VIDEO TRAFFIC DETECTION GOES MOBILE

Sponsor: Iowa Department of Transportation

Detection: Background

As CTRE graduate assistant Kera VanDerHorst can tell you, collecting traffic data at busy interstate work zones is difficult enough. Collecting high-quality traffic data from several such work zones around the state can be downright daunting.

VanDerHorst is researching options for improving traffic management in and around interstate work zones. To meet the challenge of collecting detailed traffic information from several work zones in Iowa, she has applied emerging intelligent transportation systems (ITS) technologies for traffic monitoring. The result: a video-and-computer-based traffic data collection system—on wheels.

The mobile traffic data acquisition system consists of two parts: mobile data collectors, and a lab for video image processing.

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Graduate assistant Kera VanDerHorst adjusts video cables on the mobile traffic surveillance unit.
Since CTRE’s last newsletter, we have been very busy (which seems to always be the case). In the last six months we have started new projects, hired new employees, and presented awards to some incredibly talented students from ISU and other midwestern universities (see page 11). But probably the most important activity for CTRE was the development of our advisory board.

Advisory Board
Although CTRE has advisory committees for many of its individual programs, the center has not historically had the benefit of an advisory group for its overall program. However, external reviewers who reviewed the center in January 1997 reached the conclusion that CTRE now has the scale, breadth, and depth of activities to provide a group of busy transportation decision makers with a meaningful agenda. The reviewers suggested two possible models for an advisory board. One was a large board of mid-level managers covering the broadest variety of constituencies; the other model was a small board of only top managers. We decided to adopt the second model.

The first meeting of CTRE’s advisory board was held in December 1997. The level of activity that resulted from the board meeting, as well as the level of interaction with individual board members, has simply been amazing.

The individuals we invited to serve on our advisory board are featured on the next page. The members represent key constituents for transportation research in the private or public sectors at the federal, state, and local levels. We wanted to limit the advisory board to a small group to allow for meaningful group discussions, and we ended up with 13 members. We recognize that not every transportation mode is represented on the board (for example, no one directly represents the passenger transportation industry), but membership may change in the future.

The advisory board will review and assess CTRE’s programs and recommend new programs and activities for the center. At the first meeting, board members were generally pleasantly surprised by the quality and breadth of CTRE’s programs and activities. Their lack of awareness about center activities was attributed to our failure to appropriately market CTRE. Advisory members agreed to meet again in the summer of 1998, at which time they will concentrate on marketing issues.

TRB
In January 1998, several of CTRE’s students, staff, and faculty attended the annual meeting of the Transportation Research Board (TRB). In fact 15 students received some sponsorship from CTRE so they could attend the meetings, the largest number of students we have ever sponsored.

TRB meetings provide an excellent opportunity for CTRE-sponsored students to experience the magnitude and variety of transportation research being conducted at the national level. Several undergraduate students have come back from TRB annual meetings energized and ready to pursue a career in transportation or even to continue on to graduate school and pursue a master’s degree in a transportation-related field. TRB helps our graduate students focus their work and understand...
INTRODUCING CTRE’S ADVISORY BOARD

Benjamin Allen, Chair
Distinguished Professor of Transportation and Logistics
Dean, College of Business
Iowa State University

Leonard Boswell
Member, Transportation and Infrastructure Committee
U.S. House of Representatives

Fenton Carey
Associate Administrator of Research and Special Programs
U.S. Department of Transportation

John Dobson
Associate Vice Provost for Research
Iowa State University

Richard Drake
Chair, Transportation Committee
Iowa Senate

Catherine Dunn
Chair, Iowa Transportation Commission
President, Clarke College
Dubuque, Iowa

Jane Halliburton
Story County Supervisor

Fred Housman
Vice President of Distribution
HyVee, Inc.
Chariton, Iowa

Ann Hutchinson
Mayor, City of Bettendorf
President, FirstCity Mortgage Company of Bettendorf and Moline

Richard Mikes
Senior Vice President and Chief Financial Officer
Ruan Transportation Management Systems
Des Moines, Iowa

Darrel Rensink
Director, Iowa Department of Transportation

Jim Shattuck
Executive Vice President of Marketing and Sales
Union Pacific Railroad
Omaha, Nebraska

Jerry Welter
Chair, Transportation Committee
Iowa House of Representatives
CTRE en route

FEBRUARY 1998

DIRECTOR’S MESSAGE

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how their own personal research fits into the broader framework of transportation research. TRB also allows students to see the big picture of transportation. They meet with individuals from the private and public sectors and from all levels of government, and with individuals representing every aspect of transportation from transportation policy to transportation facility design.

The TRB meetings provide faculty and staff an opportunity to get caught up on current activities around the country and to visit with old friends and make new acquaintances. To assist with the social aspects of the TRB meetings, we held an Iowa reception on Tuesday night of the 1998 meetings. Rockwell International, the Iowa Department of Transportation, the Asphalt Paving Association of Iowa, the Iowa Concrete Paving Association, John Deere Company, and the Civil and Construction Engineering (CCE) Department of Iowa State University assisted CTRE in sponsoring the reception. Together, we were able to develop one of the classiest receptions held at TRB. If other organizations would like to participate in sponsoring next year’s reception, they are encouraged to contact me.

New Staff
As you can see on page 12, in the fall semester we hired three new staff members. Brian Coree and Michele Regenold were hired early in the semester and have been on board for several months. Tom McDonald joined CTRE in January 1998 after retiring from a long and distinguished career with the Iowa DOT. Tom is CTRE’s new transportation Safety Circuit Rider. The circuit rider position is a very important position for CTRE, both because the circuit rider performs an important service and because the circuit rider is a grassroots program serving individuals throughout the state. We are pleased that we were able to attract an individual of Tom’s caliber with an entire career of personnel contacts throughout Iowa.

In the next six months, we plan two new hires. One is a junior position to help us with our ever increasing level of activity in developing transportation applications and databases for geographic information systems (GIS). The other position is a transportation engineering faculty member. The faculty member will fill a joint appointment with ISU’s CCE Department and with CTRE, focusing expertise and research interests in traffic engineering and transportation design. This new hire is intended to strengthen CTRE’s and CCE’s expertise in traffic engineering and to strengthen our traffic engineering capabilities in anticipation of the planned retirements of two of CCE’s senior and distinguished faculty in the next two to three years.

The remainder of this issue is devoted to covering ongoing or completed projects and programs, changes in staff, and student awards. Also included is a calendar of seminars sponsored by CTRE. If you are interested in attending any of the listed seminars or receiving a videotape of a seminar, please contact us. For more information on any of our projects, view our home page at http://www.ctre.iastate.edu or contact us directly.
Sponsor: Iowa Department of Transportation

Mapping: Background

Personal injuries, fatalities, and property damage from highway accidents are estimated to cost Americans billions of dollars a year in medical bills, repairs, and lost income; the emotional costs are, of course, beyond measure. A useful tool of highway agencies in the campaign to make roadways safer is an accident location and analysis system, a database query tool that provides a method for storing and analyzing information about accidents and, particularly, for identifying and analyzing high-accident locations and situations.

The Iowa Department of Transportation (Iowa DOT) has developed one of the best computerized accident location and analysis systems in the country, PC-ALAS. PC-ALAS is used by transportation agencies throughout Iowa—cities, counties, metropolitan planning organizations, and regional planning affiliations.

PC-ALAS is more portable than its mainframe predecessors and, with its pull-down menus, more user friendly. Searches (queries, inputs) can be narrowly defined. For example, users can query for accidents of specific types or at certain times or by drivers with certain characteristics. The results (outputs, statistics) can be viewed on the screen, saved to a file, or printed using predefined formats.

Still, PC-ALAS can be improved. Locations in the program are designated by node numbers; the actual locations must be identified by matching the numbers with location descriptions on cumbersome node tables or paper/CAD maps. Also, PC-ALAS is a text-based program. Users cannot see on-screen maps of accident sites or click on location nodes for more information. PC-ALAS could be improved by incorporating significant recent developments in the graphic display and query capabilities of geographic information systems (GIS).

Other ongoing projects at the Iowa DOT and elsewhere in the state are relevant to, and could be coordinated with, the department’s accident location and analysis efforts. These projects include:

- developing a program for assessing the potential benefits of safety improvements to roadways
- using software to develop collision diagrams for intersections or short sections of roadway
- analyzing the relationship of accidents to roadside features like guardrails
- developing statewide transportation management systems, especially safety and intermodal systems, but also maintenance, pavement, bridge, and congestion management systems
- automating reporting methods of law enforcement officers (e.g., the Mobile Accident Reporting System (MARS) being implemented across Iowa for accident reporting and accident data interfacing, which is pioneering the application of global positioning systems (GPS) and GIS technologies for such systems)

CONTINUED ON PAGE 6
To enhance PC-ALAS’s capabilities for the Iowa DOT, while making it compatible with related efforts in Iowa, CTRE is developing a GIS-based accident location and analysis system: GIS-ALAS.

In addition to enhancing PC-ALAS, the new GIS-ALAS must satisfy other design requirements:

- **Maintainability.** The system must be easily updated to accommodate new and improved data and cartography and easily adjusted for changes in the format of the accident database.
- **Compatibility.** The system must have import/export options that are compatible with other systems (as described above) and interact with external programming languages (C, Java, etc.).
- **Enhanced logical query capabilities.** Users must be able to use standard queries or define their own queries based on any field(s) in the database.
- **Spatial query capabilities.** Users must be able to query by actual accident locations, while retaining the ability to use the old node system to reference non-accident information like roadside features.
- **Maps and accident diagrams.** The system must provide diagrams of specific accidents, maps of accidents in a given city or county, pie diagrams of accidents at nodes (e.g., by cause, number of vehicles, etc.), and intersection maps.
- **Accessibility.** The system must be accessible statewide; ideally, data will be accessible via the World Wide Web, queries will be possible via an interactive Web session, and the data and program will be accessible via CD-ROM.
- **Performance.** The system must respond quickly and efficiently to a large volume of simultaneous requests.
- **User friendliness.** The program must have a short, stress-free learning curve.
- **Report generation.** Users must be able to select predefined report formats or define their own.
The first phase of the project—developing a system that reproduces the functions of PC-ALAS and incorporates graphic display and query capabilities—is completed.

The project team selected and evaluated three GIS software packages—MapInfo, ArcView, and Maptitude. Accident reference node cartography for Dallas County, Iowa, was imported into the GIS packages, along with five years of ALAS location and attribute data. (The conversion process for the entire state of Iowa takes about one week.) If the Iowa DOT’s cartography is enhanced in the future (e.g., the nodes realigned to more accurate locations), the process can easily be repeated to update the accident locations.

Each of the resulting GIS-ALAS systems provides an immediate enhancement to PC-ALAS: users can see accident sites on a map. With a click of a mouse on a location, users have access to more detailed information. Each system also provides a potential tool for finding discrepancies, such as missing roads in the cartography of recently developed areas, or incorrect coding in the accident file. Such discrepancies might display, for example, an accident where there is no roadway in the GIS system.

The three software packages were evaluated according to their capacity to fulfill the requirements listed above (accessibility, user friendliness, etc.). ArcView was selected for further development. ArcView GIS-ALAS was then customized to mimic the query functions of PC-ALAS while providing robust GIS capabilities like mapping and spatial queries.

CONTINUED ON PAGE 8
ArcView GIS-ALAS is being designed to work with a commercial collision diagram software already selected for use by the Iowa DOT through another CTRE-managed project. Care was taken to avoid inefficient file structures, duplicate and orphan databases, etc., because ultimately the GIS-ALAS may be integrated with MARS and other law enforcement applications, as well as other safety and engineering applications outside the current scope of ALAS. Throughout the programming process, compatibility with the World Wide Web has been considered.

CTRE has also developed a freeware version of the system, Explorer ALAS. This system allows users to simultaneously view crash data and background layers of information but does not have the mapping and spatial query functions of the ArcView-based system.

Mapping: Current Efforts

The second and third phases of this project will address many issues.

A usability study is being conducted to evaluate the GIS-ALAS menus and toolbars, query and report options, and online documentation and to test for bugs or potential technical problems. After improvements suggested by the usability study have been incorporated, both the ArcView and Explorer versions will be distributed to transportation agencies throughout Iowa via CD-ROM and via secure World Wide Web access.

Using Black Hawk County as a pilot area, the research team is working with the University of Northern Iowa to experiment with incorporating additional kinds of information: road features, health care facilities, geographic borders (e.g., counties, census tracts), emergency response service districts, highway/rail grade crossings, aerial photos/digital ortho quads/digital elevation models, and maintenance and emergency facilities.

The team will also develop a two-way conversion process between node-specified locations and latitude/longitude addresses, as well as links to weather and other real-time information. Questions will be considered regarding security and proprietary information, providing outputs for service jurisdictions, classifying accidents by type of intersection and/or turning movements, and analyzing the relationships of various factors (traffic volume, road and weather conditions, lighting, etc.) in causing accidents.

VisualBasic and MapObjects are being explored to see if a fully functional, freeware GIS-ALAS can be developed. In addition, the data from ArcView GIS-ALAS will be ported to GeoMedia, which is compatible with the Iowa DOT’s enterprise GIS implementation strategy.

System distribution and training is beginning across the state of Iowa. For more information, contact Tim Strauss, transportation research specialist, 515-294-8103, strauss@ctre.iastate.edu.
The mobile data collector is a small (4-foot by 6-foot) enclosed trailer that carries traffic surveillance equipment. A pneumatic, telescoping mast rises from the top of the trailer. Mounted on the mast are two black-and-white video cameras, each enclosed in a casing to protect it from the elements and mounted on a pan/tilt unit to enable a full 180-degree viewing angle. The mast can be extended from a 7-foot nested position to a 30-foot fully extended position, powered by a one-eighth horsepower air compressor inside the trailer. Each video camera is connected by cable to one of two VCRs inside the trailer. The trailer also houses a video monitor to view the video images provided by the cameras, a time-code generator that places a time stamp on the videotapes, and pan/tilt units to control camera views. A 1000-watt generator powering the video equipment and the air compressor completes the data collection unit.

To collect traffic data at a work zone, the mobile data collector is positioned in the median of a four-lane interstate highway. The cameras are directed toward the areas of roadway to be studied and the VCRs set to record. Each tape records two hours of data; after two hours, the tapes must be changed manually. Using two mobile data collectors (with two cameras on each unit), four different views of traffic can be recorded simultaneously.

While the tapes are played back with the VCR, Autoscope™ processes the image and is able to detect vehicles. Autoscope™ records traffic data such as volume, speed, and vehicle classification. The data can be downloaded to a computer spreadsheet for further analysis.

VanDerHorst is using the mobile traffic data acquisition system to collect and analyze traffic data at merge areas in interstate work zones. The trailer’s mobility allows her to move it easily among various work zones and to collect data for a variety of merge lane setups at each work zone. The system provides her with the convenience of video images to view, frame by frame if desired, and hard data to analyze.

Using data collected in the 1997 and 1998 construction seasons, VanDerHorst will recommend practices to improve merge area design and will develop criteria for determining when it’s appropriate to encourage traffic to use alternate routes. The goal of her research is to reduce or eliminate congestion at work zone merge areas, reducing the formation of traffic queues and, potentially, the number of work zone traffic accidents.

For more information about the research project and the mobile traffic data acquisition system, contact Kera VanDerHorst or Tom Maze at CTRE, 515-294-8103; kera@ctre.iastate.edu; tom@ctre.iastate.edu.
**CROSSROADS 2000**

CTRE and the Iowa Department of Transportation are planning their second biennial transportation research conference to be held August 19–20, 1998, in Ames, Iowa.

“Crossroads 2000” is the encore to Iowa’s 1996 Semisesquicentennial Transportation Research Conference held in honor of the Transportation Research Board. Like its predecessor, Crossroads 2000 will provide an opportunity for midwestern transportation professionals who may not regularly attend national events like the annual Transportation Research Board conference to attend a high-level research event. Researchers from around the country will present.

The conference will cover a broad spectrum of transportation issues, ranging from infrastructure design to transportation policy. An emphasis this year will be on intelligent transportation systems (ITS) and their applications. Participants will find sessions on both basic and highly applied research.

Registration brochures will be mailed in June.

The conference is cosponsored by the Iowa Department of Transportation and Iowa State University and is a program developed under the Memorandum of Agreement between the two organizations.

For more information, contact Tom Maze, 515-294-8103, tom@ctre.iastate.edu.

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**IOWA SUMMER EXPO**

If you maintain bridges, culverts, roads, or roadsides, “Iowa’s Summer Maintenance Expo” offers you a unique educational opportunity. The expo will be held May 11–12, 1998, in Des Moines, Iowa.

The expo will bring together the latest research, technologies, and techniques for summer maintenance. During educational sessions, national and local experts will discuss the following:

- identifying distress in AC and PC pavements
- choosing and applying herbicides
- installing culvert liners
- patching and crack sealing in AC pavements
- patching and joint sealing in PC pavements
- using appropriate roadside safety features
- repairing decks, joints, abutments, and substructures
- using traffic control techniques

In addition, state-of-the-art products will be demonstrated at the vendor exhibits.

In addition to CTRE, expo sponsors include the Iowa Department of Transportation, Federal Highway Administration, Iowa Chapter of the American Public Works Association, Iowa County Engineers Association, and Iowa Secondary Road Maintenance Supervisors Association.

For more information about the expo, contact Duane Smith, CTRE’s associate director for outreach, 515-294-8103; desmith@iastate.edu.
Seven students from the University of Kansas, the University of Missouri at Columbia, Kansas State University, and Iowa State University participated in the 1997 Transportation Scholars Conference, hosted by CTRE at Iowa State University. Four presenters won cash awards for their papers:

Matthew Eatherton, undergraduate in civil engineering from the University of Missouri at Columbia, won $350 for “Enhancements in the Ductility of FRP Reinforced Beams through the Use of Fiber Reinforced Concrete.”

Jennifer Guggisberg, undergraduate in business administration at Iowa State University, won $350 for “The Third-Party Logistics Industry: A Discussion of Characteristics and Uses.”

Ayman Khalil, MS student in civil and construction engineering at Iowa State University, won $1,000 for “Out-of-Plane Distortions of X-Type Diaphragm Bridges: Revisited.”

Heng Wei, PhD student in civil engineering from the University of Kansas, won $1,000 for “A Study of Heuristic-Optimization Model for Service-Request Vehicle/Crew Routing with Time Windows in a GIS Environment.”

The Scholars Conference is sponsored by the Mid-America Transportation Center (MATC), a consortium of universities that forms the U.S. Department of Transportation’s University Transportation Center for Region 7. The MATC is headed by the University of Nebraska-Lincoln; Iowa State University is a member of the consortium.

Two CTRE graduate research assistants walked away with prizes at the student poster contest at the 3rd Annual Iowa Conference on Geographic Information Systems in November 1997. David Preissig, graduate student in civil and construction engineering, won first prize for his poster on GIS applications for freight transportation planning. Jon Resler, graduate student in civil and construction engineering, came in third place with his poster on Iowa’s pavement management program.
CTRE welcomes Brian Coree to a joint appointment with CTRE and the Civil and Construction Engineering Department at Iowa State University.

With a PhD in materials engineering from Purdue, Coree has worked in the design, construction, evaluation, and research of highway and airfield pavement materials in the Middle East and the United States. Materials projects he has engineered include the largest harbor construction project in the world, two military air bases, and thousands of miles of highway.

At CTRE Coree will conduct research projects and technology transfer activities sponsored primarily by the Iowa DOT and related to asphalt pavements.

CTRE en route and other of the center’s publications are benefiting from the writing and editing skills of Michele Regenold, CTRE’s three-quarter-time communication specialist.

Regenold has master’s degrees in English and journalism from Iowa State University. Before accepting a professional position at CTRE and while pursuing her journalism program, she worked part-time for CTRE’s publications group.

In addition to writing and editing newsletter articles, Regenold edits and prepares reports for publication, takes photographs for several of the center’s newsletters, maintains CTRE’s World Wide Web site, and otherwise assists the editor in publishing print and online documents.

Tom McDonald joins CTRE’s staff as Iowa’s new Safety Circuit Rider. He comes to CTRE from the Iowa Department of Transportation’s Southeast Transportation Center, where he served as district engineer from 1988 to 1994 and then as development engineer. McDonald, a professional engineer, worked for the Iowa DOT for more than 30 years.

McDonald has spent most of his life in Iowa and graduated from Iowa State University in 1964 with a bachelor’s degree in civil engineering.

As Safety Circuit Rider McDonald will continue and enhance CTRE’s award-winning safety program. He brings a knowledge of Iowa, a thorough and diverse engineering background, and a passion for highway safety to his new position.
1998 103EORE CONFERENCE/SEMINAR CALENDAR

1998 Transportation Seminar Series

Each spring transportation students at Iowa State University have the opportunity to take a course of weekly seminars. Speakers of national and international repute provide a broad perspective on contemporary transportation issues. CTRE and Iowa DOT researchers, ISU faculty, and area transportation professionals are invited to attend the seminars Fridays at 10 a.m. in 147 N. Lagomarcino Hall at ISU. Seminars are broadcast via the Iowa Communications Network (ICN) to the University of Northern Iowa and the Iowa Department of Transportation’s central offices; with ample lead time, seminars can be viewed remotely at other ICN classrooms in Iowa. For more information, or to borrow a videotape of any seminar, contact Sharon Prochnow, 515-294-8103; sharon@ctre.iastate.edu. (Speakers for April 10 and April 17 are to be scheduled; there is no seminar on March 20.)

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| January 16 | “Which Roads to Iowa’s Future?”  
Gene Maddox, State Senator, Iowa General Assembly, Des Moines, Iowa |
| 23 | “Transportation’s Role in Sustainable Development,” Kevin E. Heanue, Director, Office of Environment and Planning, Federal Highway Administration, Washington, D.C. |
| 30 | “A Case Study of Transportation’s Role In Sustainable Development,” Robert Layton, City Manager, City of Urbandale |
| February 6 | “New Paradigm for Transit,” Mike Bolton, Transit Operations Group Director, Institute for Transportation Research and Education, Raleigh, North Carolina |
| 13 | “Weather Traveler Information Systems,” Peter Davies, President, Castle Rock Consulting |
| 20 | (title to be announced)  
Keith C. Leftwich, State Senator  
Oklahoma Senate |
| February 27 | “Regulation and Innovation: Lessons from the American Railroad Industry,” Robert Gallamore, Director of Strategic Planning, Union Pacific Railroad, Omaha, Nebraska |
| 13 | “I-35 Corridor Feasibility Study,” Scott Smith, HNTB Corporation, Kansas City, Missouri |
| 27 | “ITS/CVO: Can It Really Work?”  
Gene Bergoffen, Vice President, TransCore, McLean, Virginia |
| April 3 | “Transportation and Sustainable Communities,” Lee Munich, Hubert H. Humphrey Institute of Public Affairs, Minneapolis |
| 24 | “Reauthorization of the U.S. Transportation Program,” Norman Mineta, Senior Vice President, Lockheed IMS, and former chair of the Transportation and Public Works Committee of the U.S. House of Representatives |
| May 1 | “Asset Management’s Relationship to Transportation Investment Policy,” Darrel Rensink, Director, Iowa DOT, Ames, Iowa |

Conferences

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| August 19–20 | Scheman Center  
Iowa State University  
Ames, Iowa  
“Crossroads 2000”: A research conference for transportation professionals from coast to coast, held in the nation’s heartland to give Iowans and other Midwesterners easy access to TRB-level transportation research |
| May 11–12 | Polk County Convention Center  
Des Moines, Iowa  
“Iowa Summer Maintenance Expo” |
To add someone to the mailing list or to correct your mailing address, please fill out the following form and return this page to CTRE. You may also fax the page (515-294-0467) or contact Georgia Parham at CTRE, 515-294-8103; georgia@ctre.iastate.edu.

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