INTELLIGENT TRANSPORTATION SYSTEMS

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IEEE ITS SOCIETY NEWSLETTER

Editor: Prof. Bart van Arem, b.vanarem@utwente.nl

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In This Issue

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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: LaTeX, plain ASCII, PDF, or Word, to the Editor at b.vanarem@utwente.nl *at least 1 month prior to the newsletter's distribution:*

Issue	Due date
March	February 1st
June	May 1st
September	August 1st
December	November 1st

THE
IEEE INTELLIGENT TRANSPORTATION SYSTEMS SOCIETY

Society News

From the Editor

by Bart van Arem

Dear Readers,

I am pleased to offer you the second newsletter of the IEEE Intelligent Transport Systems Society. In this second newsletter you can already witness the changes that are taking place. Our VP Conferences Paul Kostek announces two additional conferences supported by the ITS Society. Our VP Technical Activities Stefano Stramigioli announces his plans for a technical activity board, in which committees will be initiated for a range of ITS subjects. I encourage you to read these new plans and to join our activities. This newsletter features one technical paper on electronic fee collection. Besides our traditional news sections we are introducing two new sections. The first is a book review section which will be coordinated by Algirdas Pakstas, and which contains a first review on 'Economic Impacts of Intelligent Transportation Systems'. If you have books to be reviewed or would like to submit a review, please contact Algirdas Pakstas: a.pakstas@londonmet.ac.uk. The second new section is reviews of research programs. Many interesting research programs are being started, conducted and finished throughout the world. This section aims to review these programs and indicate ways of getting involved. The first contribution is made by Richard Bishop: richardbishop@mindspring.com, focusing on Intelligent Vehicle research in the USA. If you also would like to contribute please contact me: b.vanarem@utwente.nl.

Please let us know if you enjoy reading this newsletter!

Message from the IEEE ITS Society President

by Charles J. Herget

We have now operated for over three months as a Society with only a few startup problems. We have nearly achieved our goal of 1,000 members in the first year. I am sure that we will eventually be a society of several thousand members.

We will have the first election of members of the Board of Governors (BOG) later this year. The Nominations and Appointments Committee will select a slate of candidates that will be submitted by mail ballot to all members of the Society. Five members will be elected for a term of three years. There is a provision in the Society Bylaws, which can be found on the Society's web site, for nomination of candidates for the BOG by petition. The deadline for nominations by petition for the BOG has passed.

The BOG elects the officers of the Society. This year, the BOG will elect the Vice President for Conference Activities, Vice President for Publication Activities, Vice President for Member Activities and Editor-in-Chief of Transactions at its meeting in September to take office January 1, 2006. The Bylaws also contains

a provision for nominating candidates for office by petition. There is still time to submit petitions for the election of officers in September.

As always, I am asking for volunteers to help keep our Society running. Please send me an email if you would like to volunteer to participate in any of our activities or if you have any suggestions for improving the operation of the Society.

Charles Herget 2005 President, IEEE ITS Society c.herget@ieee.org

Calendar of Society Events

by Daniel J. Dailey

Up Coming events for ITSS:

ITS Society Meetings:

- IEEE ITSS Board of Governors: June 5, 2005, Las Vegas, NV, USA.
- IEEE Intelligent Vehicles Symposium: June 6-8, 2005, Las Vegas, NV, USA
- IEEE ITSC'05: September 13-16, 2005, Vienna, Austria
- IEEE ITSS Board of Governors: September 17, 2005, Vienna, Austria.
- IEEE ITSC'06: 2006, Toronto, Canada.
- IEEE ITSC'07: 2007, Seattle, WA, USA.

ITSS Officers and Committees can be found at: http://www.ewh.ieee.org/tc/its/officers.html
ITSS Calendar and Related Events can be found at: http://www.ewh.ieee.org/tc/its/calendar.html
Web Pages for past, present and future Conferences: http://www.ewh.ieee.org/tc/its/conf.html
Update your IEEE membership to include ITSS at: http://www.ieee.org/itss and click Update

Message from the VP for Conferences

by Paul Kostek

This year ITSS is pleased to be adding two additional conferences to our present offerings. ITSS will now be the sponsor for The International Conference on Intelligence and Security Informatics and the International Conference on Vehicular Electronics and Safety. We feel these two Conferences will be an excellent fit with our current Conferences: the Intelligent Vehicles Symposium and the Intelligent Transportation Systems Conference.

Coming in 2005

The IEEE InternationalConference on Intelligence and Security Informatics was the first ITSS Sponsored Conference of 2005. The Conference was held May 19-20 in Atlanta, Georgia and details are available at: http://ecom.arizona.edu/ISI/oc.htm. The Co-Chairs for the Conference are Ralph Merkle of Georgia Tech, Atlanta, Georgia, USA and Hsinchun Chen of the University of Arizona, Tucson, Arizona.

Next will be the Intelligent Vehicles 05 (IV05) symposium which will be held in Las Vegas June 6-8. You can learn more at http://www.ieeeiv.org. The Chair for the Conference is FeiYue Wang of the University of Arizona, Tucson, Arizona.

The ITSC05 will be held in Vienna, Austria September 13-16. ITSC05 planning is on schedule and papers are now being assessed/selected for the Conference. Thanks to all who submitted abstracts. You can learn more at: http://www.itsc2005.at. The General Chair of the Conference is Reinhard Pfliegl of Via Donau, Vienna, Austria.

The fourth Conference ITSS is sponsoring this year is the IEEE International Conference on Vehicular Electronics and Safety. It will be held October 15 - 17, 2005 in Xi'an, Shanxi,China. Learn more at: https://150.135.155.192/ves05/index.php. The Chair is Nanning Zheng of Xi'an Jiaotong University, China.

2006 and Beyond

In 2006, the Intelligent Vehicles Symposium will be held in Tokyo, Japan. The contact for IV06 is Katsushi Keuchi of the Institute of Industrial Science University of Tokyo.

ITSC06 will be held in Toronto, Canada. The contact for ITSC06 is Baher Abudalli: baher.abdulhai@utoronto.ca of the University of Toronto.

Proposals for IV07 are now being accepted. The location for the 2007 symposium will be Europe. Please submit proposals to me: p.kostek@ieee.org.

ITSC07 will be held in Seattle, Washington and the contact is Dan Daily: dan@its.washington.edu of the University of Washington.

Proposals for ITSC08 (North America) are also welcome. Contact me if you are interested in submitting a proposal.

ITSC2005 in Vienna

by Reinhard Pfliegl

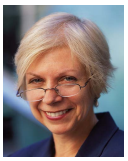
The organisation activities for ITSC 05 are in full progress. ITSC 05 - 8th International IEEE Conference on Intelligent Transportation Systems - will be held from September 13 - 16, 2005 in Vienna, Austria. With the target of 300 submitted papers reached at the beginning of March, 200 selected papers will be presented during the conference. Since the review process is nearly finished, we would like to thank the entire International Programme Committee and Reviewers for serving on ITSC 05 and the Programme Chair Stefano Stramigioli for handling the review process. The Programme Chairs will now compile the technical/scientific Programme for ITSC 05. Moreover there will be Workshops held on Tuesday, September 13 and Technical Tours on Friday, September 16 within the scope of the conference.

Registration has already started. Forms and online registration are available on the conference website, including hotel reservations, sightseeing programme and technical tours. The Exhibition will be situated close to the Plenary Room. If you are interested in presenting your company or project in a highly international community please contact the responsible exhibition agency Media Plan. A wide range of Sponsoring Opportunities offer an additional possibility to promote your company. There will be an extensive cooperation with Universities, research institutes and national organisations to present the state of the art evolutions of the conference matters.

I invite everybody to participate in this state of the art conference in the heart of Europe. Further information can be found at the conference homepage www.itsc2005.at.

ITSC ´05

8th International IEEE Conference on Intelligent Transportation Systems



Message from the VP for Publications

by Emily Sopensky

Exercising Your Subscription

Springtime evokes sights and sounds of renewal and of new ground being broken. IEEE Xplore, IEEE's portal for online access to its digital media, is no exception. Version 2.0 is easier for users. Access rights are automatically recognized based on IP address. Non-subscribers can search abstracts at no charge. Previously, they could only browse titles. Payment is required only if the non-subscriber decides to download the full article.

Stay current on the ITS research by accessing online the **IEEE Transactions on Intelligent Transportation Systems**. Access is free to members of the ITS Society. If you are not already a member of the IEEE Intelligent Transportation Systems Society, now is the perfect time to join. IEEE dues are half-price through 15 August when you visit http://www.ieee.org/join.

Access to the ITSS newsletter is free to IEEE members and non-members alike. Go to http://www.ieee.org/itss and sign up. Each quarter, an email notice is sent to each subscriber with a link to the newsletter in pdf format.

Spring time is also a time when fitness programs are invoked in preparation for the long year ahead. If you haven't been reading **IEEE Transactions on ITS**, now is the time to start your exercise program and read vital new research in the field. Recent papers include:

- **Geometric Travel Planning** by Stefan Edelkamp, Shahid Jabbar & Thomas Willhalm, covering optimal route planning using GPS trajectories refined by geometric filtering and rounding algorithms
- **Advanced Traveler Information System for Hyderabad City** by Praveen Kumar, V. Singh & D. Reddy. An ATIS provides vital information to travelers regarding traffic regulation, route and location guidance, hazardous situations and safety warnings.
- **A Framework for Real Time Behavior Interpretation from Traffic Video** by Andreas Hegyi, Bart De Schutter & Hans Hellendoorn. Dense freeway traffic can cause shock waves, which result in sudden, large variations in the speeds of vehicles, which could lead to unsafe situations. Dynamic speed limits could be the answer.

ITSS members may read these and other peer-reviewed papers online at http://ieeexplore.ieee.org

Regards,

Emily Sopensky Vice President, Publications IEEE Intelligent Transportation Systems Society
http://www.ieee.org/itss

P.S. – Want to find out more about the articles mentioned above? You can read the brief online abstracts from all of the papers in the March 2005 issue of IEEE Transactions on ITS here:
http://ieeexplore.ieee.org/xpl/tocresult.jsp?isYear=2005&isnumber=30446

Message from the VP Technical Activities

by Stefano Stramigioli

The Technical Activity Board (TAB) is starting to shape up! We have decided to form a set of Technical Committees in order to structure the technical activities of the society. Two technical committees already have a chair and for the others we are looking for volunteers which would like to lead them, so take initiative and contact me!

The two initial TCs are on ITS Technologies and another on ITS Applications. The initial lists follow:

- Technologies TCs
  - Hardware and Data Processing
  - Traffic Modeling
  - Traffic Management
  - Control
  - Vision and Sensors
  - Reliability and Quality
  - Computer Tools and Simulations
  - Human Machine Interfaces
- Applications Fields TCs
  - Logistics and Services (chaired by Prof. Robin Qiu, Pennsylvania State University)
  - Mobile Communication Networks (chaired by Prof. CK. Toh, University of Hong Kong)
  - Standards

You certainly may have some questions like: "What should a technical committee do?" or "What is the responsibility of a TC chair?"

A TC should be the contact point for a certain expertise within the society in many different ways. A TC chair should promote the field by organizing special sessions at conferences, special issues, tutorials and/or workshops and any other topical related event. It is expected that every year a couple of these activities are organized and promoted by the TC and the VP TAB will keep account of the involvement and the productivity of each TC. The society will do its best to recognize the most active TCs in a way or another via this Newsletter or at conferences.

Organizing these events is not all. Conferences are one of the major activities of the society. After some brainstorming with the VP Conference, we think it would be a good idea to combine the synergies of the TAB and the Conference Board. This may be done by creating a Conference Editorial Board which will be involved in conference paper reviews year in year out and will get a recognised status. In this way we would ensure quality and timeliness of our conference review process. Each TC chair would nominate a person which will be a Conference Editorial Board Member (CEBM) in charge of finding a trustful, professional and motivated number of people which will serve as International Program Committee Members, serving a certain number of years. Members will function similarly to Associate Editors (AEs) for the transactions.

Each TC chair will prepare a short report at least once a year in order to present the activities which have been organized or planned for the future.

This is all for the moment. If you are interested in chairing one of the available technical committees, please do not hesitate to contact me at: s.stramigioli@ieee.org! We are looking for volunteers!

Bookreview

by Algirdas Pakstas London Metropolitan University

Introduction to the book review section

We would like to introduce a new section of the Newsletter which we hope to become active from the next issue. This section will be edited by Prof. Dr.tech. Pakštas from London Metropolitan University, Department of Computing, Communications Technology and Mathematics. Prior to establishing IEEE Intelligent Transportation Systems Society Prof. Pakštas served as one of the representatives from IEEE Communications Society to the IEEE ITS Council. His interest to ITS mostly from the Communications prospective. He is a Senior Member of IEEE, IEEE Computer and Communication Societies as well as member of ACM and the New York Academy of Sciences.

Book reviews will include the following elements: relevance; scientific quality; awareness of state of the art; accessibility (and for which levels of readers); readability; usefulness to scientists, practitioners, students; bibliographic details. We invite readers to provide other topics of interest regarding book review contents as well as suggestions for titles which are worth considering. Prof. Pakštas can be contacted by e-mail a.pakstas@ieee.org

Economic Impacts of Intelligent Transportation Systems: Innovations and Case Studies (Research in Transportation Economics, Volume 8), Editors: Evangelos Bekiaris, Yuko Nakanishi, Elsevier, 2004, Hardbound, 655 pages, ISBN 0-7623-0978-4

Economic valuation of Intelligent Transportation Systems (ITS) is very complex task because traditional methods of quantitative analysis may not be appropriate in accurately and reliably assessing the economic impacts of ITSs. Many of the technologies associated with ITSs are still relatively new, and their use may be found only in a few countries. Information and statistics about ITSs are mostly of anecdotal character and focused more on benefits rather than costs. There is not much of the historical data and "lessons learned" which can be used for planning future ITSs. ITS technologies have different life cycles, cost structures, and a number of interrelated elements as compared with traditional transportation infrastructure.

Thus, there is a need to address these concerns and discuss new economic assessment techniques and/or modifications to existing ones - and that is exactly a goal of this book which is a result of efforts of the big group of authors (47 authors from Australia, Belgium, Canada, Finland, Germany, Greece, Japan, Korea, Sweden, UK, and USA). Editors of the book are actively involved into EU (Evangelos Bekiaris) and USA (Yuko Nakanishi) projects related to ITSs. The book includes case studies covering a wide range of ITS technologies including freeway management, electronic toll collection, advanced driver assistance systems, and traveller information systems from many North American, EU, and Asian nations and major metropolitan areas.

The book consists of 10 parts. Part I introduces the reader to the area and background of ITSs as well as framework for an economic evaluation of transportation investments (43 pages). Part II (39 pages) supplements the introduction, giving background information on the relevant technologies and market. In particular, ITS clustering and terminology are described: Presented infomobility services are considered as an emerging market.

An array of evaluation techniques and assessment methodologies is presented in Part III (151 pages). Here are considered issues of application and limitations of Cost-Benefit Assessment (CBA) for ITSs as

well as analytical alternatives and applicability of multicriteria-analysis in ITS evaluation. CBA-related discussion is also focusing on the role of discount rates and pilot projects. Data Envelopment Analysis (DEA) is considered for performance assessment of ITSs. Additionally, framework for investment decision-making under risk and uncertainty for infrastructure asset management as well as detailed case study for highly congested network in South Jersey that evaluates the economic impact of Variable Message Signs (VMS) route guidance using microsimulation are presented.

Parts IV-IX focus on actual case studies of benefits, costs and impact measurement performed by researchers and practitioners.

Incident management on freeways is considered in Part IV (90 pages). An incident delay model for the evaluation of incident management strategies is presented in the context of the IIMS project which is currently being implemented in the New York City. Strong empirical evidence of the safety benefits of freeway management systems and motorist assistance patrols is provided through two case-study assessments - one in Phoenix, Arizona and the other in St.Paul/Minneapolis, Minnesota.

Part V (68 pages) is focused on electronic toll collection and commercial vehicle operation. A case study on technology considerations for the implementation of a statewide road user fee system is using data from state of Oregon, USA and due to its typical functionality concludes about generic applicability of the findings. Active dedicated short range communications application for ITS and its economic evaluation is considered using data from City Bus Information System (CBIS) and Electronic Toll Collection System in Korea. A Commercial Vehicle Information System and Networks (CVISN) programme began in USA in 1996 - first in Maryland and Virginia and was later extended to California, Colorado, Connecticut, Kentucky, Michigan, Minnesota, Oregon, and Washington. A benefit/cost analysis of the CVISN program is presented.

Case studies related to public transport are subject of Part VI (36 pages). A study on prioritizing various technologies and incorporating ITSs and other telematics projects into public transport is presented with some details on Chicago Transit Authority projects. Perceived benefits of improved information exchange is a subject of the next research paper from Sweden - a case study on rail and intermodal transports is presented based on the data from the Swedish National Rail Administration (Banverket).

Advanced Driver Assistance Systems (ADAS) and driver/traveller information are features of Part VII (38 pages). The projects ADVISORS and TRAVEL-GUIDE were co-funded by Directorate General of Transport and Energy of the European Commission. The strategic evaluation of new technologies through multicriteria analysis is presented using data from the ADVISORS project (pan-European study in 2000-2002 which involved various public agencies, publicly funded research institutes, transport and insurance companies, and automobile manufacturers from 10 EU countries - http://www.advisors.iao.fhg.de. Costs and benefits of ITS systems and their application in the infomobility services have been evaluated within the context of the research project TRAVEL-GUIDE (11 participants from 6 EU countries, including automotive and ADAS industries as well as relevant city authorities and research partners).

Part VIII (40 pages) is considering effects of using advanced computing technologies such as Virtual Reality (VR), Virtual Environment (VE), simulators and digital road data in ITSs. The first paper is discussing how to balance costs and benefits in applying VR/VE tools in the ITS sector. The second paper is presenting a new way for quantifying impacts of different ITSs and other applications using a vehicle motion simulator (Vemosim) combined with digital road data. This is illustrated by two case studies from Finland: (a) use and impact of information technology on timber transportation, and (b) impacts caused by congestion on fuel consumption, emissions and fuel tax of a truck plus trailer combination.

Assessing the Impact of ITS on the overall economy of country is studied in Part IX (43 pages) using two holistic case studies - first from Japan and second from California, USA. The study on Japan is assessing impact of ITS on the country's economy using a Computable General Equilibrium (CGE) model. Productivity benefits and cost efficiencies from ITS applications to public transit are discussed using an example of the evaluation of Advanced Vehicle Location (AVL) applications in California.

Planning perspective and policy recommendations are topics for Part X (67 pages). It suggests ways in which utilization and merger of the new ITS impact assessment techniques may be fulfilled within existing transportation planning processes. Evaluating benefits and costs of ITS elements from a planning perspective is considered in a context of the design and development of a computer-based decision system for New York State Department of Transportation. Case study from the ADVISORS project is used to illustrate design of the ITS implementation policy for two ADAS clusters: Adaptive Cruise Control (ACC) and Intelligent Speed Adaptation (ISA).

Recommended publisher's price for this book is 150 USD.

The intended audience of the book includes researchers and postgraduate students in transportation, civil servants, policy makers and consultants. The book is the summary of the research done by the contributors, but supplemented with some background descriptions of analyzed problems. It can help a less advanced reader to understand the main idea of the featured problems.

Report on IEEE Trans. on Intelligent Transportation Systems

by Alberto Broggi

The March 2005 issue was devoted to the publication of the remaining papers from the special issue associated with the IEEE ITS Conference 2003, together with a set of regular papers.

The June 2005 issue is now in preparation at IEEE Headquarters.

The current backlog of papers ready for publication is increasing. The September 2005 issue was already full, while we are still working on the December 2005 issue. Therefore, we have negotiated an increase to our page budget for 2005 and for the coming years.

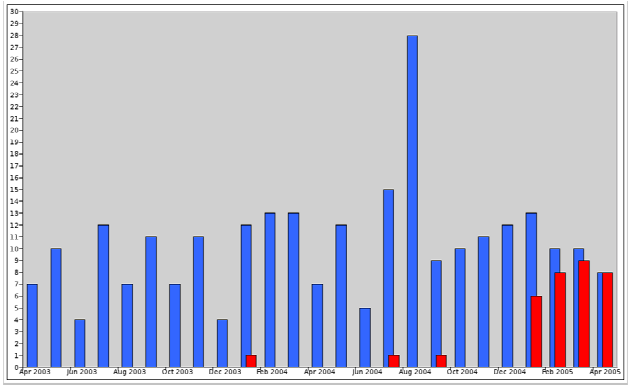
I'm proud that the average turnaround time (the time from submission to decision) for the papers submitted from January 1, 2004 up to now (excluding special issue papers which got a fairly higher processing speed) is still less than 100 days: Again I'm indeed working to further reduce this, towards the ideal of 10 weeks maximum.

Many submissions in the last few months included additional files (e.g. movie clips) to present the results obtained in the work. Currently these additional documents are considered only by the reviewers and are not passed on when the article is published.

We are currently looking into the possibility of publishing papers on IEEE Xplore together with their multimedia content, if any. There are many possibilities to include multimedia content within a paper and we are investigating all options.

We also are testing and customizing –with the help of IEEE staff– the new version of Manuscript Central (Version 3.2) which is going to replace the old version in mid 2005.

During 2005, Manuscript Central will be populated with new features, including a tool to help authors to check their graphics attachments before submitting the final version of their papers, and an automatic tool to generate the copyright form, just to name a few changes. IEEE staff can now handle a larger number of file formats. This will ease authors' preparations of their final papers.



The attached figure shows: in blue the number of papers submitted in each month from April 2003 (when we switched to electronic submission), and in red the number of papers sill without a decision; this means that either the first submission did not come to an end, or that a new revision is currently under evaluation.

The figure shows that the trend is positive and, a part from isolated cases, all submitted papers receive a notification in a reasonably short time.

The next Editorial Board meeting will be organized in conjunction with IEEE ITSC 2005, in Vienna, Austria.

IEEE Trans. on Intelligent Transportation Systems - Index

by Simona Berté

To go directly to the online Transactions Table of Contents, click on "Index" above. IEEE ITSS members have full access to the papers. Non-members can browse the abstracts, which are provided below.

Vol.6, No.2, June 2005

- **On-road Vehicle Detection Using Evolutionary Gabor Filter Optimization** , by Zehang Sun, Ronald Miller and George Bebis

  Abstract: Robust and reliable vehicle detection from images acquired by a moving vehicle is an important problem with numerous applications including driver assistance systems and self-guided vehicles. Our focus in this paper is on improving the performance of on-road vehicle detection by employing a set of Gabor filters specifically optimized for the task of vehicle detection. This is essentially a kind of feature selection, a critical issue when designing any pattern classification system. Specifically, we propose a systematic and general evolutionary Gabor filter optimization (EGFO) approach for optimizing the parameters of a set of Gabor filters in the context of vehicle detection. The objective is to build a set of filters that are capable of responding stronger to features present in vehicles than to non-vehicles, therefore, improving class discrimination. The EGFO approach unifies filter design with filter selection by integrating Genetic Algorithms GAs) with an incremental clustering approach. Filter design is performed using GAs, a global optimization approach that encodes the Gabor filter parameters in a chromosome and uses genetic operators to optimize them. Filter selection is performed by grouping filters having similar characteristics in the parameter space using an incremental clustering approach. This step eliminates redundant filters, yielding a more compact, optimized set of filters. The resulting filters have been evaluated using an application-oriented fitness criterion based on Support Vector Machines (SVMs). We have tested the proposed framework on real data collected in Dearborn, Michigan in Summer and Fall 2001, using Ford's proprietary low light camera.

- **Real-Time Freeway Level of Service Using Inductive-Signature-Based Vehicle Re-identification System** , by Andre Tok, Stephen Ritchie and Cheol Oh

  Abstract: The Highway Capacity Manual (HCM) provides a method for determining the level of service (LOS) on freeways to evaluate freeway performance. Apart from being essentially an off-line decision support tool for planning and design, it is also based on point measurements from loop detectors, which may not provide an accurate assessment of freeway section performance. In order to meet user requirements of advanced traffic management and information systems (ATMIS), new LOS criteria based on section measures are required for real-time freeway analysis. The main aim of this research was to demonstrate a technique for development of such LOS criteria. The study uses a new measure of effectiveness, called re-identified median section speed (RMSS), derived from analysis of vehicle inductive signatures and re-identification of vehicles traveling through a major section of freeway in the city of Irvine, California. Two main issues regarding real-time LOS

criteria were addressed. The first was how to determine the threshold values partitioning the LOS categories. To provide reliable real-time traffic information, the threshold values should be decided such that RMSSs within the same LOS category represent similar traffic conditions as much as possible. Also, RMSSs in different LOS categories should represent dissimilar traffic conditions. The second issue concerned the aggregation interval to use for deriving LOS categories. Two clustering techniques were then employed to derive LOS categories, namely k-means and fuzzy approaches. Wilk's lambda analysis and LOS stability analysis were performed to design new LOS criteria. Six LOS categories defined in terms of RMSS over a fixed 240 sec interval were identified as the best solution to meet two major considerations described above. The procedures used in this study are readily transferable to other similarly equipped freeway sections for the derivation of real-time LOS.

- **Development and Field Test of a Laser-Based Non-Intrusive Detection System for Identification of Vehicles on the Highway** , by Harry H. Cheng, Benjamin D. Shaw, Joe Palen, Bin Lin, Bo Chen and Zhaoqing Wang

  Abstract: A real-time laser-based non-intrusive detection system has been developed for the measurement of true travel time of vehicles on the highway. The detection system uses a laser line that is projected onto the ground as a probe. The reflected light is collected and focused into a photodiode array by an optical system. Vehicle presence is detected based on the absence of reflected laser light. By placing two identical laser/sensor pairs at a known distance apart, the speeds of both the front and rear of a vehicle are measured based on the times when each sensor is triggered. The length of each vehicle is determined by using these speed measurements and the residence time of the vehicle under each sensor. Using real-time software, the speed, acceleration, and length of a detected vehicle can be calculated and displayed simultaneously. A new prototype system has been tested on the highway with different types of vehicles and scenarios, and the results are presented here. The tests have also been carried out for different weather conditions and road materials. The results indicate that the laser system operates well under real highway conditions.

- **Detecting Stress During Real-World Driving Tasks Using Physiological Sensors** , by Jennifer A. Healy and Rosalind W. Picard

  Abstract: This paper presents methods for collecting and analyzing physiological data during real world driving tasks to determine a driver's relative stress level. Electrocardiogram, electromyogram, skin conductance and respiration were recorded continuously while drivers followed a set route through open roads in the greater Boston area. Data from twenty-four drives of at least fifty minute duration were collected for analysis. The data were analysed in two ways. Analysis I used features from five minute intervals of data during the rest, highway and city driving conditions to distinguish three levels of driver stress with an accuracy of over 97and driving days. Analysis II compared continuous features, calculated at one second intervals throughout the entire drive, with a metric of observable stressors created by independent coders from video tapes. The results show that for most drivers studied, skin conductivity and heart rate metrics are most closely correlated with driver stress level. These findings indicate that physiological signals can provide a metric of driver stress in future cars capable of physiological monitoring. Such a metric could be used to help manage non-critical in-vehicle information systems and could also provide a continuous measure of how different road and traffic conditions affect drivers.

- **Detection of Loitering Individuals in Public Transportation Areas** , by Nathaniel D. Bird, Osama Masoud, Nikolaos Papanikolopoulos and Aaron Isaacs

  Abstract: This paper presents a vision-based method to automatically detect individuals loitering about inner-city bus stops. Using a stationary camera view of a bus stop, pedestrians are segmented and tracked throughout the scene. The system takes snapshots of individuals when a clean, non-obstructed view of a pedestrian is found. The snapshots are then used to classify the individual images into a database, using an appearance-based method. The features used to correlate individual images are based on short-term biometrics, which are changeable but stay

valid for short periods of time.this system uses clothing color. A linear discriminant method is applied to the color information to enhance the differences and minimize similarities between the different individuals in the feature space. To determine if a given individual is loitering, timestamps collected with the snapshots in their corresponding database class can be used to judge how long an individual has been present. An experiment was performed using a 30 minute video of a busy bus stop with six individuals loitering about it. Results show that the system successfully classifies images of all six individuals as loitering.

- **Optimal Vehicle Routing with Real-Time Traffic Information**, by Seongmoon Kim, Mark E. Lewis and Chelsea C. White, III

  Abstract: This paper examines the value of real-time traffic information to optimal vehicle routing in a non-stationary stochastic network. We present a systematic approach to aid in the implementation of transportation systems integrated with real time information technology. We develop decision-making procedures for determining the optimal driver attendance time, optimal departure times, and optimal routing policies under time-varying traffic flows based on a Markov decision process formulation. With a numerical study carried out on an urban road network in Southeast Michigan, we demonstrate significant advantages when using this information in terms of total costs savings and vehicle usage reduction while satisfying or improving service levels for just-in-time delivery.

- **Receding Horizon Control for Aircraft Arrival Sequencing and Scheduling** , by Xiao-Bing Hu, and Wen-Hua Chen

  Abstract: Airports, especially busy hub airports, prove to be the bottleneck resources in the air traffic control system. How to carry out arrival scheduling and sequencing effectively and efficiently is one of main concerns to improve the safety, capacity and efficiency of the airports. This paper introduces the concept of Receding Horizon Control (RHC) to the problem of arrival scheduling and sequencing in a dynamic environment. The potential benefits RHC could bring in terms of airborne delay and computational burden are investigated by means of Monte Carlo simulations. It is pointed out that while achieving similar performance as existing schemes, the new arrival scheduling and sequencing scheme significantly reduces the computational burden and provides potential for developing new optimization algorithms for further reducing airborne delay.

- **Reliable Method for Driving Events Recognition** , by Dejan Mitrovic

  Abstract: Motor vehicles greatly influence human life, but are also a major cause of death and road congestion is an obstacle to future economic development. We believe that, by learning driving patterns, useful navigation support can be provided for drivers. In this paper we present a simple and reliable method for the recognition of driving events using hidden Markov models, popular stochastic tools for studying time series data. A data acquisition system was used to collect longitudinal and lateral acceleration and speed data from a real vehicle in a normal driving environment. Data were filtered, normalized, segmented and quantified to obtain the symbolic representation necessary for use with discrete hidden Markov models. Observation sequences for training and evaluation were manually selected and classified as events of a particular type. An appropriate model size was selected, and the model was trained for each type of driving events. Observation sequences from the training set were evaluated by multiple models and the highest probability decides what kind of driving event this sequence represents. The recognition results showed that hidden Markov models could recognize driving events very accurately and reliably.

- **An Expectation-Maximization Based Interacting Multiple Model Approach for Cooperative Driving Systems** , by Dongliang Huang and Henry Leung

  Abstract: In this paper, we present a novel combined sensor registration and fusion approach for cooperative driving in intelligent transportation systems (ITS). A realistic augmented registration and fusion state space model in three dimension is first developed for dissimilar sensors. In order to have unbiased sensor registration parameter estimates, the expectation-maximization (EM)

algorithm is incorporated with the extended Kalman filter (EKF) to give simultaneous state and parameter estimates. Furthermore, the interacting multiple model (IMM) filter is introduced here for collaborative driving in order to deal with the jumping model problem occurred in different vehicle driving status. To evaluate the registration and fusion performance, a new recursive relationship is derived theoretically for computing the posterior Cramer-Rao bound (PCRB). It is shown by simulation that the proposed EM-IMM-EKF method has a more robust estimation performance than the conventional approach. The performance is furthermore verified by comparing the mean square error (MSE) with the PCRB.

- **Range Policy of Adaptive Cruise Control Vehicles for Improved Flow Stability and String Stability** , by Jing Zhou and Huei Peng

  Abstract: A methodology to design the range policy of Adaptive Cruise Control vehicles and its companion servo-loop control algorithm are presented in this paper. A nonlinear range policy for improved traffic flow stability and string stability is proposed and its performance is compared against the Constant Time-Headway policy, the range policy employed by human drivers and the Greenshields policy. The proposed range policy is obtained through an optimization procedure with traffic flow and stability constraints. A complementary controller is then designed based on the sliding mode technique. Microscopic simulation results show that stable traffic flow is achieved by the proposed method, up to a significantly higher traffic density.

- **Acoustic Signal Processing to Diagnose Transiting Electric-Trains** , by Marco Cerullo, Giuseppe Fazio, Maurizio Fabbri, Francesco Muzi and Giancarlo Sacerdoti

  Abstract: This paper deals with a method based on vibro-acoustic techniques to diagnose electric trains and other important railway components. The proposed method can detect the following main subsystems: pantographs, electrical contact lines, rails, bogies, wheels, etc. Signal processing techniques are thoroughly applied to acoustic vibrations that are directly acquired on the field when the train is transiting. Signals are picked up, processed and stored by acquisition systems installed along the railway on structures jointed to the soil. The processed data can be sent to a remote, dedicated diagnostic center to get continuous monitoring and supervision of the railway system. The received diagnostic information can be conveniently used to improve safety, schedule a correct maintenance and reduce costs. The results of the experimental tests conducted to validate the method during an extensive measurement program are reported and commented.

- **Tracking Trains via Radio Frequency Systems** , by Antnio Jos Duarte Santos, Amrico Rodrigues Soares, Fernando Manuel de Almeida Redondo and Nuno Borges Carvalho

  Abstract: The technological evolution which occurred in digital systems favoured the appearance of new services to be applied in railways. Radio communications played an important role in the management, exploration, and maintenance of railway transports. Due to the vital importance of security, the Track-to-Train communications system is studied in depth, with significant changes through the integration in its operation of the GSM and GPS systems. This paper presents an integrated system that simultaneous includes a radio communication system and a location solution. The proposed network will work as a redundant and also as a unique system for secondary lines where no other system is available. Moreover the paper also presents a low budget system to track the trains inside tunnels.

Research on the GPS/GIS Based ERP System in Singapore[1]

by Xu Aigong, Department of Surveying and Mapping, Liaoning Technical University, Fuxin, Liaoning Province, 123000, China,
Ling Keck Voon and Law Choi Look, Positioning and Wireless Technology Centre, Nanyang Technological University, 639798, Singapore

I. Introduction

ROAD pricing in Singapore has been effective in managing congestion on roads in the Central Business District (CBD) since its inception in 1975, and in recent years on expressways and other major roads outside the CBD [1,2]. Changes have been made to the road pricing scheme since its implement from a manual scheme based on paper permits and applicable during the morning peak period only to an electronic version in 1998 that operates almost throughout the day presently. Technologies had helped to make the expansion of the original road pricing scheme possible; and the authorities are still keeping tab on new developments in road pricing technology to further enhance the world's first Electronic Road Pricing (ERP) system. A new charging scheme for the next phase of ERP system based on Global Positioning System (GPS) and Geographic Information System (GIS) is presented. The new scheme charging will be based on distance vehicle travelled in different areas determined by integrated GPS positioning and digital road network database in GIS. This makes the new system not only more consistent with road pricing principles and objectives of reducing traffic congestion and air pollution, but also more flexible for the integration of ERP system with other Intelligent Transportation Systems (ITS) such as emergency assistant and dynamic traffic assignment. At the same time, it has lower capital investment and operating costs, and is relatively simple to implement and modifying with the expansion of CBD and changes of traffic conditions due to nondependent on gantries as current system [3].

II. System Design

To meet the requirements of an effective and fair road pricing system, the characteristics should be reflected from different perspectives. The users always hope the system is easy to understand, convenient (i.e. does not require vehicles to stop at toll booths), different options (alternative modes, travel times, routes, destinations), payment options (cash, prepaid card, credit card, etc), transparent, and anonymous. The traffic authority wants the system to be less traffic impacts, efficient and equitable, flexible, reliable, secure and enforceable, cost effective, minimum disruption during development phase and can be expanded as needed. From the society's perspective, it is to be positive net benefits when all impacts are considered, politically acceptable, positive environmental impacts, and easy integration with the same charging system such as parking, public transit, etc. The proposed GPS/GIS-based ERP system is the best method to balance the requirements from different perspectives. The new GPS/GIS-based ERP system consists of In-vehicle Units (IU) and the Control Centre System (CCS). The block charts of IU and CCS are shown in figure 1 and figure 2 respectively. The IU provides continuous vehicular position determined by integrated GPS/Dead Reckoning (DR) positioning device and transmits it with vehicle ID to CCS. Data fusion is mainly for fusing all the sensors' data to get more accurate, robust positioning information. Display function shows related information to the driver, such as guidance, charging information or map interface. Transceiver provides two-way data link via wireless network and IP based packet data transmission. The data would be broadcast into the Internet so that any authorized user can make full

[1]This paper has not been subjected to a peer review process. The responsibility for the content lies with the authors.

use of them to provide value-added services. Smart card interface is for charging via pre-paid smart card.

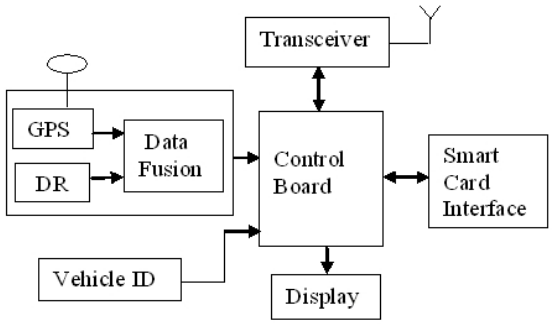


Figure 1: In-vehicle Unit

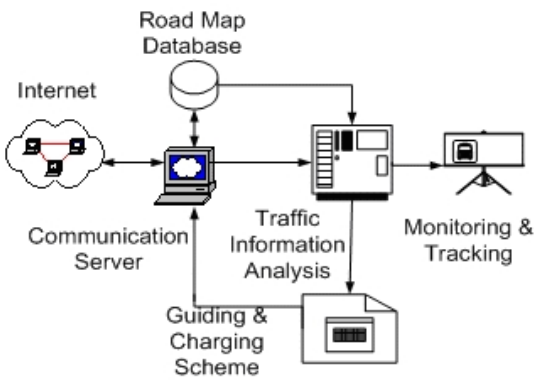


Figure 2: Control Centre System

CCS is functioned to track, monitor, charge, and provide guidance to all vehicles travelling on the road. Charging is based on the road links vehicle travelled matching with map database and determined charging standard. Charging standard is available on Internet for all drivers. It can also be checked through IU if it is functioned. Upon receiving the vehicle position, CCS matches vehicle trace with the road links through map matching and calculates the vehicle cost. Payment can be made through smart card in IU immediately afterward or later on monthly based.

III. Technical Issues

Technical issues included in the system are road map database structure, integrated DGPS/DR positioning, map matching, and communication between IU and CCS.

A. Map Database

Efficient map data model can improve the algorithms such as map matching and route selection which depend on map data. The node/link planar and non-planar models are effective data models and the planar model is currently one of the most commonly accepted models because of its least complexity and most efficiency. Besides, the planar model and the real road or street map is conceptually similar. It is also an effective model to meet the needs of new charging scheme of 'link by link'.

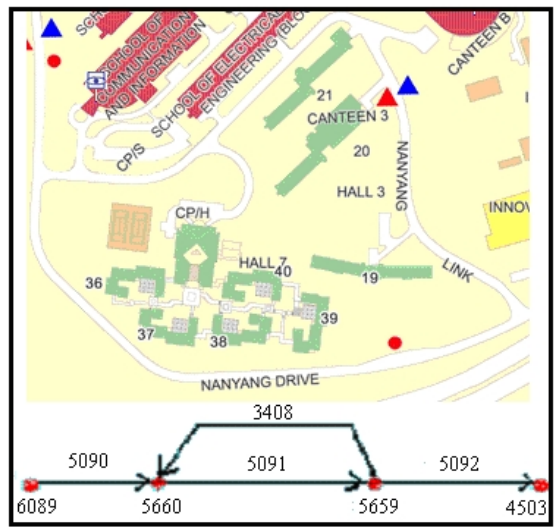
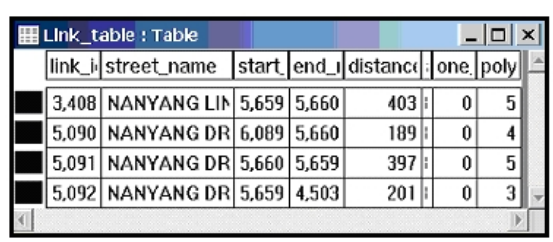


Figure 3: Representation of links and nodes

In our database, the road network is composed of two elements, links and nodes. Every road intersection must be indicated by a node and road between nodes is a link. Link is a single line representation of the road. Associated with each link and node will be a set of attributes, conceived as the entries in one row of a list of rectangular tables. A graphical represented network of figure 3 can be modelled in several tables as shown in figure 4 and figure 5. Different from usual ones, the link table contains a price field to sign the corresponding link cost. The whole Singapore road network includes more than 13,000 nodes and 17,000 links. In order to improve the efficiency for the navigation system, a unique hierarchical database structure is designed to divide the map in 2 layers and 194 regions.



LInk_table : Table

link_i	street_name	start_	end_i	distanc	one_	poly
3,408	NANYANG LIN	5,659	5,660	403	0	5
5,090	NANYANG DR	6,089	5,660	189	0	4
5,091	NANYANG DR	5,660	5,659	397	0	5
5,092	NANYANG DR	5,659	4,503	201	0	3

Figure 4: Link table (sample)

Node_table : Table

node_id	latitude	longitud	altit	type
5659	103.68267	1.3403405	0	0
5660	103.67925	1.3413023	0	0
5661	103.66982	1.3272811	0	0
5662	103.67513	1.3276242	0	0
5663	103.63219	1.2961501	0	0

Record: 1 of 12451

Figure 5: Node table (sample)

B. Positioning

Integrated Differential GPS and Dead Reckoning (DR) system is used for vehicle tracking with high accuracy and continuously. Singapore Integrated Multi-Reference Station Network (SIMRSN) has been developed as shown in figure 6. It can be used for real time differential service.

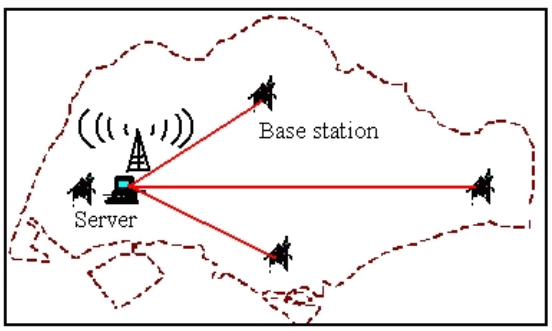


Figure 6: Singapore DGPS reference stations

To insure continuous positioning in the downtown area, a low cost DR system consists of magnetic sensor HMC 1022 and accelerometer ADXL202 for heading and velocity or distance information is integrated with DGPS. Test results show that the positioning accuracy is within an acceptable range during a short time interval [5,6].

C. Map Matching

Map matching algorithm in CCS processes the received vehicle position and searches the map database to create the list of road links the vehicle travelled. The required payment is calculated according to the road link price in database and deduction is made from prepaid card or stored to the vehicle ID account for monthly-based payment. Different from vehicle navigation system [6], map matching for ERP does not require real time calculation. This means that the searching of road link vehicle travelling on current can use not only the past and present vehicle position but also the following vehicle position. The off time matching makes it much more accurate and reliable. The matching processes (as shown in figure 7) are: initialisation (O), position between intersections (M-N), position near intersection and no turn detected (M), position near intersection and turn detected (P), and re-initialisation.

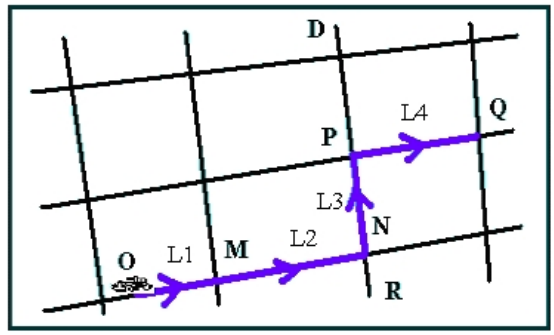


Figure 7: Map matching process

A probabilistic algorithm is designed to match the initial position of the vehicle. Since the actual location of the vehicle is never precisely known, so we determine an error ellipse, i.e. confidence region, that vehicle is likely to be within. From estimation theory, the input and output signals can be modelled as stochastic process. Variable associated with the true and measured values can be modelled as random variables. Variance-covariance information is propagated through appropriate algorithms to derive the variances and co-variances as functions of the original random variables or as functions of parameters estimated from the original observations. These variances and covariances are used to define confidence region. The determination of the confidence region should also consider the map accuracy as well as the road width. Searching process proceed until there are candidates within the region. A match completed if there is only one road link cross or within the region. If more than one candidates exist, the candidates are eliminated with the following standards until the only correct link is matched: direction difference between road link and vehicle travelling, traffic restrictions such as one-way road, distances between vehicle position and candidate link. One matched link can be used to verify the immediate past link with their topology relationship. After a valid start point is known, only three situations are to be considered: vehicle on a road link between intersections, vehicle near an intersection while no turn is detected, and vehicle near an intersection while a turn detected. Suppose the route travelled is O-M-N-P-Q, the map matching processes are as following (fig. 7).

- Matching the start position to initial location O on link L1, record the distance OM by GPS and DR distance sensor.

- When vehicle near node M, three possible connections are considered and match to link L2 while no turn is detected at M.

- Among 3 possible connections at N, when a turn is detected, link L3 is selected according to azimuth measurements or angle turned.

- Repeat the same processes above.

- The vehicle trace recorded is L1-L2-L3-L4, ...

Suppose the recorded links in one month for a vehicle are L_i $(i = 1, 2, 3, \ldots, m)$, then the monthly payment P for the vehicle can be calculated according to price scheme in the database,

$$P = \sum_{1}^{m} \text{price}(L_i).$$

D. Communication

Wireless communication is used to transmit all the vehicles positions to CCS and broadcast differential information to the IU. Current cellular mobile systems or third generation wireless communication could be employed and the mobile set could be embedded in the IU. As 2.5 Generation wireless communications, General Packet Radio Service (GPRS) has quicker session set-up, permanent connection, lower cost, and higher data rate performance. Furthermore, it is IP based data transmission so the transceiver is unnecessary in the management centre, which is connected with Internet. It is a good choice for GPS-based ERP system and can be easily upgraded into the next generation wireless communication.

IV. Test Results

Tests have been made on expressways and major roads all over Singapore Island. The devices used are show in figure 8. Vehicle tracing data and its overlay on road network based on map database are shown in figure 9 and figure 10 respectively.

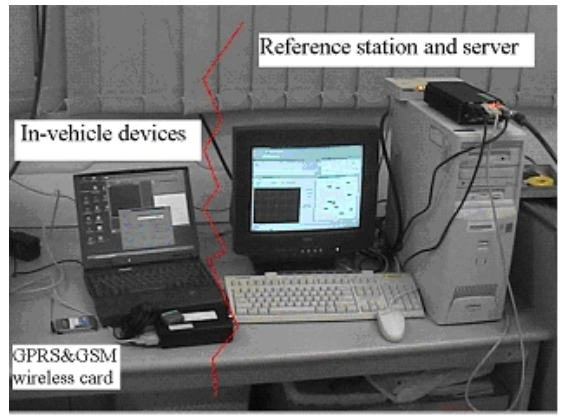


Figure 8: Devices used for tests

Test results show that positioning output is available continuously in all areas of Singapore Island. The deviations between digital road link and tracked vehicle trace are within 30 metres on road links. Deviations larger than 30 meters happen only near intersections (nodes) where slip roads are not expressed in database. Map matching can process these cases and there is no influence on the tracking results.

Figure 9: Tested vehicle traces

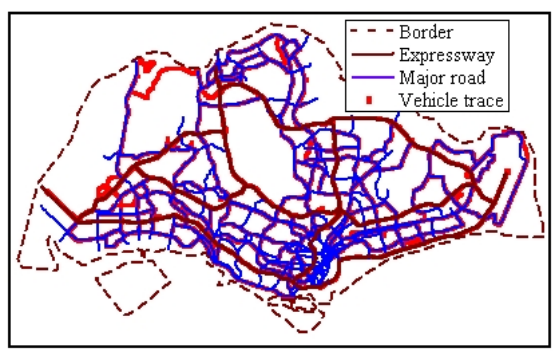


Figure 10: Vehicle traces overlay on road map

V. Summary

GPS-based ERP system is proposed and technical solutions are investigated. Test results show these solutions work well in all Singapore Island. Compare with the currently used ERP system in Singapore, The GPS-based system has the advantages of lower operation cost, more user convenience, more flexibility and easier integration with other ITS systems. Despite the technical feasibility, more investigations are necessary on issues for implement GPS-based ERP system. These include integration of ERP with other ITS systems, price criterion, possible influences on travel behaviour, privacy concerns, and relative vehicle policies.

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Non-Society ITS News

A Glimpse on the Web

by Alessandra Fascioli

This department is dedicated to catching a glimpse on the WWW trying to discover interesting ITS related Web resources. Reviewed sites range from research programs and projects, to software packages, databases, associations, non-profit companies, and more.
Every suggestion or contribution is welcome and should be addressed to fascal@ce.unipr.it.

- **PIARC, the World Road Association,** is a non-political and non-profit association whose mission is exchanging knowledge on roads and road transport policy and practices within an integrated sustainable transport context. PIARC wants to be an international forum for analysis and discussion of the full spectrum of transport issues, related to roads and road transport. PIARC creates and coordinates Technical Committees, organizes a World Road Congress and various technical seminars and publishes a large number of documents including a quarterly magazine. Link to PIARC site:
  http://www.piarc.org/en/

- The aim of the **Society of Automotive Engineers** is sharing information and exchange ideas for advancing the engineering of mobility systems. SAE is a resource for standards development, events, and technical information and expertise used in designing, building, maintaining, and operating self-propelled vehicles for use on land or sea, in air or space. SAE International, through the work of committee members and participants, maintains a number of technical standards and related documents. Through its ITS initiative, SAE has identified key intelligent vehicle (IV) functional areas as prime candidates for development to improve basic vehicle functions that, in turn, provide the basis for improved safety/security and information/entertainment functions. Link to SAE site:
  http://www.sae.org

- The University of Maryland's **Center for Advanced Tranportation Technology (CATT) Lab** works to provide safe and efficient transportation systems through improved operations and management by means of research and development, technology implementation, training and education. Research focuses on Archived Data User Services, Data Visualization, Image Processing, Traveler Information Systems. Link to CATT site:
  http://www.cattlab.umd.edu/

- The **Bureau of Transportation Statistics (BTS)** is a statistical agency aimed at data collection, analysis, and reporting and to ensure the most cost-effective use of transportation-monitoring resources. BTS brings a greater degree of coordination, comparability, and quality standards to transportation data, and to fill important gaps. Its mission is developing transportation data and information of high quality, and to advance their effective use in both public and private transportation decision making. Link to BTS site:
  http://www.bts.gov

An overview of Intelligent Vehicle Activities in the United States

by Richard Bishop Bishop Consulting http://www.IVsource.net.

The U.S. Department of Transportation (USDOT) initiated its ITS program around 1990 and has conducted significant IV R&D since that time. From 1992-1997, research and prototyping of automated highway systems was conducted, which culminated in the very successful Demo '97, showcasing automated vehicle technology on highways in California. During that time, early work in developing performance requirements for first-generation crash avoidance systems was also conducted.

In 1998, work was re-focused to emphasize near-term safety research under the Intelligent Vehicle Initiative program. IVI continued through 2004, at which point new initiatives were defined, which took into account progress to that point and future trends. R&D under IVI is reviewed briefly here, and the remainder of the article focuses on the new activities.

The significance of active safety systems for meeting U.S. road safety goals has been recognized. The chief of the National Highway Traffic Safety Administration within USDOT, Dr. Jeff Runge, stated in 2004 that his agency should "shift the focus of safety efforts to avoiding crashes instead of simply protecting people when a crash happens. The future will be about crash avoidance".

Intelligent Vehicle Initiative (IVI) Program

The IVI program ran from 1998-2004. The program objectives were to prevent driver distraction and to facilitate the accelerated development and deployment of crash avoidance systems. IVI addressed four classes of vehicles: light vehicles, commercial vehicles, transit vehicles, and specialty vehicles. The program is focused on improving safety under three driving conditions: normal driving conditions, degraded driving conditions, and imminent crash situations. The majority of the IVI investment during this time was in the imminent crash domain.

A significant portion of the R&D was focused through the Collision Avoidance Metrics Partnership (CAMP), which was led by Ford and GM and also had participation from BMW, DaimlerChrysler, Navigation Technologies, Nissan, Toyota, and Volkswagen.

Some key projects are described below. The final reports for this work have either been completed or are nearing completion. Access http://www.its.dot.gov. to find the reports which have been published.

- Naturalistic Driving Study: 100 vehicles were equipped with unobtrusive instrumentation in order to observe regular drivers on actual roadways. Researchers report that, in addition to significant amounts of basic data, several crashes also occurred in equipped vehicles, providing a unique opportunity to understand crash dynamics.

- CAMP: driver workload metrics and test procedures were being developed to assess the impact of various in-vehicle systems on driver workload. Experiments were conducted using a driving simulator, test track, and public roads.
- CAMP: in the Enhanced Digital Maps project, the feasibility of improved digital maps to support collision avoidance systems was investigated.
- CAMP: detailed requirements for Forward Collision Warning Systems were developed.
- CAMP: in the Vehicle Safety Communications Project, the potential of Dedicated Short Range Communications (DSRC) for supporting collision avoidance systems was investigated.
- Automotive Collision Avoidance System (ACAS) project: in the largest operational test within the IVI program, USDOT has partnered with General Motors, Delphi, and others to equip ten Buicks with both forward collision warning and adaptive cruise control. The cost-shared project was funded at $35M. A key goal of the testing was to determine if this technology can truly lead to fewer crashes, and if the performance of the system can meet customer expectations.
- Passenger Car Road Departure Avoidance: a $16M field operational test in which the system warns drivers when they are about to drift off the road and crash into an obstacle, as well as when they are traveling too fast for an upcoming curve. Technologies include a vision- and radar-based lateral drift warning system and a map-based curve speed warning system. The radar sensors enable the system to scan for any roadside obstacles and adjust warning timing appropriately.
- Passenger Car Intersection Crash Avoidance Systems: The IVI program's key emphasis in cooperative vehicle-highway systems was in the area of intersection crash avoidance. Such "intersection decision support" systems were prototyped for traffic signal intersections, stop sign intersections, and left-turn-across-path situations. Both infrastructure-only and vehicle-infrastructure cooperative systems were developed and evaluated. This research was performed under the Infrastructure Consortium (IC), a partnership of California, Minnesota, and Virginia, in-state universities, and FHWA.
- Evaluation of Active Safety Systems for Heavy Trucks: Field operational testing in IVI centered on heavy truck systems and evaluated Driver Fatigue Management, Vehicle Rollover Stability, Lane Departure Warning, Forward Collision Warning, and Electronically Controlled Braking.
- Special Vehicle Driver Support: USDOT worked with the University of Minnesota to evaluate a driver assist system which indicates the vehicle position within the travel lane (on a heads-up display) even when visibility is at or near zero due to blowing snow. The lane information relies on differential GPS which is augmented by magnetic markings in the pavement. Forward and side-looking collision avoidance provides warnings as to any obstacles ahead.
- Transit Bus Collision Warning Systems: prototyping and evaluating collision warning systems for forward, side, and rear-impact collisions. The outcome of the program will be performance specifications for such systems, to guide commercial developers and transit agencies in commercialization. In addition, optimum driver-vehicle interfaces are being investigated, particularly for the case of a system which integrates all of these functions into a single system.

New Initiatives

In 2004, the USDOT ITS program was reorganized into a focused set of nine initiatives. These are:

1. Mobility Services for All Americans
2. Integrated Corridor Management Systems
3. Universal Electronic Freight Manifest

4. Integrated Vehicle Based Safety Systems
5. Cooperative Intersection Collision Avoidance Systems
6. Emergency Transportation Operations
7. Vehicle Infrastructure Integration
8. Nationwide Surface Transportation Weather Observation System
9. Next Generation 9-1-1

Three of these initiatives are of interest from an IV perspective: Integrated Vehicle Based Safety Systems (IVBSS), Cooperative Intersection Collision Avoidance Systems (CICAS), and Vehicle Infrastructure Integration (VII).

Integrated Vehicle Based Safety Systems
While there is an extensive body of knowledge on countermeasures for unilaterally addressing individual crashes; the Integrated Vehicle Based Safety Systems initiative will be the first attempt to fully integrate these individual solutions. Goals are to:

- consolidate current information about available countermeasures
- perform additional research into integration of the driver-vehicle interface (DVI)
- develop objective tests and criteria for performance of systems that simultaneously address common types of crashes
- design appropriate data acquisition systems.

The idea is to integrate crash warning systems for forward collisions, run-off-road, and lane change crashes, which together account for 48of crashes in the U.S. Systems could of course be deployed which address these crash types separately, however USDOT officials believe that an integrated system will "increase safety benefits, improve overall system performance, reduce system cost, enhance consumer and fleet operator acceptance, and boost product marketability."

The IVBSS program plan calls for a partnership with a private-sector consortium which would include vehicle manufacturers as key players. In this way, they seek to create a strong link with commercialization and the real-world issues that must be resolved to get there. Engineering activities call for the development of technology-independent performance specifications, building and testing prototype vehicles, and determining driver and fleet operator acceptance of these systems. Further work will address safety benefits and the development of objective test procedures. Objective test procedures are seen by USDOT as a way to provide consumer information on these systems and to potentially create active safety "star ratings," similar to those issued now by the National Highway Traffic Safety Administration for crashworthiness (no decisions made on this at this point, though).

A more detailed view of the flow of program activities follows. Following industry and stakeholder input, system functional requirements based on target crashes and dynamic scenarios will be developed. Key questions must be addressed in this phase. For instance, should the functional scope be warning only or also include control intervention (such as active braking)? Further, should system development address both cost and performance goals, or performance goals only?

Evaluation requirements will also be defined, which includes data needed to capture a visual image of the driving scene and the driver, as well as numerical data needed to evaluate system performance and to identify and study crash conflict events. This is likely to be based on experience gained in the ADAS project outlined above.

Business cases and deployment potential will be addressed as well. Definitive cost-benefit analyses are most relevant for commercial trucks and transit bus operation as compared to cars sold to the general public.

In the system design phase, the industry partners will design, build, and test sensor subsystems, develop threat assessment algorithms, and design the driver interface. The intent is to deliver an integrated system that exceeds the performance of current single-function systems such as ACAS. Sensor fusion and sensor

complementarity will play a key role here. Advanced technology subsystems such as enhanced digital maps, driver state identification, and vehicle-to-vehicle communications may also be employed if the vehicle industry partners deem these to be sufficiently mature and practical.

Research and definition of an effective driver-vehicle interface (DVI) is absolutely central to the IVBSS effort. Since crashes are rare events, it is quite likely that a driver will have never experienced the warnings prior to the critical moment. The DVI must be simple and intuitive enough that drivers are able to assimilate information almost instantly about a developing crash situation and respond appropriately.

Following system design, prototypes will be built and tested. A key parallel activity is the development of a data acquisition system to collect data required for performance validation. Validation tests are expected to comprise a series of controlled test scenarios and procedures on a test track or pre-defined on-road public routes. The IVBSS FOT approach is expected to be similar to previous USDOT FOTs, in which fleets of 10 - 15 vehicles were deployed and several dozen drivers had use of the vehicles for several weeks or more. Data will be gathered on driver performance with and without the assistance of the integrated safety system.

An independent evaluation will be performed to assess the safety benefits and driver acceptance of the system. A key challenge will be to create tools to effectively wade through the vast amount of multi-media data expected from the FOT.

The program plan calls for kick-off in summer of 2005, with initiation of the FOT in 2007 and the program completed late in 2009. In the end, the government expects that the IVBSS program will produce performance specifications, objective test procedures, prototype vehicles, a database of driver performance with and without the assistance of integrated safety systems, and an evaluation report on benefits and user acceptance.

An open solicitation for proposals for IVBSS is expected to be released in May 2005.

Cooperative Intersection Collision Avoidance Systems

Building on research conducted to date by the Infrastructure Consortium, the Cooperative Intersection Collision Avoidance Systems program approach will pursue an optimized combination of autonomous-vehicle, autonomous-infrastructure and cooperative communication systems that address a wide range of intersection crash problems, culminating in a series of coordinated field operational tests. These field operational tests will also help achieve a solid understanding of safety benefits and user acceptance. VII will provide the enabling communication capability necessary for cooperative crash avoidance systems.

The R&D phase will focus on assessing safety performance and user acceptance via field operational testing. USDOT sees the auto industry coming together with IC researchers from State DOTs to define practical systems which are feasible for deployment. USDOT has set a goal to develop and deploy systems at 15of the most hazardous signalized intersections nationally, with in-vehicle support in 50

R&D solicitations for CICAS are expected to be released later in 2005.

Vehicle Infrastructure Integration

USDOT's work to pursue the Vehicle Infrastructure Integration (VII) will potentially result in a sea change in the relationship of roads, vehicles, and drivers. The VII goal is to achieve nationwide deployment of a communications infrastructure on roadways and in all production vehicles and to enable a number of key safety and operational services that take advantage of this capability. The envisioned approach calls for vehicle manufacturers to install the technology in all new vehicles, beginning at a particular model year, to achieve safety and mobility benefits while, at the same time, federal/state/local transportation agencies would facilitate installation of a roadside communications infrastructure.

To determine the feasibility and an implementation strategy, a partnership has been formed which consists of the seven vehicle manufacturers involved in the Intelligent Vehicle Initiative, the Association of State Highway and Transportation Officials, and USDOT. Discussions are focused on a decision point in the 2008/9 timeframe regarding proceeding with full-scale deployment of communications technology in both the vehicles and the infrastructure: what questions must be answered, and what analyses performed, in order to make this decision? As a technology enabler for VII, USDOT is continuing to support DSRC standards activity, and has initiated a program to build prototype DSRC communications equipment to test the viability of these standards.

While most of the VII activities are kept within the circle of stakeholders noted above, a public information meeting on VII was held in February 2005 to update the broader community. It is expected that such meetings will be held in the future as well.

Call for Papers

by Onur Altintas

Vehicle-to-Vehicle Communications workshop

San Diego, CA, July, 2005 in conjucion with MobiQuitous 2005 http://www.v2vcom.org or http://mobiquitous.org/

Overview

High-tech sensors, radars, cameras, navigation systems, and tens of microprocessors are some of the technologies that are already being used in vehicles to enable systems such as parking assist units, lane keeping assistance, adaptive cruise-control systems, and more. These technologies have all brought more safety, comfort and convenience to drivers and passengers. Coupled with the advances in wireless communications technology, recently, governments, highway authorities and automobile manufacturers push the move from "passive safety" to "active safety" by employing communications functions in vehicles. Once the communications and networking capabilities are integrated into vehicles, not only safety applications, but also many other applications ranging from intelligent/interactive transportation systems that could help smooth the flow of traffic, to vehicular diagnostics, mobile commerce, and business services could become a reality.

Topics

This one-day workshop intends to bring together researchers, professionals, and practitioners to discuss and address recent developments and challenges in deploying vehicle-to-vehicle and infrastructure-to-vehicle networking technologies, as well as their subsequent applications with a focus on safety assistance applications. Specifically, we solicit original research contributions addressing the following areas:

- Vehicular mobile ad-hoc networks
- Potential applications of vehicular networks
- Vehicle-to-infrastructure communications
- Role of V2V communications in Intelligent Transportation Systems
- Routing protocols for V2V communications
- High-speed mobility management for V2V communications
- MAC layer issues in V2V communications
- Physical layer and RF level issues in V2V communications
- Antenna technologies for V2V communications
- Security and authentication issues in V2V communication
- Cross-layer designs
- Radio resource management and QoS support
- Mobility models and mobility management
- Experimental systems and testbeds
- Algorithms, protocols and systems for data dissemination

Submission guidelines

Authors are invited to submit full papers of up to 20 double-spaced pages, including references, figures and tables. All submissions should be submitted electronically in Postscript or Adobe PDF format to both of the workshop co-chairs: Onur Altintas `onur@jp.toyota-itc.com` and Wai Chen `wchen@research.telcordia.com`

Important dates:

Full Papers due: May 25, 2005
Notification of Acceptance: June 6, 2005
Camera-ready Manuscripts due: June 20, 2005
Workshop Date: July 21, 2005

Organizing committee:

V2VCOM Workshop Co-chairs:
Dr. Onur Altintas (Toyota InfoTechnology Center, Japan)
Dr. Wai Chen (Telcordia Technologies, USA)
V2VCOM Workshop Program Advisor:
Prof. Tadao Saito (Professor Emeritus, Univ. of Tokyo, Japan)

Program committee:

Dr. Stephane Amarger (Hitachi Europe, France)
Richard Bishop(Bishop Consulting, USA)

Dr. Jasmine Chennikara-Varghese (Telcordia Technologies, USA)
Prof. Eylem Ekici (Ohio State University, USA)
Prof. Mario Gerla (UCLA, USA)
Dr. Kenneth Laberteaux (Toyota Technical Center, USA)
Dr. Thomas Luckenbach (Fraunhofer Institute for Open Communication Systems, Germany)
Prof. Ken'ichi Mase (Niigata University, Japan)
Dr. Carsten Metz (Bell Labs, Lucent, USA)
Prof. Guevara Noubir (Northeastern University, USA)
Dr. Sadao Obana (ATR, Japan)
Prof. Umit Ozguner (Ohio State University, USA)
Prof. Dipankar Raychaudhuri (WINLAB, Rutgers University, USA)
Prof. Behcet Sarikaya (University of Northern British Columbia, Canada)
Matthias Schulze (DaimlerChrysler AG, Germany)
Prof. Sirin Tekinay (New Jersey Institute of Technology, USA)
Prof. Ryuji Wakikawa (Keio University, Japan)
Prof. Halim Yanikomeroglu (Carleton University, Canada)

Call for Papers

by Pierre Fastrez

International Journal of Human-Computer Studies

Special Issue on Driver-Centered Design http://www.elsevier.com/locate/ijhcs

General Theme

In recent years, Driver Support Systems (DSS) have become commonplace in cars. Nowadays, Intelligent Driver Support Systems (IDSS) are intended to enhance driving by providing continuous feedback and control augmentation instead of taking control over the driver to perform sub-tasks. In this perspective, IDSS have to be integrated with the driver's cognitive processes.

This evolution calls for a paradigm shift, where the design and evaluation process is grounded on the key component of an IDSS: the driver. Understanding and formalizing the drivers behavior, perception and sense-making is obligatory to design intelligent vehicles that respond in relevant ways according to the drivers perspective.

Many complementary approaches and disciplines capture knowledge of drivers needs for technological design. They may for instance make use simulators and statistical validation, or explore the variety of real-world situations by using ethnographic techniques.

In this special issue, we propose to explore the foundations of a new driver-centered design paradigm.

Topics

Adopting an interdisciplinary approach, we intend to focus on the following topics:

- Theoretical frameworks Experimental setup
- Technical tools for observation and analysis
- Capturing cognitive processes and specifying contextual needs
- Acceptability of a new system
- Technology interaction and integration

Submissions

Original papers presenting unpublished material related, but not restricted, to these topics are invited for submission. Manuscripts should not exceed 8,000 words.

Important dates (may change in the future):

- Submission deadline: 1 August 2005
- Notification to authors: 15 October 2005
- Final submission: 15 November 2005

See

http://hci.ucsd.edu/idss/specialissue.htm for details and up-to-date information.

Guest Editors

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Pierre Fastrez Dpt of Communication, UCL, Belgium: fastrez@reco.ucl.ac.be

Announcement Short Course

by Markos Papageorgiou

Technical University of Crete Dynamic Systems and Simulation Laboratory Chania 73100, Greece

7th SHORT COURSE 2005: DYNAMIC TRAFFIC FLOW MODELLING AND CONTROL

Lecturer: Prof. Markos Papageorgiou
Date: 3-7 October 2005
Location: Chania (Crete), Greece
Fee: 1.200 EURO (for graduate students: 800 EURO) 20% reduction is granted in case of more than one participation from the same institution)

Scope

The design, analysis, and evaluation of Intelligent Transportation Systems (ITS) requires a good knowledge of traffic flow modelling and control techniques as well as of powerful methodologies from the areas of optimisation, control, networks and dynamic systems. The purpose of the intensive 5-day course is to cover the basic theory and tools necessary for efficient design and evaluation of ITS on highway networks. The course will begin with traffic flow modelling and validation that includes a coverage of the various traffic flow models, the modelling of traffic networks, and simulation tools. Measurement devices and estimation problems in traffic networks, that include automatic incident detection and O-D estimation, will be presented and discussed. The state-of-the art techniques on freeway control, road traffic control, and integrated control employing ramp metering, signal control, and route guidance via application of modern optimisation, control, and estimation techniques, together with several case studies will be presented. Some 45 exercises will be used for consolidation of the provided knowledge. Extensive written materials, including all transparency copies, will be handed out.

Who Should Attend

Graduate students, engineers, researchers, consultants, and government employees who are interested in improving their understanding of advanced traffic flow modelling and control tools and in becoming familiar with their application in ITS.
Please forward the information about the Short Course to any of your colleagues who may be interested.

For More Information

To take more information (Detailed Course Contents, About the Lecturer, Fee and Registration Form, Location, Accommodation, Evaluation of previous courses) please visit the site:
http://www.dssl.tuc.gr/en/ShortCourse/7thShortCourse.htm or contact:

Prof. Markos Papageorgiou Director Dynamic Systems & Simulation Laboratory TECHNICAL UNIVERSITY OF CRETE University Campus GR-73100 Chania, GREECE

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Web: http://www.dssl.tuc.gr

Upcoming Conferences, Workshops, or Symposia

by Massimo Bertozzi

This section lists upcoming ITS-related conferences, workshops, or exhibits. Contributions are welcome; please send announcements to itsconfs@ce.unipr.it.

ITS in Europe 2005
http://www.itsineurope.com
Hannover, Germany
June 1–3

IEEE IV 2005
http://www.ieeeiv.org
Las Vegas, USA
June 5–7

ESV 2005 Enhanced Safety of Vehicle Conf.
http://www-esv2005.nhtsa.dot.gov
Whashington, USA
June 6–9

3rd Intl. Driving Symp. on Human Factors in Driver Assessment, Training, and Vehicle Design
http://www.driving-assessment.org
Rockport, USA
June 27-30

The 16th Intl. Symp. on Transp. and Traffic Theory
http://www.mti.umd.edu/news/isttt16/index.htm
College Park, USA
July 19–21

IASTED Automation, Control, and Applications
Novosibirsk, Russia
June 20–24

ITE 2005 Annual Meeting and Exhibit
http://www.ite.org/annualmeeting
Melbourne, Australia
August 7–10

Asia Pacific ITS Conference & Exhibition
http://www.itsindia.org
New Delhi, India
August 9–11

IEEE ITSC 2005
http://www.itsc2005.at
Vienna, Austria
September 13–16

Biennial on DSP for in-Vehicle and Mobile Systems
http://dspincars.sdsu.edu
Sesimbra, Portugal
September 3

IASTED Artificial Intelligence & Soft Computing
Benidorm, Spain
September 12–14,
♢ submission by June 1

ISPA2005: Computer Vision in Intelligent Transport Systems
http://www.isispa.org/sscvits.html
Zagreb, Croatia
September 15–17

IEEE 61st Semiannual Vehicular Technology Conf. (fall)
http://vtc2005fall.org
Dallas, USA
September 25–28

IEEE 63st Semiannual Vehicular Technology Conf. (spring)
http://vtc2006spring.com
Melbourne, Australia
May 8–10, 2006,
♢ submission by Semptember 16

IASTED Intelligent Systems and Control
Cambridge, USA
October 31–November 2,
♢ submission by June 15

IASTED Robotics and Applications
Cambridge, USA
October 31–November 2,
♢ submission by June 15

ITS Worls Congress
http://www.itsworldcongress.org
San Francisco, USA
November 6–10