IEEE ITS COUNCIL NEWSLETTER
Editor: Prof. Alberto Broggi, broggi@ce.unipr.it

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Information for contributors
Announcements, feature articles, books and meetings reviews, opinions, letters to the editor, professional activities, abstracts of reports, and other material of interest to the ITS community is solicited.
Please submit electronic material for consideration in any of the following formats: BtX, plain ASCII, or Word, to the Editor at broggi@ce.unipr.it at least 1 month prior to the newsletter’s distribution:

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Vehicular Technology: Robert M. Barrett, E. Ryerson Case
From the Editor

by Alberto Broggi

Dear ITS-researcher,

a short update about our Newsletter: due to the large increment in the number of images, graphics, and artistic layouts, from this issue only the PDF version (and its corresponding PostScript version) will be available. This choice will avoid problems with the display of images and graphics.

Moreover this choice opens the possibility to include advertisements, which generally use proprietary logos and colors. Therefore if you intend to propose an advertisement and be seen by over 10,000 subscribers, I encourage you to contact me via e-mail at broggi@ce.unipr.it.

Thanks again to everyone for helping me completing another very rich issue.

Calendar of Council Events

by Charles J. Herget

Next Meetings are scheduled as follows:

**ITS Council Meetings:**

August 26, 2001 ............. Oakland, California, during IEEE ITS Conference 2001

**ITS Executive Committee Meetings:**

May 14, 2001 .................. Tokyo, Japan, during IEEE IV 2001 Symposium
July 7, 2001 .................................................. teleconference
August 26, 2001 ............. Oakland, California, during IEEE ITS Conference 2001
November 17, 2001 ...................... Mexico City, Mexico

**ITS Council Committees Meetings:**

MyBus: Helping Bus Riders Make Informed Decisions

by Stuart D. Maclean and Daniel J. Dailey

MyBus: Helping Bus Riders Make Informed Decisions

Reprint of the article appeared on IEEE Intelligent Systems, January-February 2001, p.84–87

The Smart Trek Model Deployment Initiative, a US Department of Transportation-funded Intelligent Transportation Systems program in the Puget Sound region, has made great strides in integrating and disseminating traveler information. The initiative focuses on real-time information to help travelers make informed decisions about their travel options. The Smart Trek project has brought about a variety of real-time transit information applications. One of these is MyBus, which makes departure predictions and delivers traveler information to Web browsers and cell phones.

MyBus aims to present to riders, in real time, the predicted departure times of buses at specific locations throughout a transit region. King County Metro, Seattle’s transit agency, operates a large fleet. Up to 1,200 vehicles are in service simultaneously, departing from over 1,000 locations. MyBus predicts approximately 210,000 weekday and 140,000 weekend scheduled departure events. This is over a million departure predictions per week. MyBus has shown that predictions on this scale are feasible and manageable.

Several technologies are central to the success of MyBus. A common format for the transit agency schedule and spatial data was crucial, letting us redeploy the Seattle pilot project with data from the Portland Tri-Met transit agency with minimal effort. The format we chose was a database schema based directly on the Transit Communications Interface Profiles standards [1].

MyBus

MyBus is a distributed application (see Figure 1). Schedule data and real-time automatic vehicle location data streams flow between components. These components include a legacy AVL system as the source of real-time data, a prediction generator (the predictor), and a Web server for final text formatting and delivery over the Web. The extensive use of the ITS Self-Describing Data (SDD) protocol [2] for intercomponent communication ensures reliable and efficient data manipulation and transport. Reusable collaborative components simplify building new applications [3]. For example, the predictor’s output goes to the Mybus Web server, but other components could also access this data. These downstream components could do such things as analyze on-time performance or estimate congestion.
Prediction

The predictor uses three inputs: a schedule data set, a set of historical trip realizations, and a real-time AVL stream. The schedule data provides each event’s expected time, as well as its location along the pattern or path that the vehicle traverses. Historical data provides ensemble-averaged statistics to the algorithm that predicts vehicle departure. The AVL stream supplies instantaneous bus location information approximately every one to three minutes per vehicle. The latter two inputs are the most important; you can build a successful predictor without temporal schedule information.

According to the TCIP standard nomenclature, a bus travels along a block (not to be confused with a city block), which comprises a sequence of trips. Each trip is a single run of a bus route in one direction—for example, the 10:30 a.m. Route 43 bus from Downtown Seattle to the University of Washington. Along each trip, scheduled locations called timepoints exist, generally at major road intersections. We designate each timepoint as a prediction goal. The prediction algorithm [4] tracks each bus to its many goals along the block.

The prediction algorithm uses an optimal filtering technique based on Kalman filter technology [5]. An underlying assumption is that any real-time arrival prediction algorithm depends on reliable real-time transit vehicle location information. When the maximum number of vehicles are in service (for example, approaching morning rush hour), the Seattle-based predictor produces up to 25,000 predictions every 10 seconds. To minimize statistical errors, MyBus starts a prediction process for each goal. It bases this process on the time before the scheduled departure of the distance from the goal. For example, the tracking of a bus could begin 30 minutes before the scheduled departure time or 20 miles from the goal. At each time step of 10 seconds, the predictor makes a new prediction for both the distance to the goal and the time until departure from the goal. Interleaved with this propagation phase are the real-time AVL inputs, which constitute the update phase. The state vector for each predictor is output at both the propagation and update phases.

In principle, MyBus can track a bus from the start of its block to any goal on the block. In practice, the schedule contains deadheads-out-of-service segments for each block. The current prediction process will not predict across a deadhead trip. That is, a goal appearing in a block just after a deadhead trip will not be associated with an active prediction process until MyBus has observed through the AVL updates that the bus has completed the deadhead portion of the trip.

The prediction algorithm produces the optimal estimate of the departure time given the information provided to the filter. However, predicting the future is always a challenge. To compare the predictions with the vehicle behavior, we need to estimate the actual departure time. Because we are tracking the vehicle irregularly, we have no guarantee that the location will be reported just as the vehicle departs. To estimate the real departure, we can record the location report just before the arrival and just after the departure and...
linearly interpolate the actual departure time. The filter continuously predicts the departure as a function of both space and time.

We can express the deviation of the predictions from the actual behavior as a probability surface in space and time. Figure 2a shows the probability of this deviation and the time until the departure for which MyBus made the prediction. Figure 2b shows these measures for the transit agency schedule. We created the surfaces in Figure 2 using the predictions made over the course of one day for the second-busiest location in Seattle Metro Transit’s service. Comparing these two surfaces suggests that prediction errors from dynamic information are 50 to 75 percent smaller than those from using the schedule alone. Moreover, predictions are accurate both long before the scheduled departure time and near departure time. Rider access to such information is vital in encouraging mass transit.

Presentation

The Web server receives input from the predictor and stores and formats this data for output over the Internet. To deliver the final prediction information, MyBus uses the standard HTTP/HTML or HTTP/WML (Wireless Markup Language) combinations. This assumes that the delivery site has an HTML/WML interpreter, which in turn implies some level of computing capabilities at that site. The most common form of delivery is a browser-like screen or a Wireless Application Protocol (WAP) phone that can display WML (see Figure 3).

MyBus uses a set of prediction states to determine the message sent to the client. Two departed states exist. The first, bus-observed-to-have-departed goal, indicates that MyBus has received an AVL update that shows a bus past the goal. The second, bus-predicted-departed, indicates that, in the absence of data, the Kalman filter has predicted that the bus has departed. Formatted messages directly reflect these states (for example, see Figure 3a, rows 6 and 7). MyBus also provides timeliness reports such as "On Time" or "15 Min Delay."

The Kalman filter produces a covariance that measures the prediction’s validity.

When a vehicle has not reported its location for a long time, this measure becomes large, and eventually the prediction reaches an unacceptable level of significance. In such cases, MyBus switches the display message to "No Info."

Any number of rule sets for mapping predictions into displayed messages are possible. Because the predictor and Web server are distributed, we can easily substitute a new display application.

Implementation

The predictor, Web server, and supporting SDD applications are all built in Java [6]. Currently, the Seattle predictor and the combined Seattle/Portland Web site run as two Java Virtual Machines on the same Windows NT host. The ratio of dynamic to static content available from the Web site is high. This requires a mechanism for producing the dynamic content and interfacing it with standard Web server software, such as Apache (http://www.apache.org). To this end, MyBus uses Java servlet and Java Server Pages technology [7]. The SDD component library used for data transport within the MyBus hierarchy is

TCIP and MyBus

The TCIP is a set of interface standards for the US transit industry. The domain covers the data needs of the functions related to the support of public transportation operations, service, and planning [1]. This includes input and output data for scheduling and passenger information, which are of particular interest to MyBus. The TCIP’s crux is the definition of data elements and how they are presented [1].

Pertinent standards

From a software architecture standpoint, TCIP is a benchmark for data structure names, types, and relationships. For a rider-directed information system such as MyBus, three standards are of interest:

- the Standard on Passenger Information Objects (NTCIP 1403),
- the Standard on Scheduling/Run-Cutting Objects (NTCIP 1404), and
- the Standard on Spatial Representation Objects (NTCIP 1405).

All are available for review at http://www.ite.org/standards/ntcip/index.htm.

Integrating TCIP

The schedule information from the target transit agencies can be represented in terms of TCIP data-dictionary data elements with the additional relational keys necessary to couple the data elements. Each agency is likely to manage its schedule data differently, so each agency’s data must be transformed into the TCIP format. This transformation makes the data available to MyBus. For example, we’ve successfully mapped the data elements from both King County Metro and Portland Tri-Met into this framework. This mapping has let us construct a TCIP-based database.

At the simplest level, we map TCIP data elements—for example, timepoint, pattern, and trip—into an SQL schema. We call this the standard TCIP schema. We use the schema’s tabular structure to create the components that support the MyBus application interface. Both spatial and temporal schedule information are necessary to support any predictive algorithm, and both contribute to the schema; for example, a timepoint table and a trip table both exist. The combination of a real-time AVL stream with TCIP schedule information lets MyBus make real-time predictions on bus departures. Without the AVL component, MyBus can use the TCIP schedule data to produce a scheduled or “timetable” interface. Such a system will typically present richer content than available through an agency’s published schedules. Figure 4 demonstrates
these two possibilities that both rely on the availability of TCIP schedule data in the context of Seattle and Portland.

MyBus combines optimal estimation, distributed computing, information technology, and the World Wide Web to produce an Advanced Public Transportation System information system. It supports existing Web browsers as well as the latest handheld devices. Because MyBus conforms to the TCIP standard, it is portable to any US transit property. It is constructed in a portable language, so it can operate on a variety of computing platforms. Its modular construction allows for future interfaces. Interfaces under design include voice synthesis and recognition systems and interfaces to other advanced-traffic-management systems where the transit vehicles act as probes to measure traffic congestion.

References


Opening

The Administrative Committee of the IEEE Council on Intelligent Transportation Systems met at the Hyatt Regency Albuquerque, in Albuquerque, New Mexico, USA on February 17, 2001. The Administrative Committee, or AdCom, consists of two representatives from each of the member societies of the Council and the officers.

After the usual opening parliamentary procedures of call to order, roll call, and approval of the minutes of the preceding meeting, the AdCom proceeded with topics on the agenda.

Recognition Awards, Bylaws ad hoc Committee, Committee Approval

The first action was the recognition of services performed by volunteers for the years 1999-2000, the first two years of the Council’s operation. President Dan Dailey presented plaques to:

- Dr. Alberto Broggi, Newsletter Editor
- Dr. Chip White, Transactions Editor
- Mr. E. Ryerson Case, Immediate Past President
- Ms. Emily Sopensky, Secretary
- Dr. Richard Klafter, Vice President for Finance
- Dr. Ichiro Masaki, Vice President for Conferences
- Dr. Umit Ozguner, President
- Dr. Daniel J. Dailey, Vice President for Publications 2000 and Chair, Publications Committee 1999

President Dailey recommended that an ad hoc committee should be formed to review the Council bylaws. The AdCom agreed that it was time to review the Council bylaws and approved the motion to form the ad hoc committee. Dailey appointed Rye Case to chair the ad hoc committee.

Dailey requested approval of his appointments of Committee chairs. The AdCom approved the appointments.

Officers Reports

As the next item of business, the AdCom heard reports from the Vice Presidents and Editors.

Transactions

Chip White, Editor of the Transactions, reported that the Transactions achieved its first year goal in 2000 with four issues within budget on both pages and finance. White announced that he intended to appoint Bill Scherer as the Executive Associate Editor.

Dailey commended White for his outstanding job as Editor for the first year and the AdCom agreed unanimously.
Newsletter

Alberto Broggi, Editor of the Newsletter, reported that the announcement of the availability of the newsletter is distributed electronically to more than 10,000 e-mail addresses, while the newsletter itself can be downloaded in different formats, including HTML, PDF, Postscript, and text. Broggi said that he would like to reduce the distribution of the Newsletter to just one format. He suggested using only Adobe Portable Document Format (.PDF). The discussion generally supported this recommendation.

Dailey commended Broggi for his outstanding job as Editor for the first two years and the AdCom joined in the commendation.

Conferences

Hideki Hashimoto presented his report on Conferences. He reported that the joint meeting of the ITS Conference and the Intelligent Vehicles Symposium (IVS), which were held concurrently in Dearborn in 2000, was very successful both in number of attendees and financially.

Hideki reported that plans for the ITS Conference, to be held in Oakland, California, in August 2001 and the IVS, to be held in Tokyo, Japan, in May 2001 were progressing on schedule.

Hideki reported a tentative schedule for upcoming ITS Conferences in Singapore in 2002, Shanghai, China, in 2003, and Northern Virginia, USA, in 2004. The IVS is tentatively planned for Versailles, France, in 2002. All of these conferences and symposia are subject to final approval by the AdCom.

Finance

Emily Sopensky gave her report on the Council’s finances. Sopensky said that the finances for the year ending 2000 were much better than anticipated at the beginning of the year because of the approval by the IEEE Technical Activities Board (TAB) of distributing funds from the All Society Periodicals Package (ASPP) to the Council.

Sopensky said that the Council has not yet accumulated the reserve recommended by IEEE, which is three times its annual operating expenses. Based on operating expenses in 2000, the Council should have a reserve of approximately $300K. IEEE recognizes that it will take several years to accumulate the recommended reserve. Year 2000 was only the second year of the Council’s operation.

Next Meeting

Copies of approved minutes of the Council AdCom can be found on the Council’s web site at: http://www.ewh.ieee.org/tc/its/minutes.html.

The minutes of the February 2001 meeting will be submitted for approval to the AdCom at its next meeting at the Oakland Marriott Hotel in Oakland, California, on August 26, 2001.
Call For Participation: The IEEE 4th International Conference on Intelligent Transportation Systems

by Daniel J. Dailey

The 4th International IEEE Conference on Intelligent Transportation Systems

Marriott Hotel, Oakland, California, USA
August 25-29, 2001

The IEEE Conference on Intelligent Transportation Systems (ITSC) is the premier technical conference on ITS and will be an international forum that brings together professionals from the fields of transportation, automotive technology, and information technology.

The ITSC 2001 program includes 50 sessions of peer-reviewed technical papers and invited panels as well as exhibits featuring information technology in Intelligent Transportation Systems.

Register now to attend ITSC 2001 in the Bay Area of California, USA.

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Call For Participation: 2001 IEEE Intelligent Vehicle Symposium
by Masataka Kagesawa

2001 IEEE Intelligent Vehicle Symposium (IV 2001)
May 13, 2001 - May 17, 2001
National Institute of Informatics, Tokyo, Japan.
http://www.cvl.iis.u-tokyo.ac.jp/iv2001/

IV2001 Advance Program

Monday, May 14, 2001

Session 1: Lane Recognition

- 1-1 Robust Lane Recognition Using Vision and DGPS Road Course Information A. Gern, T. Gern, U. Franke, and G. Breuel, Germany
- 1-2 Detecting Lane Boundaries with Circular Shape Models B. Ma, S. Lakshmanan, and A. O. Hero, USA
- 1-3 Road Sides Recognition Under Unfriendly Lightning Conditions R. Aufrere, R. Chapuis, F. Chausse, and J. Alizon, France
- 1-4 Snowcat Track Detection in Snowy Environments A. Broggi, V. Cantoni, U. Vallone, and A. Fascioli, Italy

Session 2: Object Classification

- 2-1 Model-Based Object Classification and Object Tracking in Traffic Scenes from Range-Images K. C. J. Dietmayer, J. Sparbert, and D. Streller, Germany
- 2-2 An Algorithm for Distinguishing the Types of Objects on the Road Using Laser Radar and Vision N. Shimomura, K. Fujimoto, T. Oki, and H. Muro, Japan
- 2-3 An Obstacle Detection Method by Fusion of Radar and Motion Stereo T. Kato, Y. Ninomiya, and I. Masaki, Japan
- 2-4 Vehicle Occupancy Monitoring with Optical 3D-Sensors M. Fritzche, M. Oberlander, T. Schwarz, B. Woltermann, B. Mirabach, and H. Riedel, Germany

Session 3: Interactive Session I

- 3-1 Human Interface Adapted to Equipment in Automobile S. Numazaki, Z. Otsuka, and M. Doi, Japan
- 3-2 How Condition Directed Maintenance Methods Can Help in Detecting and Diagnosing Dangerous Evolutions of the Driver Behaviour JC. Popieul, A. Todskoff, P. Simon, and P. Loslever, France
- 3-3 A Testing Procedure and Method for Qualifying Cameras for Automotive Use under High Glare Conditions S. Ebenstein and T. Meitzler, USA
- 3-4 Automatic Incident Detection Using Data from Vehicle Detectors O. Hattori, H. Shimomura, and K. Tenmoku, Japan
- 3-5 Automatic Recognition of Road Signs Y. Inoue, N. Ishikawa, and M. Nakajima, Japan
- 3-6 A Visual Attention System Based on Feature of Color Contrast K. Murayama and Y. Okada, Japan
- 3-7 Development of Visual System for Agricultural Walking Robot M. Tokuda and T. Kawamura, Japan
- 3-8 CARSENSE-New Environment Sensing for Advanced Driver Assistance Systems J. Langheim, A. Buchanan, U. Lages, and M. Wahl, France
- 3-9 Short Range Radar Utilizing Standing Wave of Microwave or Millimeter Wave T. Uebo, T. Kitagawa, and T. Iritani, Japan
- 3-10 Supervisory Architecture for Vehicles According to Correspondence of Vehicle Ids between Real Environment and Tracking Images S. Kamijo, K. Ikeuchi, and M. Sakauchi, Japan
- 3-11 Toward Better Visibility of Road Information Boards – the Influence of Spatial Frequency Adaptation on Visual Acuity – Y. Nagai, K. Uchida, K. Ueda, H. Onodera, T. Tanaka, and N. Sugie, Japan
- 3-12 Low-Gray Image Generating by MP Algorithm X. Ruan, H. Zhang, and H. Hama, Japan
- 3-13 Bird’s-Eye View System for ITS M. Sekitoh, K. Toyota, T. Fujii, T. Kimoto, and M. Tanimoto, Japan
- 3-14 High Accurate Positioning and Mapping in Urban Area Using Laser Range Scanner H. Zhao and R. Shibasaki, Japan

Session 4: Obstacle Avoidance

- 4-1 Development of Night Vision System T. Tsuji, H. Hattori, N. Nagaoka, and M. Watanabe, Japan
- 4-2 Image Guided Positioning by Using a Complex-Valued Associative Memory for Intelligent Navigation Systems H. Aoki and Y. Kosugi, Japan
- 4-3 Obstacle Detection Using a Deformable Model of Vehicles S. Denasi and G. Quaglia, Italy
- 4-4 Early Detection of Potentially Harmful Traffic Situations with Children U. Franke, A. Joos, and B. Aguirre, Germany

Session 5: Sensor

- 5-1 New Sensor for 360 Vehicle Surveillance-Innovative Approach to Stop & Go, Lane Change Assistance and Pedestrian Recognition V. Willhoeft and K. Furstenberg, Germany
- 5-3 Distance Range Based Segmentation in Intelligent Transportation Systems: Fusion of Radar and Binocular Stereo Y. Fang, I. Masaki, and B. Horn, USA
- 5-4 Development of Stereo Image Recognition System for Active Driving Assist K. Hanawa and Y. Sogawa, Japan
- 5-5 Town Digitizing-Recording of Street Views by Using ODVS & GPS K. Kato, H. Ishiguro, and M. Barth, USA
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Session 6: Lane Keeping

- 6-1 Feedforward and Feedback Control for Driving Assistance and Vehicle Handling Improvement by Active steering S. Mammar and L. Nouveliere, France
- 6-2 Automated Steering Systems Based on Model Reference Control T. Fukao, K. Mori, S. Miyasaka, N. Adachi, and K. Osaka, Japan
- 6-3 Supervision Strategies of a Fuzzy Lateral Guidance Automotive Copilot System F. Bonnay, Z. Zalila, C. Brassart, and F. Coffin, France
- 6-4 A study on Lateral Control for Automated Driving on Heavy Truck Vehicles S. Martini and V. Murdocco, Italy

Session 7: Projects

- 7-1 The U.S. Army’s Vehicle Intelligence Program (AVIP): The Future of Manned, Wheeled Tactical Vehicles H. E. (Bill) Knee and D. J. Gorsich, USA
- 7-2 Research Activity of the European Commission on Active Safety: Driver Assistance Systems F. Minarini, Belgium
- 7-3 Barriers to Motorway Traffic Operations and Potential Solution M. Rackstone and M. McDonald, UK
- 7-4 Supporting Safe Driving at Signalized Intersections A. Maeoka, M. Iwasaki, and T. Tajima, Japan
- 7-5 Behavioural Adaptation to Multiple In-Vehicle Intelligent Transport Systems: Report on an Australian Research Program M. A. Regam, C. Tingvall, T. J. Triggs, D. Healy, and L. Williams, Australia

Session 8: Interactive Session II

- 8-1 Third Generation Vehicle Telematics Infrastructure Based on Agent Technology in a Java TM Framework S. Buytaert, Belgium
- 8-2 Automobile Engine Fault Diagnosis Using Neural Network 245 S. Kher and P. K. Chande, India
- 8-4 Robotic Communication Terminals as an Advanced-ITS for the Elderly and the Disabled I. E. Yairi and S. Igi, Japan
- 8-6 In-Vehicle Information Infrastructure and Human Interface I. Kataoka, K. Ishii, and M. Ogawa, Japan
- 8-7 Vehicle Model for High Accuracy State Estimation M. Wada, K. S. Yoon, and H. Hashimoto, Japan
- 8-8 Technology Integration and Driver Workland Mitigation M. R. Herbst, USA
- 8-9 Longitudinal Control of Low Speed Automated Vehicles Using a Second Order Sliding Mode Control L. Nouveliere, S. Mammar, and J. S. Marie, France
- 8-10 Cellular Telephone Use While Driving: Effects on Driver Mental Workload R. A. Tokunaga, T. Hagiwara, S. Kagaya, and M. Asano, Japan
- 8-11 Intelligent Idling Stop System S. Kobayakawa, K. Takada, D. Otomo, and K. Wakabayashi, Japan
- 8-12 Displaying Method for On-board Display Adaptive to Brightness of Driving Environment Y. Hirano, A. Suzuki, T. Nakano, and S. Yamamoto, Japan
Session 9: AMI-C

- 9-1 AMI-C Demo Car for Convergence 2000 H. Furukawa, M. Kobashi, and Y. Hattori, Japan
- 9-2 AMI-C Vehicle Interface Specification T. Akatsuka and E. C. Nelson, Japan
- 9-3 OEM/AMI-C Low Speed Gateway R. Wong, Japan

Session 10: DEMO2000 (MITI)

- 10-1 An Overview on Demo 2000 Cooperative Driving S. Tsugawa, S. Kato, K. Tokuda, T. Matsui, and H. Fujii, Japan
- 10-2 Platoon Formation Control in Demo 2000 Cooperative Driving S. Kato, N. Minobe, and S. Tsugawa, Japan
- 10-3 Inter-Vehicle Communications Technologies for DEMO-2000 K. Tokuda, Japan

Session 11: DEMO2000 (AHSRA)

- 11-1 Road-to-Vehicle Communication System for Smart Cruise 21 Demo 2000 M. Mori, Y. Tanaka, Y. Sakai, N. Ejima, H. Inoue, and A. Kamemura, Japan
- 11-3 Joint Proving Test & Smart Cruise 21 Demo 2000 M. Mori, Y. Tanaka, Y. Toba, S. Ikeno, T. Kobayashi, Y. Seki, and H. Mizutani, Japan
- 11-4 The Design of Proving Test Systems M. Mori, Y. Tanaka, Y. Toba, S. Ikeno, T. Kobayashi, G. Kamata, and T. Nishikawa, Japan
- 11-6 On Defining Measure of Effectiveness of Vehicle Lateral Guidance and Control Systems W. B. Chang, USA

Wednesday, May 16

Session 12: Obstacle Avoidance

- 12-1 Lateral Vehicle Control for Collision Avoidance in Emergency Condition S. Campo and A. Chiu, Italy
- 12-2 Scenario Parsing in Transit Bus Operations for Experimental Frontal Collision Warning Systems C. Y. Chan, X. Q. Wang, and W. B. Zhang, USA
- 12-3 Collision Avoidance for Automated Urban Vehicles M. Parent and M. Crisostomo, France
- 12-4 Image Projection Based Parking Assist System Y. Tanaka, T. Kakinami, Y. Iwta, M. Nakamura, S. Hiramatsu, and A. Hibi, Japan
• 12-5 Novel Functions for Automatic Rear and Side Surveillance - Succession Vehicles Detection and Image Diagnosis in Practical Driving Condition - N. Enomoto, K. Takizawa, Y. Taniguchi, and Y. Takase, Japan

Session 13: Driver Assistance

• 13-1 Driving in Night Time Conditions: DARWIN an Advanced Driver Support System to Enhance Driver's Perception of the External Scenario L. Andreone, G. Burzio, S. Damiani, P. Barham, and X. H. Zhang, Italy
• 13-2 Non-Standard Safety Enhancements T. Acarman, Y. Pan, and U. Ozguner, USA
• 13-3 A Priori Assessment of Driver Assistance Systems with Respect to Capacity and Safety M. Mangea and J. M. Blosseville, France
• 13-4 Vehicle Routing when Future Service Requests are Anticipated B. W. Thomas and C. C. White III, USA

Session 14: Invited Talk

• Charley K. Watanabe Ministry of Public Management, Home Affairs, Posts & Telecommunications, Japan

Session 15: Inter-Vehicle Communications

• 15-1 ITS Multicast Services and Their DSRC Network Architecture T. Iwahashi, Y. Wada, and T. Miyoshi, Japan
• 15-2 Dynamic Reconfiguration of a Software Component System for Vehicles X. Chen, F. Hermes, and M. Stumpfle, Germany
• 15-3 Evaluation of Auction and Bidding Algorithms for Resolving Network Resource Competition I. Mizunuma and I. Masaki, Japan
• 15-4 An Emissions and Energy Reduction at an On-Ramp Highway Using Inter-Vehicle Communications A. Widodo, T. Hasegawa, and S. Tsugawa, Japan
• 15-5 A Study on Inter Vehicle Communication Network with CSMA/CA to Provide Driving Information for Opposite Lane and Intersection Y. Suzuki, M. Itami, and K. Itoh, Japan

Session 16: ITS Communication Network

• 16-1 A Study on Acquisition and Tracking of Vehicle Location Using between IVC and RVC Dynamic Networks K. Tsukamoto, M. Fujii, M. Itami, and K. Itoh, Japan
• 16-2 Asynchronous CDMA Using Orthogonalizing Matched Filter for Road to Vehicle Communication T. Utsi, N. Hirano, and R. Kohno, Japan
• 16-3 5.2GHz Propagation Characteristics and Mutual Interface of Wireless 1394-based Intra-Vehicle Networks H. Zhang, T. Udagawa, T. Arita, K. Takahashi, and M. Nakagawa, Japan
• 16-4 Spread Spectrum Inter-Vehicle Communication and Ranging System with Co-Channel Interference K. Mizutani and R. Kohno, Japan
We are pleased to announce that all four issues of Volume 1 were published prior to the January 31, 2001 deadline for participating in the ASPP distribution. The total number of pages published for 2000 was 252 pages. This is exactly 5% over the 2000 page budget of 240 pages. Because the entire volume met the deadline and did not exceed plus or minus 5% of the page budget, the Council will receive its share of the All Societies Periodicals Package. The ASPP distributes the profits from non-member subscriptions earned by all IEEE publications to the societies and councils that meet their page budgets plus or minus 5% before January 31st of the following year. Vol. 2, No.1 has already been sent to the publisher and is expected to be published on time in March.
The number of papers received per month is listed in the following table. Publication decisions for completed reviews are also listed according to the month in which the papers were received. Please keep in mind that the tables below do not include papers that were handled and accepted by the guest editors of the special issues. However, it should be noted that the editor sent formal letters of acceptance and information for completing the final manuscripts once the guest editors made their final paper selections. In addition, we prepared and sent the final manuscript materials to the publisher.

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50 copies of the Transactions were given out at the ITS World Congress in Torino, Italy in early November. Another 200 copies of issues no. 2 and 3 were sent to Japan. Prof. Katsushi Ikeuchi feels that the Council and the Transactions are not well known in Japan and would like to promote both the Council and the Transactions. Therefore, he will be giving the issues to government and industry leaders in Japan.

Updates on special issues are as follows:

- Prof. N. Harris McClamroch, Guest Editor of the Special Issue on Automated Air Traffic Control
Systems hopes to have the second part of the special issue ready for the June issue of the Transactions. One paper originally scheduled for Part I of the special issue had to be shifted to Part II due to page budget constraints. There may be as many as 8 papers for Part 2.

- Prof. Ryuji Kohno is proceeding with a special issue on Communications Technology for ITS. He will be considering from 5 to 10 papers for this issue. He has also proposed a second special issue on Communications Technology containing the best papers presented at IV2001.

- Prof. Katsushi Ikeuchi has also proposed a special issue of papers presented at IV 2001 in the area of Intelligent Control and Sensing in IV. He plans an issue of 5-6 papers with a 50-page budget.

- Prof. Shoichi Washino would like to propose a special issue from the ITS World Congress but at present the page budget is a limitation.

- Professors Alberto Broggi and Petros Ioannou report that they have identified 11 papers for consideration for a special issue composed of the best papers presented at ITSC and IV 2000. Markos Papageorgiou will be helping Prof. Ioannou with papers from the ITSC while Prof. Shoichi Washino will be helping Prof. Broggi with the IV papers with the exception that they will not work with their own papers. Letters will go out to authors soon, with only those papers requiring minor revision being accepted for the special issue. The remaining papers will be considered for submission to regular issues of the transactions.

- Prof. Angela Di Febbraro of DAUIN - Politecnico di Torino has submitted a proposal for a special issue on the "Discrete Event Systems in Transportation.

Given the current interest in special issues, it would be wise to consider the page budgets carefully. Most of the special issues seem to be able to generate 10 to 12 papers. We had to divide the first two special issues into two parts in order to meet our page budget. At present the page budget for 2001 is 240 pages. As mentioned above, the actual yearend page total may be no more than plus or minus 5%.

IEEE Trans. on Intelligent Transportation Systems - Index

by Jerri White

Vol.2, No.2, June 2000,
Special Issue on Automated Air Traffic Control, Part II

- Editorial, by N. H. McClamroch and B. Sridhar

- A Study on Aircraft Taxi Performance for Enhancing Airport Surface Traffic Control, by V. H. L. Cheng, V. Sharma and D. C. Foyle

Abstract: In view of the ever-increasing air traffic, much attention in air-traffic-management research has been given to improving arrival and departure efficiency. As air traffic begins and ends at the airport, the issues of taxi delays and ground incursions are becoming more evident. This paper considers the surface-traffic problem at major airports and envisions a collaborative traffic and aircraft control environment where a surface traffic automation system will help coordinate surface traffic movements. Specifically, this paper studies the performance potential of high-precision taxi towards the realization of such an environment. A state-of-the-art nonlinear control system based on feedback linearization is designed for a detailed B-737 aircraft taxi model. The simulation model with the nonlinear control system is evaluated extensively in a scenario representing the demanding situation of an arrival aircraft crossing an adjacent active
runway immediately following its own landing. The evaluation establishes the potential of an automated system to achieve high-precision taxi control, including the ability to comply with taxi clearances with tight time margins. Such a high-precision taxi capability reduces the time margin required for clearing taxiing aircraft to cross active runways, thus increasing the opportunity for issuing such clearances, which in turn reduces the need for aircraft to hold short at the runways to wait for the opportunity for crossing. The results from the analyses provide insight into future aircraft operational capabilities towards the design of the envisioned surface traffic automation system. Moreover, the nonlinear control design serves as a preliminary study for future auto-taxi functional development.

**The Rate Control Index for Traffic Flow**, by R. L. Hoffman and M. O. Ball

**Abstract:** The objective of Air Traffic Flow Management is to maintain safe and efficient use of airspace and airports by regulating the flow of traffic. In this paper, we introduce a single-valued metric for post-operatively rating the performance of achieved traffic flow against targeted traffic flow. We provide variations on the metric, one of which factors out stochastic conditions upon which a plan is formulated, and show how these improve on current traffic control analysis techniques. The core of the metric is intuitive and simple, yet leads to an interesting optimization problem that can be efficiently solved via dynamic programming. Numerical results of the metric are given as well as a sample of the type of analysis that should follow a low rating by the metric. Although this metric was originally developed to rate the performance of Ground Delay Programs, it is equally applicable to any setting in which the flow of discrete objects such as vehicles is controlled and later evaluated.

**Validating a Future Operational Concept for En Route Air Traffic Control**, by K. J. Viets and C. G. Ball

**Abstract:** In an effort to accommodate the predicted growth in air traffic, the Federal Aviation Administration (FAA) and the aviation community have developed a concept of operations for the National Airspace System (NAS) called Free Flight. This operational concept has been developed for the midterm time frame (nominally a period of time that centers around 2005). The Center for Advanced Aviation System Development (CAASD) at The MITRE Corporation developed the concept and has recently conducted laboratory exercises to validate the portion of the concept that applies to the en route domain. This paper describes CAASD’s laboratory efforts to begin validating the en route portion of the concept by examining the operational issues associated with the concept and the functional issues related to its evolution to the midterm. The laboratory validation exercises described examine the functionality of possible capability enhancements, but do not address associated detailed human factors issues. Favorable results from CAASD’s initial qualitative validation efforts support the need for further quantitative validation activities that include more detailed analyses, further development of operational procedures and computer-human interfaces, and more rigorous exercises involving FAA field controllers.


**Abstract:** The MITRE Corporation’s Center for Advanced Aviation System Development (CAASD) has been conducting research into new automation capabilities to support free flight operations. One of these capabilities is a problem resolution function to assist the en route sector controller team in handling the more complex traffic patterns that can result from a less structured free flight environment. This function is termed Problem Analysis, Resolution and Ranking (PARR). PARR is envisaged as an enhancement to the User Request Evaluation Tool (URET) Free Flight Phase 1 (FFP1) capability, and has been designated as Priority Research for the follow-on Free Flight Phase 2 (FFP2) effort.

PARR is being developed as a series of incremental enhancements, with the first step focusing on the resolution of aircraft-to-aircraft and aircraft-to-airspace problems. Follow-on enhancements
include resolutions for metering and other Traffic Flow Management (TFM) flow initiatives, resolutions for the avoidance of severe weather areas, and the integration into a common en route Sector Team CHI. A Research Management Plan has been prepared by the FAA and MITRE/CAASD to support this development process.

This paper describes the initial PARR capabilities, along with an extension to incorporate assigned metering time constraints.

- **An Experimental Approach to Measuring the Effects of a Controller Conflict Probe in a Free Routing Environment**, by K. Kerns

  **Abstract:** The unstructured traffic environment that is gradually evolving in the National Airspace System may necessitate decision aiding tools to help controllers manage aircraft traffic efficiently and within acceptable safety and workload levels. An experiment was designed to assess the effect of conflict detection and trial planning resolution aids and traffic conditions on the performance of controllers and the efficiency of flight. Twelve controllers participated in a high fidelity simulation study in the Indianapolis Center dynamic simulation facility using the User Request Evaluation Tool (URET). Study results indicated that URET clearly improves the acceptability of operations and may enhance safety, particularly in the unstructured environment. In addition, the study findings strongly support a shift toward more strategic air traffic control with conflict probe as well as a significant increase in the contribution of the D controller to the primary sector tasks. Because of study limitations, it was not possible to associate any quantitative estimates of airspace user benefits with the potentially more efficient resolution strategies. The results and experimental approach are discussed in terms of their contribution to measurement methods and issues in the evolutionary progression toward a free flight-based air traffic system.

- **A Methodology for Studying Cognitive Groupings in a Target Tracking Task**, by S. J. Landry, T. B. Sheridan, and Y. Yufik

- **Stability and Performance of Intersecting Aircraft Flows under Decentralized Conflict Avoidance Rules**, by Z. H. Mao, E. Feron, and K. Bilimoria

  **Abstract:** This paper considers the problem of two intersecting aircraft flows under decentralized conflict resolution rules. Considering aircraft flowing through a fixed control volume, new air traffic control models and scenarios are defined that enable the study of long-term aircraft flow stability. For a class of two intersecting aircraft flows, this paper considers conflict scenarios involving arbitrary encounter angles. It is shown that aircraft flow stability, defined both in terms of safety and performance, is preserved under the decentralized conflict resolution algorithm considered in this paper. It is shown that the lateral deviations experienced by aircraft in each flow are bounded.

- **Safety Verification of Conflict Resolution Maneuvers**, by C. Tomlin, I. Mitchell, and R. Ghosh
CFP: IEEE Transactions on Intelligent Transportation Systems

by Chelsea C. White

IEEE Transactions on Intelligent Transportation Systems

Call for Papers

The IEEE Intelligent Transportation Systems Council (ITSC) announces a new transactions journal, the IEEE Transactions on Intelligent Transportation Systems. The first quarterly issue will appear in March 2000.

Improved planning, design, management, and control of future transportation systems requires conducting both basic and applied research to expand the knowledge base on transportation. The new IEEE Transactions on ITS will focus on the design, analysis, and control of information technology as it is applied to transportation systems. Topics to be considered will include, but will not be limited to:

- Sensors (infrastructure & vehicle-based)
- Communications (wide area & vehicle-to-roadside)
- Man-Machine Interfaces (displays, artificial speech)
- Decision Systems (expert systems, intelligent agents)
- Simulation (continuous, discrete, real-time)
- Reliability & Quality Assurance
- Imaging and Image Analysis
- Information Systems (databases, data fusion, security)
- Computers (hardware, software)
- Control (adaptive, fuzzy, cooperative, neuro, large systems)
- Technology Forecasting & Transfer
- Systems (engineering, architecture, evaluation)
- Signal Processing
- Standards.

Transportation systems are usually large-scale in nature and are invariably geographically distributed. The complexity of transportation systems arises from many sources. Transportation systems can involve humans, vehicles, shipments, information technology, and the physical infrastructure—all interacting in complex ways. Many aspects of transportation systems are uncertain, dynamic and nonlinear, and such systems may be highly sensitive to perturbations. Controls can involve multiple agents that are distributed and hierarchical. Personnel who invariably play critical roles in a transportation system have a diversity of objectives and a wide range of skills and education.

Despite such complexity, the emergence of new technologies—such as sensors, communications, low-cost, faster computation, and new control and optimization algorithms—provides new opportunities to substantially improve efficiency, safety and environmental impact. With the use of these technologies, new and faster measurements are possible and more data can be managed and processed. Additionally, new strategies for management and control will be developed to deal with both the static and the dynamic nature of transportation systems. So, while most of the classical transportation problems raised in the past continue to exist, there now are new approaches with which to contend.
The intent of the IEEE Transactions on ITS will be to serve as a forum for the technological aspects of information technology to transportation, thus providing researchers with an outlet for publication.

For further publication guidelines, contact the editor at ccwiii@umich.edu or by call 734-764-5723. Please send five (5) copies of your manuscript for possible publication to:

Chelsea C. White, III, Editor  
Department of Industrial and Operations Engineering, College of Engineering  
University of Michigan  
Ann Arbor, Michigan 48109-2117 USA

Profile: Dr. Shoichi Washino

by Emily Sopensky

Dr. Shoichi Washino, IEEE senior member and one of two representatives from the Industrial Electronics Society to the ITS Council, is a contemplative man who is making a bold change to his life. A solid researcher with 25 years with Mitsubishi Electric Corp., Dr. Washino began teaching full time at a new university in April 2001. His post is in the Department of Information Systems at Tottori University of Environmental Studies that opened its doors in Tottori Prefecture, Tottori, a city near Himeji in Japan. It takes about one hour by train to go to Tottori from Himeji, home to the famous Himeji castle.

With a dissertation based on his study of the electron accelerator, Washino received his doctorate in electrical engineering from Osaka University in 1975. At Mitsubishi Electric Corp., he first studied the electron gun and color picture tubes. But after five years, he began studying combustion.

"No. There are no similarities between the fields of research," Washino acknowledges. "But," he adds with a twinkle in his eye, "My advisor told me that I could do anything and that’s why he gave me the degree!"

After studying the internal combustion and its control system, he then studied vehicle control systems. That field of study led to the study of in-vehicle navigation systems. As department manager of vehicle electronics, his field of investigation diverged to study infrastructure.

"That’s why I’m studying IVS," he explains.

With the transition to teaching at a university, Dr. Washino expects to influence his students to design systems that are environmentally kind. In fact, he sees the power of the student as being very large in comparison to that of a professor.

Look for some quiet revolutions to emanate from Tottori City.
CFP: PROSPER congress
by Colin Jefferson

PROSPER 2001

Promotion of Pollution Control and Energy Saving by the use of Hybrid Power Systems.

International congress sponsored by the European Commission on innovation in urban passenger transit systems aimed at energy saving and environmental improvement.

Karlsruhe, Germany, 19th-20th September 2001

The congress includes:
- Seminar
- Workshops
- Industrial Exhibition
- Demonstration of a hybrid bus (flywheel and gas engine) and light rail vehicle (flywheel and gas-turbine, the result of the EU-research project ULEV-TAP)

The PROSPER congress is aimed at disseminating the results of development projects in hybrid propulsion technology whose objective is to reduce fuel consumption and emissions in urban passenger transit vehicles through increased efficiency and effective brake energy recovery, and to provide a low cost alternative to electrification.

The congress is intended as a platform for dissemination of information on low emission vehicles, passenger transit vehicles in particular. It will bring together participants of widely differing backgrounds and disciplines and cover political, scientific and operational aspects of the quest of environmental improvement of our city centres. Though the congress will focus on public transport, it will also be of interest to operators and designers of waste disposal and local goods delivery vehicles, for instance. Other interesting fields of application include crane operations and standby emergency or local electricity generation.

Who should attend? - Public transport operators, Local transport authorities, Transport planners, Consultants, Passenger transit vehicle manufacturers, Delivery and waste truck manufacturers, Crane manufacturers, Energy managers, system designers and energy consultants.
CALL FOR PAPERS

The congress organisers invite papers for presentation at the seminar on the following topics relating to urban passenger transit systems, delivery vehicles, waste trucks, etc., or other topics falling within the scope of the meeting:

- Hybrid vehicles
- Fuel cells
- Clean and efficient engines
- Alternatives to electrification
- Low emission vehicles
- Sustainable urban transport
- Energy saving in urban transport
- Brake energy recovery
- Operational requirements
- Market aspects

Abstracts of no more than 300 words should be sent to Colin.Jefferson@uwe.ac.uk

Final acceptance will be based on the full length paper, to be submitted by July 20th, which, if accepted, will be proposed for oral presentation at the seminar or for poster presentation in the exhibition. It is proposed to publish accepted papers for distribution at the congress on CD ROM.

Full details of the PROSPER congress are on http://www.prosper.ttk.de

Position at Inria Available

by Michel Parent

INRIA, a leading public research institute in France in the fields of computer sciences, automation and applied mathematics is looking for new recruits at all levels. In particular, researchers and technicians are welcome in the project IMARA, lead by Michel Parent, which deals with automated vehicles. This group is involved in a very large (10M$) European project called CyberCars, due to start in June this year, about the development and test of an automated transportation system for cities based on fully automated electric vehicles. For more information, look at :

http://www.inria.fr/travailler/opportunites/index.en.html
and :
http://www-rocq.inria.fr/imara/
IEEE Intelligent Systems Magazine
Call for Short Papers/Reports

IEEE Intelligent Systems Magazine has started a regular department on Intelligent Transportation Systems. This department (published in each issue) describes current trends and ideas for future systems/realizations/projects in the field of ITS.

People willing to share their ideas and disseminate the results of their projects are invited to prepare a short article (from 2 to 5 magazine pages) describing current trends, projects, research directions, and their experience in any field of Intelligent Transportation Systems.

For further publication guidelines and for suggestions, contact the editor at broggi@ce.unipr.it with a possible outline of the proposed article.

Thanks to an agreement with the Magazine, published articles are reprinted in this Newsletter and are made available on the web at: www.ce.unipr.it/broggi/is-department