, given his or her spatial and temporal constraints. The results of this study suggest that space-time accessibility explains time use allocation behavior better than the traditional integral accessibilities. Furthermore, we found that integral accessibility is not necessarily related to space-time accessibility. The results of this research again point out the importance of paying more attention to people's temporal constraints.

Robert Baker -UTRC, Sandeep Mudigonda– Rutgers University, Camille Crichton-Summners– NJDOT

NJDOT Student Award

Sandeep Mudigonda, Rutgers University

Mr. Sandeep Mugdigonda received the 2006 NJDOT Research Showcase Student award for his work in "Cost of Transporting People" project for the NJDOT. Sandeep received his undergraduate degree in CEE from IIT Madras in India which is the top Civil Engineering program in India. He joined Rutgers University in 2003 and received his MS degree in the Fall of 2006 under the guidance of Professor Kaan Ozbay. He is currently a first year Ph.D. Student in the CEE program at Rutgers University. Sandeep worked on various research projects including the "Cost of Transporting People in New Jersey" funded by UTRC and NJDOT. Sandeep is the co-author of a number of papers and he will present his latest work at the 2007 TRB Annual conference that will be held in Washington D.C.

USDOT Awards Regional UTC Grant to City University of New York

The U.S. Department of Transportation (USDOT) recently named UTRC as the Regional Center serving Region II (New York, New Jersey, Puerto Rico and the U.S. Virgin Islands) through 2009. Congress began establishing university transportation centers in 1987 in recognition of transportation's crucial role in America's economy and quality of life. CUNY organized UTRC as a 12-university consortium, and became one of the original ten centers established nationwide. It successfully recompeted to host the center in 1994, 1999, and now 2006.

The UTRC will receive $6.25 million from the USDOT over the three-year period, as follows: $2 million annually during 2007 and 2008; and $2.25 million in 2009. Combined with matching funds to be raised by the Center, total funding through 2009 will be $12.5 million.

The Center's mission is to resolve regional and national transportation problems and serve as a training ground for transportation professionals. It is headquartered at the CUNY Institute for Transportation Systems at City College, and is active in research, education, and technology transfer projects in all academic disciplines relevant to transportation.

UTRC's Director, Dr. Robert E. Paaswell, University Distinguished Professor of Civil Engineering at City College, said: "this is the fourth time the Center has been named the lead institution in Region II in a highly competitive process. During the next three years," he added, "we will continue to expand the UTRC's role as an influential national leader in transportation education, research and technology."

UTRC's proposal included a number of innovative new elements. These new efforts included partnerships with advanced technology research centers, funding for research by junior faculty members, new cooperative efforts in transportation curriculum development, a renewed emphasis on helping agencies implement the results of research projects, and many other new programs. These will be launched over the next year. With this new funding cycle, UTRC is also pleased to welcome two new consortium members, Rowan University and the New Jersey Institute of Technology. We look forward to working with these new partners.

USDOT Awards Tier I UTC Grant To Rutgers University

Dr. Ali Maher, Director,
Center for Advanced Infrastructure and Technology

Rutgers' Center for Advanced Infrastructure and Transportation (CAIT) has won a rigorous national competition for funding – $1 million per year through the end of 2009 – as a Tier I University Transportation Center of the U.S. Department of Transportation (DOT).

"This federal grant recognizes the quality of the research conducted at CAIT and acknowledges the center's contributions to stakeholders such as the New Jersey Department of Transportation and the Port Authority of New York and New Jersey," said Richard L. McCormick, president of Rutgers, The State University of New Jersey. "CAIT is critical to forming a broad research alliance within the School of Engineering and across education, government and industry."

CAIT competed with 36 top engineering schools to become one of 10 Tier I centers in the country. The center held that distinction during the previous six-year funding cycle, but only five of the original 10 Tier I center were winners this time around. Tier I centers advance U.S. technology and expertise in the many disciplines comprising transportation through the mechanisms of research, education and technology transfer.

"More than the money, it's really the prestige," said Ali Maher, CAIT director and chair of civil and environmental engineering at Rutgers. "We are now in the company of major engineering schools with other Tier I centers such as Georgia Institute of Technology,

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University of Michigan and Iowa State University, a position that gives credence to the high standard of our operation."

CAIT is a dynamic enterprise whose activities extend far beyond the borders of the university's campuses in providing service to the citizens of New Jersey with research, education, local assistance and workforce training programs. It helps address the needs of the state's aging transportation infrastructure to handle population growth and serve as an international gateway for goods and people, Maher said.

It pursues innovative solutions to crucial infrastructure challenges, such as expediting freight movement through harbors, enhancing port security, developing pipeline safety and security programs, improving road durability, and implementing traffic analysis and forecasting systems. CAIT also provides safety training to highway workers, law enforcement personnel and local communities.

In addition to its funding from the U. S. Department of Transportation, CAIT receives support from the Federal Highway Administration and the New Jersey Department of Transportation. The center conducts between $4 million and $6 million in research annually, in collaboration with the Alan M. Voorhees Transportation Center.

Brenda Cruz UTRC Student of the Year Award

Brenda Cruz has been chosen as 2005 Student of the Year by the University Transportation Research Center. Students of the year are selected on technical merit, research, academic performance, professionalism, and leadership. Ms. Cruz was an outstanding participant in the NYSDOT sponsored university research project "Potential for Off-Peak Deliveries to Commercial Urban Areas", which was conducted by the Rensselaer Polytechnic Institute on behalf of NYSDOT and was presented at NYMTC last year.

Ms. Cruz has also received national recognition as the recipient of the 2005 Charley V. Wootan Memorial Award, for Outstanding Masters Thesis in Transportation Policy and Planning, completed this summer at the Rensselaer Polytechnic Institute (RPI). The Wootan Award was established by the Council of University Transportation Centers (CUTC), an organization that brings together university based transportation centers and transportation programs across the U.S. Ms. Cruz' thesis, "On the Definition of Policies to Foster Off-Peak Commercial Deliveries to Congested Urban Areas," is considered groundbreaking in this area. A native of Puerto Rico, she received a Master of Science in Transportation Engineering from RPI in 2005 and a Bachelor of Science (*Magna Cum Laude*) in Industrial Engineering from the University of Puerto Rico, Mayagüez in May 2002. She has also served as treasurer of the Alpha Pi Mu National Honor Society; a member of the Society of Hispanic Professional Engineers (SHPE); and a member of the Golden Key National Honor Society.

Ms. Cruz joined NYSDOT as a Junior Engineer in the Statewide Policy Development Section last year. She is currently working in the Statewide Policy Development section, helping to shape the future of corridor and freight policy in the State.

New Jersey Department of Transportation Research Showcase

The New Jersey Department of Transportation's Annual Research Showcase was held at the College of New Jersey in Ewing, New Jersey on October 27, 2006. The conference highlights NJDOT research activities that are being conducted and were completed by it's University partners. Engineers from NJDOT and surrounding State DOTs attend the one day conference. This year, UTRC presented the results of five research studies that are sponsored by the NJDOT. The five studies are presented below:

Traffic Mobility and Real-Time Congestion Management: A Case Study for Lower Manhattan

Dr. John Falcocchio
Polytechnic University
University Transportation Research Center

The purpose of this paper is to propose a framework for a pro-active, "real time" traffic congestion management. Using Lower Manhattan as a case study, it will be shown that network traffic speed is determined by the number of vehicles in the traffic network (vehicle accumulation) at that time. Real time monitoring of traffic entering and leaving the road network by the Traffic Management Center (TMC) will make it possible to monitor the area's vehicle accumulation, which is the key factor in determining traffic speed, and hence traffic mobility (measured in vehicles-miles per hour). By controlling vehicle accumulation through readily available traffic supply and demand strategies, it will be possible to achieve traffic speed levels that will maximize traffic mobility at any time of the day.

John Falcocchio is Co-Principal Investigator for Polytechnic University at ICIS, and is Professor of Transportation Planning and Director of the Urban Intelligent Transportation Systems (ITS) Center at Polytechnic University in New York, where he has been a member of the faculty for 22 years. Dr. Falcocchio's expertise in the area of transportation includes traffic and transportation studies, transportation systems analysis, travel demand and transportation system management, traffic congestion and air pollution reduction strategies, coordination of land use and transportation, and intelligent transportation systems. Dr. Falcocchio is an author and co-author of many technical papers and one book. Education: B.C.E., Polytechnic Institute of Brooklyn; Traffic Engineer Certificate, Bureau of Highway Traffic, Yale University; M.S., Transportation Planning, Polytechnic Institute of Brooklyn; and Ph.D., Transportation Planning, Polytechnic Institute of Brooklyn.

Medical Review Case Reporting

Dr. Naomi Rotter, New Jersey Institute of Technology
and Dr. Claire McKnight,
University Transportation Research Center

To deal with a problem of underreporting of high risk and/or unsafe drivers to its Driver Review Bureau, the Motor Vehicle Commission of New Jersey seeks to understand the state of practice in other driver licensing agencies with regard to medical review procedures and particularly both internal and external referral processes. This research, through literature review and an in-depth phone interview of heads of driver safety units, medical review units or managerial personnel in seventeen driver licensing agencies in the United States has identified a series of procedures that link to high referral rates. Typically, states with high referral rates tend to ask several specific questions regarding health at the time of initial application for license and again at renewal. These states also trained their customer service or counter personnel in observational techniques to identify applicants with potential medical problems that could make them unsafe drivers, mandatory physician reporting of specific medical conditions was another strategy that led to higher than typical referral rates. Interviewees stressed the importance of obtaining accurate information and good relationships with the medical and law enforcement communities. Another area that appears useful for increasing referrals is better integration of accident reporting information and medical review units. These findings will form the basis of recommendations to the New Jersey Motor Vehicle Commission for more pro-active policies in obtaining both internal and external referrals.

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Mobile Work Zone Protection Device (Balsi Beam)

Robert F Baker,
Transportation Research Engineer
University Transportation Research Center

This project focuses on the fabrication and implementation of the Balsi Beam which is a truck mounted, moveable, expandable beam that provides positive work zone protection comparable to a fixed concrete barrier. It is specifically intended to enhance worker safety when carrying out shoulder repair in work zones adjacent to guardrails, inlet repair, bridge rails, bridge deck repair, sound walls and other work where workers are normally exposed to traffic or behind cones in limited work areas for several hours. Usually the shadow vehicle or the truck mounted attenuator provides protection from rear end collisions; the new device provides protection from adjacent lane traffic. The Balsi Beam provides positive, steel beam protection system for exposed workers who normally work behind temporary cones and barrels in limited work areas. The TL-3 crash test at the Texas Transportation Institute shows that the beam does not deflect as conventional unpinned portable concrete median barrier in such crashes. The Balsi Beam is practically applicable to bridge and concrete repair projects where workers are concentrated in small areas over a one day period or less.

Evaluation of the Performance of Permanent Pavement Markings: Some Implications for NJDOT

Dr. Neville A. Parker,
City University of New York
University Transportation Research Center

As an implementation strategy of the federal retroreflectivity standards requirement for pavement markings, New Jersey Department of Transportation (NJDOT) undertook to evaluate their three-year fixed-schedule re-striping strategy, to see if it was consistent with the actual service life of the pavement markings. The methodology and the results of the study conducted in 2001-2002 are presented, as well as some implications for future strategies. Two types of data were collected: measured retroreflectivity by LaserLux, and subjective ratings from a survey done by the New Jersey driving public along a 32 mile circuit. Interim Visibility Indices (IVI) were developed for each age group based on pavement marking type, for use by NJDOT in determining and prioritizing needs and quantification of related resources required, based on the threshold between acceptable retroreflectivity and unacceptable retroreflectivity, when developing their pavement marking management system. It is suggested that this will also allow for cost benefit/life cycle analysis for different pavement marking materials.

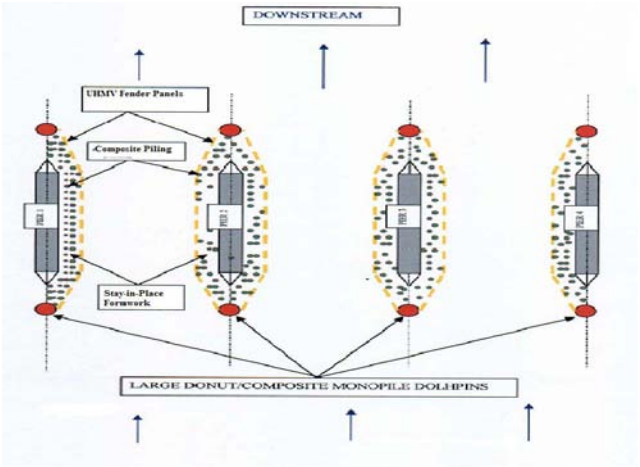
Dr. Parker is a Herbert Kayser Professor of Civil Engineering and Director for the CUNY Institute for Transportation Systems. He is a 1965 graduate of the school and has been director of the institute since 1989. Professor Parker was among those selected recently by the Daily News as the top 25 African-American leaders in the fields of education, science and medicine in New York City.

More information can be found on Events, Presentations and Seminars and PowerPoint Presentations on our web site:
WWW.UTRC2.org

Energy Absorbing Bridge Pier Fender Systems: A Survey and Recommendations

Dr. Neville A. Parker,
City University of New York
University Transportation Research Center

An overview of the results of a survey of energy absorbing bridge pier fender systems is presented. The survey had the following objectives: 1) identify existing technology which has been used for bridge fender protective systems by other states or countries; 2) identify state-of-the-art systems that are of the energy absorbing/ impact deflecting variety, and that are either currently in use or commercial scale; and 3) rate the designs based on cost benefit criteria from best to worst. The existing technologies were identified and grouped into six main system categories, as follows: 1) pile supported; 2) retractable; 3) rubber; 4) gravity; 5) hydraulic; and 6) floating, with their advantages and disadvantages listed. Three state-of-the-art systems currently in use were identified, as follows: 1) cellular sheet pile dolphin and fenders; 2) donut monopile fenders; and 3) composite pile, fender and dolphin. The survey also studied the impacts of major ship collisions with bridges, in terms of bridge and vessel/barge damage, loss of life, and the environment, noting the fender system characteristics associated with the collisions. Based on these observations, and on the costs associated with recovery, it was recommended that a pier protection system composed of "hardcore composite pile dolphins, composite tubular piles with stay-in-place formwork surrounded by composite ultra high molecular weight fender panels", be adopted as the most cost-effective state-of-the-art system, with the lowest life-cycle costs. A schematic of the recommended system is also presented.



September 11th Memorial Program Update

The University Transportation Research Center has continued to work with the New York Metropolitan Transportation Council to administer NYMTC's September 11th Memorial Program for Regional Transportation Planning – Academic Initiative. This program was established to honor three colleagues lost in the attack on the World Trade Center, Ignatius Adanga, Charles Lesperance, and See Wong Shum. It designed this program to educate and motivate people interested in transportation technology and planning and to encourage innovations in planning activities throughout the region. The program's Academic Initiative provides tuition and stipend support to talented graduate students from across the region for internships and independent research projects.

SEPTEMBER 11TH MEMORIAL PROGRAM
NYMTC
FOR REGIONAL TRANSPORTATION PLANNING
IN MEMORY OF
IGNATIUS ADANGA
CHARLES LESPERANCE
SEE WONG SHUM

On September 21, 2006, NYMTC announced the second group of students chosen to participate in this program. They include:

Amit Arora, a masters student in Urban Planning at Rutgers University. She will conduct an independent research project on off-street parking regulations and supply/demand issues in the NYMTC region, under the guidance of her advisor, Prof. Dan Chatman, and Angelina Foster of NYMTC.

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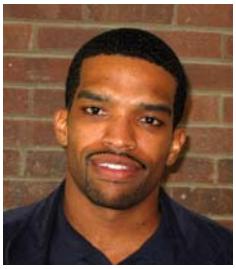
Richard Barone, a masters student in Urban Planning at Columbia University. He will be doing an internship with NYMTC's Technical Group to develop new regional strategies for data sharing and web-based analysis tools.

Xiaoqiang Chen, a doctoral student in Civil Engineering at City College. He will conduct an independent research project on the relationship between land use and transit ridership behavior, under the guidance of his advisor, Prof. Cynthia Chen, and James Barry of MTA New York City Transit.



Michael Silas, a doctoral student in Civil Engineering at Rennselaer Polytechnic Institute. He will conduct an independent research project on modeling firms' responses to incentives for off-peak freight deliveries in New York City, under the guidance of his advisor, Prof. José Holguín-Veras, and Nathan Erlbaum of the New York State Department of Transportation.

Final presentations by 2005-06 participants

On October 18th, 2006, the four students who participated in the 2005-06 Academic Initiative presented their work at a NYMTC Brown Bag Lunch Seminar.

David Dayu Zhang, reviewed the highlights and key outcomes of the major NYMTC conference, "Good to Go – Transit Options for Older Adults," which was held on Sept. 26, 2006. A recent graduate of the urban planning program at Columbia University, Mr. Zhang worked with NYMTC to help plan this and other regional policy conferences.

Wei Li described the findings of her research on transportation services for the region's aging population. As a student in Civil Engineering at CUNY, she gathered data on the characteristics of transit services for seniors in Westchester County, through interviews and data analysis.

Jeevanjot Singh, a Civil Engineering student at Rutgers University, described her work examining time-of-day pricing in public transit, on behalf of the Westchester County Department of Transportation. She has researched how these strategies are being used in bus systems nationwide, and developed models to estimate how their introduction would affect travel behavior in Westchester County.

Li Chen, a student in Civil Engineering at CUNY, described her work assisting the New York City Department of Transportation with its West Side Manhattan Traffic and Transportation Study. She has helped the DOT launch this study and assess existing traffic, pedestrian, bicycle, safety and land use conditions in this rapidly evolving area on the edge of the region's central business district.

For more information on the Sept. 11th Memorial Program, including the final presentations from last year's participants, please visit our website at: http://www.utrc2.orgeducation/911memorial.php

Reliable Neighborcast: A New Communications Paradigm for Vehicle-to-Vehicle Applications

NYMTC Technology Transfer Seminar

Dr. Nicholas F. Maxemchuk
Professor, Electrical Engineering, Columbia University

This presentation described a set of applications for vehicle-to-vehicle networks, a new communication paradigm called "Reliable Neighborcast," and a protocol, RNP, that implements reliable neighborcast.

Vehicle-to-vehicle networks use wireless links to communicate between nearby trains, planes or automobiles. The networks are used to provide warnings and coordinate the operation of the vehicles. The applications 1. provide safer, more fuel efficient use of trains, planes and automobiles, 2. increase the volume of traffic that can be handled by existing airports, highways and railways, thereby reducing the need to construct new transportation facilities, and, 3. can lead to new ways to use subways and buses to make mass transit faster and more convenient. The applications are implemented on ad hoc networks and do not require a large investment in new networking infrastructure. In the applications that we describe, each vehicle communicates with a set of nearby vehicles. The set of nearby vehicles is a vehicle's neighborhood. Every vehicle has a different set of neighbors, and the sets of neighbors change as vehicles move with respect to one another. The applications require reliable delivery, delay bounds and message sequencing, in order for the vehicles to operate safely.

Reliable broadcast or multicast protocols are not adequate for vehicle-to-vehicle applications. These protocols provide message delivery guarantees to all of the members of a group. In vehicle-to-vehicle applications the group of vehicles may be very large and cover a large area. For instance, in an automotive application the group may consist of all of automobiles on a highway. However, vehicles do not use the information from vehicles that are far away, and providing the delivery guarantees to the entire group results in messages being forwarded and recovered unnecessarily. Reliable neighborcast is more focused and only provides the delivery guarantees to those vehicles that need a message.

RNP is a protocol that implements reliable multicast. It guarantees that:
1. a vehicle reliably receives the messages transmitted by all of its neighbors,
2. messages that are received by multiple vehicles are placed in the same order at each of the vehicles, and
3. a vehicle knows which other vehicles have received each message that it receives. Most group communications protocols that have changing groups are quasi-stationary. They provide guarantees to a fixed group of receivers, use a different protocol to change the group, then provide the guarantees to the new group.

RNP is a dynamic protocol. It uses a voting procedure to continuously change the group as the protocol operates. This makes RNP well suited to the rapidly changing groups in vehicle-to-vehicle networks. RNP efficiently uses the limited bandwidth in the wireless network. Messages are broadcast and there are between 1 and 4 control messages per transmitted message depending on the dimensionality of the network. A highway is a 1-dimensional network, the surface of an airfield is a 2-dimensional network, and an air space is a 3-dimensional network. RNP provides the guarantees within a delay bound. It quickly provides guarantees that all of the receivers in the neighborhood have recovered and sequenced a message, independent of the number of receivers in the neighborhood. In a time that is proportional to the number of receivers in the neighborhood, it learns which receivers are in the neighborhood and which neighbors have acquired the message. The trade-off between delay and guarantees makes RNP useful in a range of applications that require different guarantees.

For more information and a full list of past events, many with their full PowerPoint presentations, please visit our web site:

http://www.utrc2.org/events/past.php

NYSDOT Commissioner Thomas J. Madison, Jr. welcomed participants and spoke about the importance of linking transportation planning with land use planning.

Advancing the Transportation-Land Use Connection

The New York State Quality Communities Workshop, "Advancing the Transportation-Land Use Connection," was held in Binghamton on June 13, 2006. The New York State Department of Transportation (NYSDOT), Department of State, and Department of Environmental Conservation sponsored the event with the assistance of the University Transportation Research Center. The event attracted over 150 participants from state and local governments, regional organizations, universities, businesses, and citizens' organizations from throughout New York State. The workshop discussed New York State's approach to integrating transportation investment decisions with community land use planning. It featured presentations for New York State Lieutenant Governor Mary O. Donohue, NYSDOT Commissioner Thomas J. Madison, Jr., senior NYSDOT staff, and planners working around the state to introduce new approaches for how to improve the interface between the transportation system and the communities it serves. It was intended to provide input to NYSDOT as it develops a strategy for encouraging and supporting greater transportation and land use coordination in the future. The conference included breakout sessions featuring innovative practices from across the state to stimulate discussion and identify ideas for action.

More information on the conference can be found at UTRC's website: www.utrc2.org

NYMTC Conference on Transit for Seniors

by D. Dayu Zhang
NYMTC

On September 26th 2006, NYMTC held the conference, "Good to Go: Transit Options for Older Adults at New York University. The conference was organized by NYMTC, the NYU Wagner Rudin Center for Transportation Planning and Management, and the American Association of Retired Persons, and was co-sponsored by UTRC. Over 240 people attended the event, the largest in NYMTC's history.

The conference featured a keynote address by James Simpson, the recently-confirmed Administrator of the Federal Transit Administration. He spoke about the importance of transit to the large and growing segment of the population becoming seniors. The two panel sections that followed highlighted key issues and strategies for improving transit services for the region's older residents. Panelists pointed out that different needs, different purposes of trips and different age groups must be addressed differently by suggesting "one size does not fit all"; the critical connection between land use and transit is essential in address the problem of low transit usage by the older population. The discussions also presented the efforts paid by Federal and State agencies, but many emphasized the importance of customer and community involvement, and local and regional level coordination, which one panelist suggested needs to have more resources attached to it to make it effective. The importance of local land use planning was particularly emphasized.

In concluding the conference, NYMTC Executive Joel Ettinger announced a further partnership between NYMTC and AARP to meet with local agencies at a county or borough level to discuss more specific follow-up efforts. NYMTC would work closely with the County Executives and Borough Presidents. These would include listening sessions or workshops at the neighborhood level, to cover issues and concerns raised from the conference, as well as issues which were not discussed, such as problems experienced by older drivers. Mr. Ettinger further announced NYMTC will be holding a series of regional transportation conferences on other critical issues in future to fulfill its role as the region's transportation collaborative forum.

As the beginning of a series of NYMTC regional conference on critical transportation issues, the focus of this conference was transit issues and challenges for the region's aging population.