The Signal

Advanced Traffic Analysis Center Offers Technology Support

ATAC's Traffic Data Collection System features video detection.

ATAC Builds Relationship with the North Dakota Department of Transportation

by Jerry Horner, NDDOT

The North Dakota Department of Transportation (NDDOT) strives to provide safe and efficient transportation to support the mobility needs of its residents and businesses. Several challenges greatly influence the transportation system in North Dakota, such as low population density, migration of state population to urban centers, and shortages in available transportation funds.

These challenges are best addressed through enhanced decision making, supported by accurate data and state-of-the-art analysis tools. Technology, in the areas of information and Intelligent Transportation Systems, can also enhance the performance of the transportation system. Therefore, the NDDOT is committed to its partnership with North Dakota State University in supporting the Advanced Traffic Analysis Center.

The NDDOT is using the ATAC as a resource for cutting-edge technical solutions, as well as an investment in the future of North Dakota, which will yield qualified engineers who can effectively operate the state's transportation system. This partnership has been and will continue to be a win-win relationship for the NDDOT, NDSU, and the entire region.

by Ayman Smadi

Welcome to the first issue of The Signal, a newsletter dedicated to reporting information about the Advanced Traffic Analysis Center (ATAC) and its activities. The ATAC was established at North Dakota State University in 1998 as a Technology Support Center to address transportation needs and issues of small-to-medium size cities.

We believe small-medium cities and urban areas are special! Not only are they home to about 25 percent of the U.S. population (or roughly over 50 million residents), but these areas provide critical economic, social, health and cultural opportunities for vast surrounding rural areas. According to census estimates, these areas experienced the largest growth among urban and metropolitan areas in the US. As a result, these areas also experienced the highest growth in traffic levels and traffic congestion. At the same time, small-to-medium size cities generally have modest resources to meet the increasing transportation challenges. Customer demands, limited budgets, resistence to additional taxes, heightened environmental standards, and advances in information technology all influence transportation decisions and contribute to their complexities.

The ATAC program was developed with those challenges in mind, with extensive input from local, state, federal, and private sector partners. The goal of ATAC is to focus on enhancing transportation systems in small-to-medium size cities through the use of advanced traffic analysis and ITS solutions to safety and mobility problems. We believe that the analysis capabilities we have developed are valuable for supporting various transportation decisions, ranging from evaluating proposed roadway designs to enhancing traffic operations. We are working on building a knowledge base on ITS planning, evaluation, and deployment which targets rural and small-medium size urban areas.

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Dr. Ayman Smadi	Director
Shawn Birst	Traffic Engineer
Kiel Ova	Traffic Engineer
Mary Marquart	Administrative Assistant
Mohammad Smadi	Graduate Assistant
Matthew Martimo	Graduate Assistant
Amy McAdoo	Graduate Assistant
Sonya Nelson	Graduate Assistant
Jason Gates	Research Assistant
Jeff Johnson	Research Assistant
Jessica Green	Research Assistant
Maria Barnhardt	Research Assistant
Ross Lagasse	Research Assistant

ATAC is a Critical Element of UGPTI Program

by Gene Griffin, Upper Great Plains Transportation Institute Director

Mobility is prized by U.S. residents as one of the most important characteristics of our advanced socio-economic system. It is that mobility that underpins the justification for the *Advanced Traffic Analysis Center* (ATAC) at North Dakota State University. The ATAC was established to improve traffic management in small-to-medium sized urban areas, typical to North Dakota and many other rural areas. This is critical to the quality of life and the future growth of local economies for several reasons.

First, the timely and efficient movement of people and freight is important to our future success as a society in a fast paced domestic and global economy. Without superior mobility time is wasted and scarce resources are poorly utilized.

Second, small-to-medium size urban areas have an opportunity to avoid the mistakes that have been made in the largest metropolitan areas. It may take years and billions of dollars to mitigate traffic congestion in the largest U.S. cities, and in fact, the problem may not be solvable. On the other hand, advanced traffic management combined with careful land use planning can help the growing cities avoid these huge and costly mistakes.

Finally, safety is a concern. Traffic fatalities and injuries due to highway crashes continue to plague our society. Advanced traffic management applications in small and medium sized cities can improve traffic safety providing untold benefits in actual economic saving not to mention the reduction in personal anguish.

These fundamental reasons make the ATAC a valuable resource in advancing the state-of-the-art in traffic management and assisting in implementing cutting edge solutions. We look forward to supporting the ATAC program as an essential part of the UGPTI.

System Collects Traffic Data

by Kiel Ova

The Traffic Data Collection System (TDCS) was designed and developed by the ATAC as a state-of-the-art data collection system and surveillance unit. This system is capable of collecting detailed traffic data and can support Intelligent Transportation System (ITS) applications, such as freeway incident detection. The TDCS is a tool that allows the ATAC to perform various research, from video detection applications to work zone management.

The Autoscope Wide Area Video Vehicle Detection System developed by Image Sensing Systems Inc., is the core technology behind the TDCS. Autoscope collects traffic information such as volume, turning percentages, speeds, queue lengths, and incident occurrences. The system can be readily adapted to communicate with traffic controllers for vehicle detection.

The TDCS is a mobile unit that can be set up quickly and without disrupting traffic. A self-contained power source allows the system to be deployed for up to eight hours without the need for personnel. In addition, the TDCS can operate during various lighting conditions and in non-ideal weather conditions.

## Incident Management in Small to Medium-Sized Cities

by Shawn Birst

Congestion on freeways, which adversely affects the economy, environment, and quality of life, continues to be a major problem in the United States. Minor incidents, such as traffic accidents, stalled vehicles, special events and road construction/maintenance account for the majority of urban freeway congestion.

Many large metropolitan areas have implemented Incident Management Systems (IMS) to alleviate congestion and safety problems associated with incidents. These systems provide motorists with timely and accurate information to avoid incident locations, and as a result, reduce potential delays. However, little is known about the possible benefits of IMS in smaller urban areas.

This study examined the feasibility of implementing IMS in small-to-medium size urban areas using a case study of the I-29 corridor in Fargo, ND. Since an IMS was not available for evaluation, a traffic simulation model was used to assess the benefits of IMS. In the analysis, two main IM components were examined: traveler information and traffic control. Motorists would receive information about incident delays via various methods, such as VMS, and can therefore avoid incident locations. Enhanced traffic control and management would facilitate traffic operations on alternative routes and accommodate increased traffic.

Indirectly and directly related to these is the institutional framework that would coordinate these activities to compare base cases to ITS enhanced cases.

The INTEGRATION traffic simulation model was used to evaluate the impact of a 20-minute incident blocking one lane and estimate traffic delays with and without IMS. The case study analysis revealed that the combination of traveler information and traffic control/management provide the largest reduction in traffic delays. The case study analysis revealed that the combination ATIS and ATMS provided the most favorable network benefits under the 20-minute incident. The IMS reduced incident travel times by 13 percent (city arterials), 28 percent (freeways), and 18 percent (overall network); average trip times were reduced by 20 percent (overall network); and average speeds increased by 21 percent (overall network).
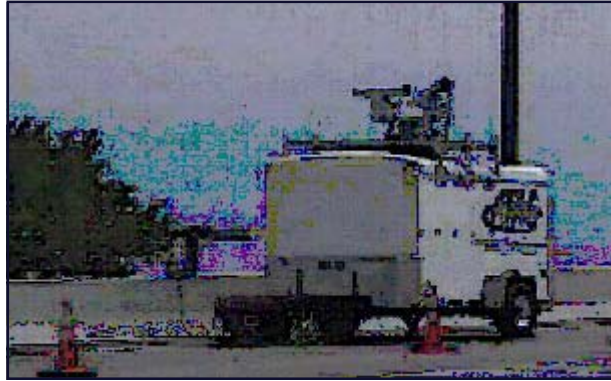
North Dakota Intelligent Transportation Systems for Commercial Vehicle Operations

by Ayman Smadi

The Advanced Traffic Analysis Center assisted the North Dakota Department of Transportation and the North Dakota Highway Patrol in developing an intelligent transportation systems commercial vehicle operations business plan. This plan will guide ITS/CVO deployment in North Dakota.

Guided by a steering committee of state agencies and private motor carriers, the plan identifies critical issues related to current commercial vehicle operations in the state, including administrative process and registration. It also includes credentials, safety assurance and information/data needs.

Opportunities for improving current systems are discussed in the plan. They include updating the existing registration and titling system, improving crash data collection and analysis. The opportunities also involve partnering with other states in the region, participating and taking advantage of opportunities within trade corridor consortiums.

Trailer continued from page 2

The TDCS consists of two video cameras and pan/tilt devices mounted on a 42-foot telescoping mast. The Autoscope system processes the video images based on user input and records the data. In addition the images are recorded using time-lapse recorders. All components are rack-mounted in a mobile cart, which allows for further analysis of VHS tapes in the ATAC laboratory when the system is not needed.

ATAC personnel have used the system in the Fargo/Moorhead area for intersection data collection, work zone speech measurements, and pedestrian counts. Train detection analysis was also completed in Moorhead, Minnesota.

We are currently evaluating the video detection system and comparing the performance to traditional data collection devices, such as tube and magnetic counters. Future studies will include analysis of other video detection devices. For further information on the TDCS, contact Kiel Ova at kiel@atacenter.org

VISSIM TRAINING

VISSIM

VISSIM is a powerful traffic simulation tool which supports decisions relative to traffic operations, transit operations, planning, ITS decision making, and traffic impact assessment. Transportation and traffic engineers, planners and system operators are encouraged to attend.

The VISSIM Training Course

The VISSIM Basic Course is designed to provide the user with the necessary training to effectively use VISSIM. This basic course is intended for individuals with varying levels of experience using VISSIM, from beginner to intermediate. The first part of the course will explain the advantages of using traffic simulation and illustrate possible applications. Materials are arranged to guide the user in building VISSIM networks, representing traffic characteristics, modeling traffic control features, running the model, interpreting results, and using advanced network features. The course incorporates case studies and class problems to maximize the learning experience.

Instructors

The VISSIM Basic Course will be taught by a team from the Advanced Traffic Analysis Center at North Dakota State University. The ATAC team has been working over the past three years on the application of advanced models to support transportation decisions. The team has experience in developing and evaluating traffic simulation networks and illustrating how these tools could greatly enhance decision making. Over the past couple of years, ATAC staff have become experienced in using VISSIM for various applications.

Continuing Education Units

NDSU's Division of Continuing Education will award participants 1.7 Continuing Education Units (CEUs) for attending the VISSIM Basic Course.

Training Locations and Dates

Bloomington, Minnesota   June 18-20, 2001

Chicago, Illinois   August 16-17, 2001
* Prior to ITE 2001 Annual Meeting

Registration

The fee for the VISSIM Basic Course is $950. Agencies registering three or more individuals will receive a $50 discount per person if registrations are received prior to the registration deadlines. The registration fee includes instruction, course materials, a training manual and computer equipment. Continental breakfasts and refreshment breaks will also be provided. Registration must be received by the deadline specified for the training location. Information received after the deadline will be accepted on a space available basis

Registration forms are available by calling Mary at (701) 231-8058 or at www.atacenter.org. You may also fax your registration to (701) 231-1945.

Cancellation

Cancellations will be accepted prior to the registration deadlines. A $75 administrative fee will be charged for any cancellations received in writing postmarked prior to the registration deadline. Special arrangements may be made for future training sites for cancellations received after the registration deadline. The Upper Great Plains Transportation Institute reserves the right to cancel the training due to insufficient registration. Registrants will be notified two weeks prior to the training date if the training will be cancelled.

Special Assistance

North Dakota State University is committed to providing access to and inclusion in academic and campus programs for individuals with disabilities by providing reasonable accommodations. Please contact Mary Marquart at (701) 231-8058 with special requests and we will make accommodations, if possible. Please identify any requests on the registration forms as well.

TRAFFIC SIMULATION

ATAC Researchers Utilize Computer Simulation Models to Analyze Complex Traffic Systems

by Ayman Smadi

Computer simulation models are often used to study complex systems that cannot be efficiently and accurately modeled with standard analytical methods. These systems are generally stochastic (the outcomes may be governed by random process) and dynamic (the outcomes and system status changes in relatively short periods of time). Modeling traffic operations is a good example of complex stochastic and dynamic systems, and is therefore best suited for computer simulation applications.

Traffic simulation models aim to represent roadway networks and traffic conditions for a specific time period. There are various levels of traffic simulation models ranging from macroscopic to microscopic models. Macroscopic models depict traffic flow in a generalized form, such as platoons of vehicles on a less detailed network. Microscopic simulation models use a higher level of detail and are capable of tracking individual vehicles (drivers) on a more detailed network. These models have special algorithms that model specific tasks such as car following and lane changing behavior.

Advances in computer technology have resulted in an increase in the number and capabilities of microscopic traffic simulation models. Today's traffic simulation models can produce detailed output and provide fascinating graphics and animation that provide effective tools for both transportation engineers and the general public.

The use of traffic simulation models as effective analysis tools has significant benefits. Traffic simulation can be used to investigate and estimate the impacts of making modifications to the network, such as road geometry, traffic control and traffic levels. Traffic simulation can assess these impacts without disrupting traffic operations, implementing costly measures, or causing unsafe conditions to motorists before a design is finalized. The use of traffic simulation can therefore support various decision levels such as operational, planning, and design.

One of the main components of a traffic simulation model is the network which includes roadway characteristics and the traffic control devices (traffic sig-

VISSIM simulation software models complex transportation systems.

nals). Detailed geometric data and traffic signal timing plans are coded for the simulation model. The other main component is traffic data, which include traffic volumes, turning percentage and truck percentages. Traffic simulation models have a component that addresses driver behavior parameters (acceleration and deceleration preferences, car-following, gap acceptance, etc). Usually these factors have a range of default values supplied by the model. However, in order to obtain representative results, additional local data may be needed to calibrate the model.

The range of output available from traffic simulation models includes standard measures of effectiveness such as travel speeds, delay and queues. In addition, several customized output data may be obtained depending on the traffic simulation model used. Most traffic simulation models also allow the user to specify how the output is collected and whether they will be for the entire network or a specific section.

Traffic simulation models will continue to gain acceptance among transportation professionals as they continue to be enhanced. The traffic simulation models are becoming increasingly valuable tools for modeling complex transportation situations. For more information on the traffic simulation tools used at ATAC, please visit www.atacenter.org.

ATAC IN THE NEWS

Ova Honored by Eno Transportation Foundation

Kiel Ova, ATAC traffic engineer, was selected and participated in the esteemed Eno Leadership Development Conference on May 21-25 as an Eno Fellow.

The ninth annual week-long program brought 20 top students from colleges and universities around the country to Washington D.C. The program introduces students to the formation and implementation of transportation public policy.

"It was a great opportunity to meet key people in the transportation field and get their perspectives on transportation issues and policies," stated Ova.

The Advanced Traffic Analysis Center Director Dr. Ayman Smadi nominated Ova for this program. According to Smadi, Ova's work on transit signal priority is exceptional. He also said Ova is a model employee who displays leadership qualities as well as the ability to effectively collaborate with other employees.

The Eno Transportation Foundation is a nonprofit organization dedicated to improving all modes of transportation—ground, air, and water.

Eno was founded in 1921 by William Phelps Eno, with the goal of improving traffic control and safety. Since then, the foundation's activities have changed in response to changes in transportation and society.

ATAC Students Present Traffic Research at HEEP Conference

The Highway Engineers Exhange Program, a consortium of international highway engineers, held their annual conference May 15 in Bismarck, North Dakota.

HEEP encouraged students to participate by presenting traffic studies and other research at the conference.

Several students from UGPTI submitted applications and Matthew Martimo and Jason Gates were selected to present their transportation research projects at the conference. Martimo's presentation was entitled "The Future of Signalization: The Advanced Transportation Controlling" and Gate's presentation was "Hardware in the Loop."

Martimo and Gates were awared second and third places respectively and each received scholarships from the conference committee.

Ryan Callahan from University of North Dakota will be sent to Nova Scotia to present at the international conference.

HEEP is an international organization which promotes the exchange of information relating to highway and bridge engineering among its members. Specifically addressed is the use of computers in the engineering process.

ATAC Students Recognized for Accomplishments

Matthew Martimo, a graduate student, was awarded a $500 scholarship from the Transportation Club of Fargo-Moorhead. He also received a $500 scholarship from the North Central Section of the Institute of Transportation Engineers. Matthew earned a bachelor of science degree in civil engineering at North Dakota State University and is working on his master's degree in civil engineering with a transportation option. His current graduate work focuses on the traffic engineering application development and enhancement. Matthew has worked for ATAC for almost two years.

Ryan Ackerman, an undergraduate student, also received a $500 Transportation Club of Fargo-Moorhead scholarship. Ryan is a junior at NDSU majoring in civil engineering. Ryan has worked at ATAC for over six months.

The Transportation Club of Fargo-Moorhead required each candidate to submit an essay describing academic accomplishments and future goals. Scholarship recipients were chosen based on scholastic achievement, involvement and interest in the transportation field. The students were recognized at the awards banquet held at the Holiday Inn on April 25.

ATAC STAFF

Dr. Ayman Smadi

Ayman serves as the director of the ATAC and brings over eight years of experience in various aspects of transportation modeling,safety, planning, traffic operations, and ITS.He works with various transportation agencies and organizations and is active in national transportation research. Ayman has taught courses in transportation systems and the application of operations research to transportation problems. Ayman earned a Ph.D. in Transportation Engineering from Iowa State University and a M.S. in civil engineering from the University of Oklahoma. He is a member of ITE, ITS America, and TRB.

Shawn Birst

Shawn works in the application of traffic analysis tools in a wide range of projects, including corridor operations, traffic signal coordination, incident management, and work zone traffic management. Shawn has practical knowledge in various traffic analysis tools such as TEAPAC, SYNCHRO, HCS, CORSIM, INTEGRATION and VISSIM. He is also familiar with the range of problems typical in urban transportation systems. Shawn has a M.S. and a B.S. both in civil engineering from North Dakota State University.

Kiel Ova

Kiel supports ATAC's modeling and research activities, focusing on advanced applications of the VISSIM simulation model, traffic signal controller interface, and the use of video detection for traffic data collection. His experience with VISSIM includes dynamic traffic assignment and transit signal priority applications. Kiel is the main resource for developing and delivering the VISSIM Basic Course. Kiel has a M.S. and a B.S. in civil engineering, from North Dakota State University. He is also a member of ITE.

Matthew Martimo

Matthew's current work focuses on the traffic engineering applications development and enhancement. He is currently testing and evaluating travel demand modeling software and examining how they can be integrated with traffic simulation. Matthew received his B.S. in civil engineering from North Dakota State University. He is working on his M.S. in civil engineering with a transportation option.

Mary Marquart

Mary is an administrative assistant at the Upper Great Plains Transportation Institute. She assists the directors of the Advanced Traffic Analysis Center (ATAC) and the Transportation Telecommunications Network (Tel8) programs, managing activities with emphasis on financial accounting and reporting. Mary attended Bismarck State College and has held administrative secretarial positions at universities in Bismarck, Moorhead and Fargo prior to joining the ATAC team.

Mohammad Smadi

Mohammad has developed an adaptive signal control expert system and is studying its effects on an interchange in the Fargo-Moorhead area. Mohammad earned his B.S. in applied mathematics from Jordan University of Science and Technology, Jordan. He is currently pursuing his M.S. in computer science at North Dakota State University.

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ATAC Provides:

Transportation Research Lab

▣ Advanced Testing of Signal Systems Hardware

▣ Data Collection Equipment

▣ Traffic and Transportation Library

▣ Mobile Video Detection System

Software

▣ Simulation (VISSIM, CORSIM, SIMTraffic, INTEGRATION)

▣ Capacity Analysis and Signal Timing Optimization (HCS, TEAPAC, SYNCHRO)

▣ GIS (TransCAD, ArcView)

▣ Planning (TRANPLAN, TP+, VIPER, TransCAD)

▣ Customized Traffic Engineering Software Solutions (CORTOOLS)

Staff

▣ Customer-Oriented

▣ Traffic Software and Modeling Expertise

▣ Experienced in Traffic and Transportation Studies

▣ Access to resources in civil, electrical and industrial engineering, computer science, logistics, statistics, communications and business

New State-of-the-Art Training Facility

▣ Opening in October 2001

▣ Look for more information in our upcoming issue of The SIgnal

Traffic congestion causes travel delays and the need for a solution.

Our main resources in providing this support are qualified individuals who have the right background to relate to today's transportation challenges and are capable of running sophisticated analysis software. Our traffic laboratory houses the computer software and hardware used in the analysis. It also serves as the ATAC training facility which provides hands-on opportunities for exploring various traffic control strategies using traffic signal controllers and traffic simulation.

Over the past year our partnership with the North Dakota Department of Transportation has been further expanded to increase ATAC's involvement in and support for various operations and ITS functions within the NDDOT. Working with local partners, the ATAC is developing a new focus area which will support travel demand modeling development and enhancements for North Dakota MPOs and the NDDOT. We will also be working with the Minnesota DOT to evaluate the Moorhead Area Integrated Train Detection and Traffic Control System. We plan on extending these partnerships to other states in the coming year.

ATAC's staff is growing tremendously with an increase in graduate and undergraduate student involvement. Through partnerships with the computer science and civil engineering departments at NDSU, ATAC staff have access to a wide range of expertise in both students and faculty, which allows us to expand our research focus and better serve our customers needs.

We hope that you find ATAC as a valuable resource which will allow us to further expand our partnerships. I encourage you to become more familiar with our program by visiting our web site (www.atacenter.org) which contains information on our projects as well as links to various transportation resources.

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Visit our web site at www.atacenter.org