IEEE ITS SOCIETY NEWSLETTER
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Web Archive and Electronic Newsletter Subscription

The IEEE ITS Society Newsletter is published quarterly in January, April, July, and October. The current and all past issues of the Newsletter may be downloaded at no charge from the Society’s web site:

www.ieee.org/itss

You may subscribe to or unsubscribe from announcements at the same web site. Announcements are sent to approximately 10,000 ITS professionals from industry, academia, and government.

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Announcements, feature articles, book and meetings reviews, opinions, letters to the editor, professional activities, abstracts of reports, and other material of interest to the ITS community are solicited. Please submit electronic material for consideration in any of the following formats: Microsoft Word, OpenOffice, plain ASCII, rich text format (rtf), or portable document format (pdf) to the Editor-in-Chief at c.herget@ieee.org.

SOCIETY NEWS

From the Editor

by Charles Herget

There are two announcements in this issue of the Newsletter that I want to bring to your attention.

Anyone who has an interest in Intelligent Transportation Systems (who doesn’t?) needs to read the article on the VisLab Intercontinental Autonomous Challenge. We had an article on VisLab (Artificial Vision and Intelligent Systems Lab) in the January issue of this Newsletter. The Director of VisLab is Alberto Broggi, the president of the Intelligent Transportation Systems Society this year. The VisLab’s intelligent vehicles will travel from Italy to China, 13,000 km,
without a driver and powered by solar energy. I think you will enjoy reading the article in this issue of the Newsletter.

The other announcement I want to bring to your attention is on the IEEE Forum on Integrated and Sustainable Transportation Systems (IEEE FISTS) which is to be held in Vienna in June 2011. We discussed FISTS in the April issue of this Newsletter. A four page announcement is included in this issue. FISTS is being jointly sponsored by four societies in IEEE, the Aerospace and Electronics Systems Society, the Intelligent Transportation Systems Society, the Oceanic Engineering Society, and the Vehicular Technology Society. These four societies cover all aspects of transportation (air, land, and sea). The purpose of FISTS is to bring together world leaders in technology, implementation, and policy management to share information on issues involving land, air, and sea systems.

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**Conferences**

**ITS Society Sponsored Conferences**

Following are upcoming ITS Society sponsored conferences.

**2010**

September 19-22
The 13th International IEEE Conference on Intelligent Transportation Systems
Madeira Island, Portugal

**2011**

June 5-9
IEEE Intelligent Vehicles Symposium
Baden-Baden, Germany
[http://www.mrt.uni-karlsruhe.de/iv2011](http://www.mrt.uni-karlsruhe.de/iv2011)

June 29 to July 1
IEEE Forum on Integrated and Sustainable Transportation Systems
Vienna, Austria
[http://ieee-fists.org](http://ieee-fists.org)

Announcements for these conferences appear on the following pages.
On the Way to Intelligent Sustainable Mobility

The IEEE Intelligent Transportation Systems Society (ITSS) is sponsoring its 13th annual international conference on Intelligent Transportation Systems (ITS). This conference is one of a few premier conferences focusing on research and applications of leading advances in communications, computer, control, and electronics technologies related to ITS. It is an international forum that brings together professionals from the fields of traffic engineering, information technology, automotive engineering, as well as many other ITS-related fields.

Program Topics
- Travel and Traffic Management;
- ITS Modeling and Analysis;
- Advanced Vehicle Safety System;
- Intelligent Vehicles;
- Emergency management and transportation Security;
- Commercial Vehicle Operations;
- Public transportation management;
- Electric Vehicle Transportation Systems.

Workshops
Three workshops are being organized:
- Emergent Cooperative Technologies in Intelligent Transportation Systems;
- Traffic Behavior, Modeling and Optimization;
- Artificial Transportation Systems and Simulation (ATSS'2010).

Best Paper Awards
Best paper(s) will be awarded at the Conference.

Venue
ITSC 2010 will be held at the
Madeira Tivoli Ocean Park Hotel
Funchal, Madeira Island, Portugal

http://itsc2010.isr.uc.pt/site/
THE INTELLIGENT VEHICLES SYMPOSIUM (IV'11) is the premier annual forum sponsored by the IEEE INTELLIGENT TRANSPORTATION SYSTEMS SOCIETY (ITSS). Researchers, academicians, practitioners, and students from universities, industry, and government agencies are invited to discuss research and applications for Intelligent Vehicles and Intelligent Infrastructures. The technical presentations are characterized by a single session format so that all attendees remain in a single room for multilateral communications in an informal atmosphere. Tutorials will be offered on the first day followed by three days of presentations and a vehicle demonstration day. An exhibition area will be available for the presentation of products and projects.

Program topics include but are not limited to:
- Advanced Driver Assistance Systems
- Automated Vehicles
- Vehicular Safety, Active and Passive
- Vehicle Environment Perception
- Driver State and Intent Recognition
- Smart Infrastructure
- Impact on Traffic Flows
- Cooperative Vehicle-Highway Systems
- Collision Avoidance
- Pedestrian Protection
- V2I / V2V Communication
- Assistive Mobility Systems
- Intelligent Ground, Air and Space Vehicles
- Autonomous / Intelligent Robotic Vehicles
- Image, Radar, Lidar Signal Processing
- Information Fusion
- Vehicle Control
- Telematics
- Human Factors
- Human Machine Interaction
- Novel Interfaces and Displays
- Intelligent Vehicle Software Infrastructure

Complete manuscripts in PDF format must be electronically submitted for peer-review in IEEE standard-format. For detailed submission instructions visit the conference website www.mrt.uni-karlsruhe.de/iv2011

Important Dates
- Special Session Proposal: January 15th, 2011
- Paper submission deadline: January 15th, 2011
- Notification of acceptance: March 10th, 2011
- Final paper submission: April 1st, 2011

Contact
For proposal of a special session, demonstration, and exhibition contact the organization committee at iv2011@mrt.kit.edu

Organizing Committee
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- Demonstration Chair: Hermann Winner
  University of Darmstadt, Germany
- Exhibition Chair: Markus Maurer
  TU Braunschweig, Germany
Transportation of goods and people plays a vital role in the lives of everyone and in virtually all businesses on earth. The cost of transportation, both personal and freight, accounts for a significant share in the global economy. Traditionally, transportation has been divided into three categories: land (automobiles, trucks, and rail); air; and water. There are four societies in IEEE Division IX addressing these issues, namely the Aerospace and Electronics Systems Society (AESS), the Intelligent Transportation Systems Society (ITSS), the Oceanic Engineering Society (OES), and the Vehicular Technology Society (VTS). Each of these societies addresses issues in a particular mode of transportation. However, there are many issues affecting all of these modes of transportation in the face of increasing demand. Some of the issues include congestion, environmental impact, and energy sources.

New technologies are required to solve these issues, and IEEE is one the world’s leading professional associations for the advancement of these technologies. The purpose of FISTS is to bring together world leaders in technology, implementation, and policy management to share information on issues involving land, air, and sea systems.

Call for Papers: Program Topics

The IEEE FISTS committee invites technical papers that will undergo the standard IEEE peer review process and will appear in a conference proceedings. Program topics include:

**Sustainable Land Transportation**
- Traffic Management
- Traveler Information Services
- Traffic Data Collection and Analysis
- Traffic Estimation/Prediction
- ECO-Friendly ITS applications
- Innovative Transit Systems
- Innovative Goods Movement Systems
- Transportation Solutions for Urban Areas

**Sustainable Water Transportation**
- Linking Waterways with Road and Rail
- Advanced Propulsion Systems
- Traffic Management/Information Services

**Sustainable Air Transportation**
- Air Traffic Management Systems
- Aircraft Operations and Fuels

**Communication Efficiency**
- Green Radio
- Communication Power Systems
- Sustainable Wireless Networks

**Integrated Systems**
- Co-operative Systems
- Innovative Multi-Modal Travel Solutions
- Transportation Infrastructure
- Intelligent Vehicles/Infrastructure
- Crossborder Multimodal Integration

**Energy**
- Alternative Energy and Fuels
- Innovative Energy Management
- Future Energy Sources

**Environmental Issues**
- Transport Greenhouse Gas Emissions
- Transport Air Pollutant Emissions
- Transport-related Water Quality Issues

**Efficiency Issues**
- Capacity Management of Roads
- Capacity Management of Rail
- Throughput Maximization
- Systems Operation Efficiency
- Regulative and Legal Issues
- Intermodal Capacity Management

Paper Submission

Complete manuscripts in PDF format must be electronically submitted for peer-review in IEEE standard-format (6 pp., dbl. column). Detailed submission instructions can be found on the paper submission website: www.ieee-fists.org

Submission Deadline: December 1, 2010

Notification of Acceptance Date: February 18, 2011

Final Paper Submission Date: March 31, 2011

For More Information:

www.ieee-fists.org

Vol. 12, No. 3

July 2010
IEEE Forum on Integrated and Sustainable Transportation Systems
(FISTS)
Vienna, 29 June to 1 July 2011

FIRST ANNOUNCEMENT

Experience the first IEEE FISTS Forum - an international forum addressing the latest development in sustainable transportation.

www.ieee-fists.org
First Forum on Integrated and Sustainable Transportation Systems 2011 in Vienna

It is likely that our global transportation system will experience dramatic changes by the year 2050. The world population increased from 6.4 billion in 2006 to 6.8 billion in July 2009. Nearly 90% of the growth in population came from countries classified as less developed (LDCs) by the United Nations. The population increases within the fastest growing regions (Asia, Africa, Latin America and The Carribean) are illustrated below with a few example countries.

In this table, the average annual increase of the GDP within the time span of 2004-2008 is shown also. Because of globalization, economic development, and population growth pressure to maintain and upgrade existing systems is accelerated. Indeed a direct relationship between economic growth and increased traffic volume is highly likely.

Increased traffic volume without infrastructure improvements leads, therefore, to capacity problems (congestion), especially in urban areas. Costs resulting from congestion are tremendous. Within the European Union, they account for approximately 1% of the community GDP.

In industrialized countries, a vast majority of experts expects significant growth in economy and mobility beyond the level of 2008 after recovery by 50% for passenger vehicles and 100% by cargo by 2020. According to this prognosis, a lack of transportation infrastructure capacity will likely occur, especially in and around densely populated areas. As an example, 85% of the European population will live in cities by that time. In 2007, more than 50% of the world’s population and more than 75% of the population of “more developed countries” (MDC as defined by the Population Reference Bureau) lived in urban areas. Many of these countries have agreed to reduce carbon dioxide emissions by the year 2012 by 5% from the level at 1990.

Environmental issues are gaining political attention at the highest levels of government. A variety of agreements on the reduction of emissions has been established. Several questions arise: What kinds of actions have already been adopted? What are the political initiatives that already have been implemented? Which technological solutions can be provided to reduce the environmental impact of transportation?

The reduction of energy consumption (especially from fossil fuels) and associated emissions within the transportation sector is a topic of great importance. Again, questions arise: What are the technical solutions for a proper replacement of combustion engines? How can today’s consumption be reduced?

Particularly with the current economic climate, the required infrastructure investments funded by public means cannot be raised in a proportion to traffic growth all over the world.

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3 United Nations, World Population to 2300, 2004
4 The Worldbank, Available at: http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG, [2010-04-29]
5 OECD, Global Infrastructure Needs: Prospects and implications for public and private actors, 2006
What are some of the questions to be addressed by this conference?

What are the technological innovations that offer proper solutions to improve efficiency of transport on existing infrastructure?
How can technology respond to the demand created by economic development and population growth?
Will sufficient technological solutions be available early enough?
What framework is needed to get the most benefit of technology implementation for the society (benefit/cost ratio for the state budget)? What are resulting impacts?
Do we need to define or redefine what integrated transportation system means for the economies and the individual traveller?
Do we need to redefine the meaning of ITS – Intelligent Transportation System? What does ‘intelligent’ mean in this respect?
Will we have fully automated vehicle movement on all modes by this time?
How should the availability of the fuel and energy supply for transportation be addressed?
Will we have different regimes for access regulations to use transport infrastructure?

How Can IEEE Contribute?

Transportation of goods and people plays a vital role in the lives of everyone and in virtually all businesses on earth. The cost of transportation, both personal and freight, accounts for a significant share in the global economy. Traditionally, transportation has been divided into three categories: land, including automobiles, trucks, and rail; air; and water. There are four societies in IEEE’s Division IX addressing these issues, namely the Aerospace and Electronics Systems Society (AESS), the Intelligent Transportation Systems Society (ITSS), the Oceanic Engineering Society (OES), and the Vehicular Technology Society (VTS).

Each of these societies addresses issues in a particular mode of transportation, for example AESS in air transport, OES in oceanic systems, and ITSS and VTS primarily on ground transportation systems. Recognizing that the issues posed above cross boundaries of their individual societies, in 2009, the presidents of these four societies began to plan a meeting that would address these issues in an integrated forum. By late 2009, each of the societies agreed to participate in this Forum on Integrated and Sustainable Transportation Systems. The presidents recognized that new technologies are required to solve these issues, and IEEE is one the world’s leading professional associations for the advancement of these technologies.

The purpose of the meeting is to bring together world technical and implementation leaders in technology, implementation and policy management to share information on issues involving land, air, and sea systems.

Venue:

Reed Messe Wien GmbH
Messeplatz 1
A-1021 Vienna
T: +43 (0)1 727 20-0
F: +43 (0)1 727 20-4709
www.messe.at

The Messe Wien is located in the green area near the city center and the world-famous Vienna Prater. Surrounded by rows of chestnut trees and expansive verdant meadows, the exhibition center offers sophisticated and versatile facilities. The Messe Wien Exhibition & Congress Center consists of five separate buildings linked by covered walkways. The five function areas can be divided up between 500 and 62,000 square meters to accommodate events of the size and type according to need. The halls, furnishings, equipment, and architecture assure maximum functionality and an ideal atmosphere.

The complex is conveniently located on the public transportation network with two on-site underground U2 stations (“Messe/Prater” and “Krieau”).

Committee Chairs:

General Chair: Charles Herget
Co-chairs
Europe: Reinhard Pfliegl
North America: Wei-Bin Zhang
Asia: Toshio Fukuda
Program Chair: Matthew Barth
Finance Chair: Daniel Dailey

Time line:

- June 2010: Call for papers
- Dec. 2010: Deadline for submission of papers
- March 2011: Final Program
- June 2011: Conference

Contact:
For further information, please visit our website:
www.ieee-fists.org
**Preliminary Conference outline**

### DAY 1

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:00 – 09:30</td>
<td>Opening Ceremony</td>
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</tbody>
</table>
| 09:30 – 11:00 | Plenary Session #1  
Presentation of the general framework of environmental/climate changes, growth of economy and population and impact of mobility towards this changes |
| 11:00 – 11:45 | Interactive Session #1 + Break  
Paper Presentations 1-5  Paper Presentations 6-10  Paper Presentations 11-15  Paper Presentations 16-20 |
| 11:45 – 13:15 | Plenary Session #2  
Panel Wrap Up and Instructions for the following Breakout Sessions - forecast on transport demand – viewpoint from different sectors |
| 13:15 – 14:15 | Interactive Session #2 + Lunch  
| 14:15 – 15:45 | Plenary Session #3  
Goal of session: contribution of 4 dimensions - centred around a vision for what sustainable, integrated transportation systems look like; identify the major barriers to be overcome or issues of concern or opportunities to be leveraged to achieve the vision |
| 15:45 – 16:30 | Interactive Session #3 + Break  
| 16:30 – 18:00 | Plenary Session #4  
Technical presentations selected by program co-chair in the particular technical area.  
- Manage mobility demand  
- Potential of technologies in transport  
- Availability of technology  
- Radical change management vs. smooth continuous improvement  
- Forecast on traffic and mobility |

**Evening Event**  
Conference dinner in a historical environment (Palace in Vienna)

### DAY 2

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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| 09:00 – 10:00 | Breakout Session #1 + open discussion  
Group 1  Group 2  Group 3  Group 4 |
| 10:00 – 11:00 | Interactive Session #4  
Break |
| 11:30 – 12:30 | Breakout Session #2 + open discussion  
Group 5  Group 6  Group 7  Group 8 |

**Lunch**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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</table>
| 13:30 – 14:30 | Interactive Session #5  
| 14:30 – 15:30 | Breakout Session #3 + open discussion  
Group 9  Group 10  Group 11  Group 12  
Break |
| 16:00 – 17:00 | Interactive Session #6  
| 17:00 – 18:00 | Breakout Session #4 + open discussion  
Group 13  Group 14  Group 15  Group 16 |

### DAY 3

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>09:00-10:30</td>
<td>Plenary Session #5: Plenary Session: Breakout Reports</td>
</tr>
<tr>
<td>10:45 – 12:15</td>
<td>Plenary Session #6: Plenary Session: Summary, conclusion, next steps &amp; moderated discussion with auditorium</td>
</tr>
</tbody>
</table>

**Lunch & Farewell**
Conference Calendar

Massimo Bertozzi / Paolo Grisleri

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

2010

July 4-7, 2010
ISIE 2010 - IEEE International Symposium on Industrial Electronics
Bari, Italy
http://www.isie2010.it

July 13
eSafety Challenge 2010
Millbrook, UK
http://www.esafetychallenge.eu

August 1-4, 2010
National Rural ITS Conference
Seaside, OR, USA
http://www.nritsconference.org

September 6-8, 2010
7th Symposium on Intelligent Autonomous Vehicles
Lecce, Italy
http://iav2010.unile.it

September 6-9, 2010
IEEE 72nd Vehicular Technology Conference
Ottawa, Canada
http://www.ieeevtc.org/vtc2010fall/

September 6-8, 2010
IEEE International Conference on Virtual Environments, Human Computer Interfaces and Measurement System (VECIMS2010)
Taranto, Italy
http://vecims.ieee-ims.org/
September 8-10, 2010
2010 IEEE Multi-Conference on Systems and Control
Yokohama, a port city on Tokyo Bay, Japan
http://www.mei.titech.ac.jp/msc10/

September 9-11, 2010
5th International IIID Expert Forum Traffic & Transport Information Systems
Tech Gate Vienna, Austria
http://www.iiid-expertforum.net/

October 18-22, 2010
2010 IEEE/RSJ International Conference on Intelligent Robots and Systems
Taipei, Taiwan
http://www.iros2010.org.tw/about.php

October 20-23, 2010
10th International Conference on Transport Systems Telematics
Katowice-Ustron Poland
http://www.tst-conference.org

October 25-29, 2010
17th World Congress on ITS
Busan, South Korea
http://www.itsworldcongress.kr

November 9-11, 2010
10th International Conference on ITS Telecommunications
Kyoto, Japan
http://itst2010.org/

November 11-12, 2010
ITN - Infrastructure, Telematics and Navigation
Lingotto Fiere, Turin, Italy
http://www.itnexpo.it

December 12, 2010
Transpo2010: ITS - Now more than ever
Ponte Vedra Beach, FL, USA
http://www.itstranspo.org

2011

February 2, 2011
TrafficInfraTech
New Delhi, India
http://www.trafficinfratechexpo.com
Job Posting

We are looking for a civil or electrical engineer with 10 years experience, more or less, to work in Washington DC area. The candidate must be able to interpret design drawings and inspect field installations for correctness with both civil infrastructure and electronic systems such as traffic management systems, intelligent transportation systems, signal systems, or tolling systems. This person would be watching over the work done by contractors, spending about 25% to 50% of the time in the field. Experience working in the field would be important. For more information, contact Ken Liss at +1-707-257-9000 or by email at moeliss@sbcglobal.net.

IEEE Transactions on ITS Abstracts

Abstracts of Papers

*IEEE Transactions on Intelligent Transportation Systems*, vol. 11, no. 2, June 2010

Linjing Li; Xin Li; Zhenjiang Li; Zeng, D.D.; Scherer, W.T.; , "A Bibliographic Analysis of the IEEE Transactions on Intelligent Transportation Systems Literature," pp.251-255. Abstract: This paper presents a bibliographic analysis of the papers published in the IEEE Transactions on Intelligent Transportation Systems (T-ITS). We identify the most productive and high-impact authors, institutions, and countries/regions. We find that research on intelligent transportation systems is dominated by U.S. researchers and institutions and that China and Japan are the second most productive countries. According to this analysis, M. M. Trivedi, N. P. Papanikolopoulos, and P. A. Ioannou are the three most productive and influential authors in the IEEE T-ITS, whereas the Massachusetts Institute of Technology, Cambridge, the University of California, San Diego, and the University of Minnesota, Minneapolis, are three of the most productive and influential institutions in the IEEE T-ITS.
Abstract: We present results of an effort where position and orientation data from vision and inertial sensors are integrated and validated using data from an actual roadway. Information from a sequence of images, which were captured by a monocular camera attached to a survey vehicle at a maximum frequency of 3 frames/s, is fused with position and orientation estimates from the inertial system to correct for inherent error accumulation in such integral-based systems. The rotations and translations are estimated from point correspondences tracked through a sequence of images. To reduce unsuitable correspondences, we used constraints such as epipolar lines and correspondence flow directions. The vision algorithm automatically operates and involves the identification of point correspondences, the pruning of correspondences, and the estimation of motion parameters. To simply obtain the geodetic coordinates, i.e., latitude, longitude, and altitude, from the translation-direction estimates from the vision sensor, we expand the Kalman filter space to incorporate distance. Hence, it was possible to extract the translational vector from the available translational direction estimate of the vision system. Finally, a decentralized Kalman filter is used to integrate the position estimates based on the vision sensor with those of the inertial system. The fusion of the two sensors was carried out at the system level in the model. The comparison of integrated vision-inertial-measuring-unit (IMU) position estimates with those from inertial-GPS system output and actual survey demonstrates that vision sensing can be used to reduce errors in inertial measurements during potential GPS outages.

***

Abstract: This paper introduces a general active-learning framework for robust on-road vehicle recognition and tracking. This framework takes a novel active-learning approach to building vehicle-recognition and tracking systems. A passively trained recognition system is built using conventional supervised learning. Using the query and archiving interface for active learning (QUAIL), the passively trained vehicle-recognition system is evaluated on an independent real-world data set, and informative samples are queried and archived to perform selective sampling. A second round of learning is then performed to build an active-learning-based vehicle recognizer. Particle filter tracking is integrated to build a complete multiple-vehicle tracking system. The active-learning-based vehicle-recognition and tracking (ALVeRT) system has been thoroughly evaluated on static images and roadway video data captured in a variety of traffic, illumination, and weather conditions. Experimental results show that this framework yields a robust efficient on-board vehicle recognition and tracking system with high precision, high recall, and good localization.

***

Abstract: This paper presents our study on the emergency resource-planning problem, particu-
larly on the development of a new approach to resource planning through contraflow techniques with consideration of the repair of damaged infrastructures. The contraflow technique is aimed at reversing traffic flows in one or more inbound lanes of a divided highway for the outbound direction. As opposed to the current literature, our approach has the following salient points: (1) simultaneous consideration of contraflow and repair of repair of roads; (2) classification of victims in terms of their problems and urgency in sending them to a safe place or place to be treated; and (3) consideration of multiple destinations for victims. A simulated experiment is also described by comparing our approach with some variations of our approach. The experimental results show that our approach can lead to a reduction in evacuation time by more than 50%, as opposed to the original resource operation on the damaged transportation network, and by about 20%, as opposed to the approach with resource replanning (only) on the damaged network. In addition, the multiobjective optimization algorithm to solve our model can be generalized to other network resource-planning problems under infrastructure damage.

***

doi: 10.1109/TITS.2010.2041057
Abstract: The performance of rail vehicles running on railway tracks is governed by the dynamic behaviors of railway bogies, particularly in cases of lateral instability and track irregularities. To ensure reliable, safe, and secure operation of railway systems, it is desirable to adopt intelligent monitoring systems for railway wagons. In this paper, a forecasting model is developed to investigate the vertical-acceleration behavior of railway wagons that are attached to a moving locomotive using modern machine-learning techniques. Both front- and rear-body vertical-acceleration conditions are predicted using popular regression algorithms. Different types of models can be built using a uniform platform to evaluate their performance. The estimation techniques' performance has been measured using a set of attributes' correlation coefficient (CC), root mean square error (RMSE), mean absolute error (MAE), root relative squared error (RRSE), relative absolute error (RAE), and computational complexity for each of the algorithms. Statistical hypothesis analysis is applied to determine the most suitable regression algorithm for this application. Finally, spectral analysis of the front- and rear-body vertical condition is produced from the predicted data using the fast Fourier transform (FFT) and is used to generate precautionary signals and system status that can be used by a locomotive driver for necessary actions.

***

doi: 10.1109/TITS.2010.2044241
Abstract: Driver distraction and inattention are prominent causes of automotive collisions. To enable driver-assistance systems to address these problems, we require new sensing approaches to infer a driver's focus of attention. In this paper, we present a new procedure for static head-pose estimation and a new algorithm for visual 3-D tracking. They are integrated into the novel real-time (30 fps) system for measuring the position and orientation of a driver's head. This sys-
tem consists of three interconnected modules that detect the driver's head, provide initial estimates of the head's pose, and continuously track its position and orientation in six degrees of freedom. The head-detection module consists of an array of Haar-wavelet Adaboost cascades. The initial pose estimation module employs localized gradient orientation (LGO) histograms as input to support vector regressors (SVRs). The tracking module provides a fine estimate of the 3-D motion of the head using a new appearance-based particle filter for 3-D model tracking in an augmented reality environment. We describe our implementation that utilizes OpenGL-optimized graphics hardware to efficiently compute particle samples in real time. To demonstrate the suitability of this system for real driving situations, we provide a comprehensive evaluation with drivers of varying ages, race, and sex spanning daytime and nighttime conditions. To quantitatively measure the accuracy of system, we compare its estimation results to a marker-based cinematic motion-capture system installed in the automotive testbed.

***

Abstract: The number of vehicles that are included in a metered motorway ramp or an urban signalized link at any time is valuable information for real-time control. A recently developed Kalman-filter-based real-time estimator for the vehicle count within signalized links, using three detector cross stations, is simplified in this paper to allow for reliable estimates on the basis of one single time-occupancy measurement that is typically available in urban signalized links. The simplified vehicle-count estimator is tested and compared with the three-detector estimation scheme via microscopic simulation for a variety of scenarios and traffic conditions. Several related issues are addressed: the effect of utilizing more measurements, as well as the impact of the update period, signal cycle, vehicle length, and link length. The simulation investigations indicate less-accurate but still reasonable and robust estimation performance of the simplified estimator with low calibration effort needed, which facilitates easy applicability of the method.

***

Abstract: In this paper, a new algorithm for vehicle logo recognition on the basis of an enhanced scale-invariant feature transform (SIFT)-based feature-matching scheme is proposed. This algorithm is assessed on a set of 1200 logo images that belong to ten distinctive vehicle manufacturers. A series of experiments are conducted, splitting the 1200 images to a training set and a testing set, respectively. It is shown that the enhanced matching approach proposed in this paper boosts the recognition accuracy compared with the standard SIFT-based feature-matching method. The reported results indicate a high recognition rate in vehicle logos and a fast processing time, making it suitable for real-time applications.

***

Pauwelussen, J.; Feenstra, P.J.; , "Driver Behavior Analysis During ACC Activation and Deac-
Abstract: For the development of a traffic-simulation model to estimate the effect of adaptive cruise control (ACC) systems on traffic safety, throughput, and environment, data of a field operational test (FOT) were analyzed, in which vehicles were equipped with ACC and lane-departure warning (LDW) systems. The objective of this paper is to use this FOT to investigate the deactivation or (re)activation of the ACC on driver behavior in a real traffic environment. By taking these results into account in the traffic simulation environment, a more realistic evaluation of the impact of ACC on safety, throughput, and environment can be achieved. Some of the conclusions that were found are that after the participants deactivated the ACC by pressing the brake pedal, the gap with the lead vehicle was decreased. Resuming the ACC by activating the system or by releasing the throttle after overruling the system resulted in a larger gap between participant and lead vehicle than an overruled ACC or the ACC turned off. The participants overruled the ACC by pressing the throttle mainly to overtake the lead vehicle.

Abstract: State-of-the-art traffic-flow-detection technology includes the use of a looped vehicle detector, an infrared detector, an image detector, and a microwave detector. However, there are limitations that are associated with each detector. In this paper, we propose a channel awareness vehicle detector that can overcome these limitations. It employs only one pair of transmitter-receiver antennas to simultaneously perform the multilane and multivehicle identifications. By using the characteristics of channel variations, the proposed vehicle detector can determine the vehicle location, speed, and type. Our measurement results demonstrate its capabilities.

Abstract: This paper presents a sensor-fusion framework for video-based navigation. Video-based navigation offers the advantages over existing approaches. With this type of navigation, road signs are directly superimposed onto the video of the road scene, as opposed to those superimposed onto a 2-D map, as is the case with conventional navigation systems. Drivers can then follow the virtual signs in the video to travel to the destination. The challenges of video-based navigation require the use of multiple sensors. The sensor-fusion framework that we propose has two major components: (1) a computer vision module for accurately detecting and tracking the road by using partition sampling and auxiliary variables and (2) a sensor-fusion module using multiple particle filters to integrate vision, Global Positioning Systems (GPSs), and Geographical Information Systems (GISs). GPS and GIS provide prior knowledge about the road for the vision module, and the vision module, in turn, corrects GPS errors.

Abstract: An algorithm for optimal arrival flight sequencing and spacing in a near-terminal area
is proposed. The optimization problem and algorithm proposed in this paper are developed for a decision-support tool for air-traffic control, which uses discrete delay times as optimization variables. The algorithm is applicable to various scenarios with situational and operational constraints such as maximum position shift (MPS) constraints or different sets of discrete delay times, depending on aircraft types or approaching routes. The proposed algorithm is based on a branch-and-bound algorithm with linear programming (LP) and Lagrangian dual decomposition. We formulate the sequencing and scheduling problem as LP with linear matrix inequalities (LMIs), which allows computing the lower bound of the cost for the best first search in the branch-and-bound algorithm and propose Lagrangian dual decomposition for computational efficiency. The proposed algorithm is analyzed and validated through illustrative air-traffic scenarios with various operational constraints, and the simulation results show that the computation time can be significantly reduced using the proposed Lagrangian dual-decomposition method.

Abstract: An approach is proposed to estimate the location, velocity, and acceleration of a target vehicle to avoid a possible collision. Radial distance, velocity, and acceleration are extracted from the hybrid linear frequency modulation (LFM)/frequency-shift keying (FSK) echoed signals and then processed using the Kalman filter and the trilateration process. This approach proves to converge fast with good accuracy. Two other approaches, i.e., an extended Kalman filter (EKF) and a two-stage Kalman filter (TSKF), are used as benchmarks for comparison. Several scenarios of vehicle movement are also presented to demonstrate the effectiveness of this approach.

Abstract: This paper discusses the problem of optimizing the use of scanning resources for route flow estimation in traffic networks. Three problems are considered: (1) Minimize the number of cameras to be used for estimating a given subset of route flows; (2) identify the subsets of links to be scanned for a given number of available cameras, assuming that several runs can be done; and (3) solve the previous problems with consideration of scanning errors and error recovery. In addition to the main objective, which consists of minimizing the number of cameras, minimizing the total number of links to be scanned in all runs and maximizing the number of determined route flows are also considered as secondary and tertiary objectives, respectively. A simple and a medium-size real network are used to illustrate the proposed methods and prove the feasibility of the proposed methodology.

Abstract: A new generation of traffic alert and collision-avoidance systems based on the Global Positioning System (GPS) and Automatic Dependent Surveillance Broadcast (ADS-B) is studied in this paper. Two horizontal escape maneuvers are proposed: One is to change speed but not flying direction, and the other is to change flying direction but not speed. The algorithms for conflict detection and collision avoidance are also presented. The relationships between turn angle, horizontal miss distance (HMD), and reserving time, as well as the relationships between speed, HMD, and reserving time, are calculated and analyzed. To effectively avoid collisions by horizontal escape maneuvers, the research results indicate that the speed of the host aircraft required to increase or decrease must be bounded within a speed range, and the angle of the host aircraft required to turn right or left must also be bounded within an angle range.

Zhi-Hui Zhan; Jun Zhang; Yun Li; Ou Liu; Kwok, S.K.; Ip, W.H.; Kaynak, O.; , "An Efficient Ant Colony System Based on Receding Horizon Control for the Aircraft Arrival Sequencing and Scheduling Problem," pp.399-412.

Abstract: The aircraft arrival sequencing and scheduling (ASS) problem is a salient problem in air traffic control (ATC), which proves to be nondeterministic polynomial (NP) hard. This paper formulates the ASS problem in the form of a permutation problem and proposes a new solution framework that makes the first attempt at using an ant colony system (ACS) algorithm based on the receding horizon control (RHC) to solve it. The resultant RHC-improved ACS algorithm for the ASS problem (termed the RHC-ACS-ASS algorithm) is robust, effective, and efficient, not only due to that the ACS algorithm has a strong global search ability and has been proven to be suitable for these kinds of NP-hard problems but also due to that the RHC technique can divide the problem with receding time windows to reduce the computational burden and enhance the solution's quality. The RHC-ACS-ASS algorithm is extensively tested on the cases from the literatures and the cases randomly generated. Comprehensive investigations are also made for the evaluation of the influences of ACS and RHC parameters on the performance of the algorithm. Moreover, the proposed algorithm is further enhanced by using a two-opt exchange heuristic local search. Experimental results verify that the proposed RHC-ACS-ASS algorithm generally outperforms ordinary ACS without using the RHC technique and genetic algorithms (GAs) in solving the ASS problems and offers high robustness, effectiveness, and efficiency.


Abstract: Expert drivers' deceleration patterns in last-second braking will be formulated using a perceptual risk index for the approach and the proximity of a preceding vehicle as examples of comfortable braking patterns. It will be shown that the formulated braking pattern can uniformly generate a smooth deceleration profile for many approach conditions. In addition, the brake initiation timing of expert drivers will be successfully formulated using a modified index. Finally, an automatic braking system for collision avoidance will be proposed based on a formulated brake-initiation model and a deceleration pattern. Twenty five expert drivers will experience the automatic braking that is installed in an experimental car. It will be shown that the
proposed system can generate a smooth profile and realize secure brake patterns based on the drivers' subjective evaluation.

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Abstract: In this paper, we present a new generic model-based approach for building 3-D models of vehicles from color video from a single uncalibrated traffic-surveillance camera. We propose a novel directional template method that uses trigonometric relations of the 2-D features and geometric relations of a single 3-D generic vehicle model to map 2-D features to 3-D in the face of projection and foreshortening effects. We use novel hierarchical structural similarity measures to evaluate these single-frame-based 3-D estimates with respect to the generic vehicle model. Using these similarities, we adopt a weighted clustering technique to build a 3-D model of the vehicle for the current frame. The 3-D features are then adaptively clustered again over the frame sequence to generate an incremental 3-D model of the vehicle. Results are shown for several simulated and real traffic videos in an uncontrolled setup. Finally, the results are evaluated by the same structural performance measure, underscoring the usefulness of incremental learning. The performance of the proposed method for several types of vehicles in two considerably different traffic spots is very promising to encourage its applicability in 3-D reconstruction of other rigid objects in video.

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Abstract: Many vision-based automatic traffic-monitoring systems require a calibrated camera to compute the speeds and length-based classifications of tracked vehicles. A number of techniques, both manual and automatic, have been proposed for performing such calibration, but no study has yet focused on evaluating the relative strengths of these different alternatives. We present a taxonomy for roadside camera calibration that not only encompasses the existing methods (VVW, VWH, and VWL) but also includes several novel methods (VVH, VVL, VLH, VVD, VWD, and VHD). We also introduce an overconstrained (OC) approach that takes into account all the available measurements, resulting in reduced error and overcoming the inherent ambiguity in single-vanishing-point solutions. This important but oft-neglected ambiguity has not received the attention that it deserves; we analyze it and propose several ways of overcoming it. Our analysis includes the relative tradeoffs between two-vanishing-point solutions, single-vanishing-point solutions, and solutions that require the distance to the road to be known. The various methods are compared using simulations and experiments with real images, showing that methods that use a known length generally outperform the others in terms of error and that the OC method reduces errors even further.

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Abstract: Automated detection of vehicles in front is an integral component of many advanced driver-assistance systems (ADAS), such as collision mitigation, automatic cruise control (ACC), and automatic headlamp dimming. We present a novel image processing system to detect and track vehicle rear-lamp pairs in forward-facing color video. A standard low-cost camera with a complementary metal-oxide semiconductor (CMOS) sensor and Bayer red-green-blue (RGB) color filter is used and could be utilized for full-color image display or other color image processing applications. The appearance of rear lamps in video and imagery can dramatically change, depending on camera hardware; therefore, we suggest a camera-configuration process that optimizes the appearance of rear lamps for segmentation. Rear-facing lamps are segmented from low-exposure forward-facing color video using a red-color threshold. Unlike previous work in the area, which uses subjective color threshold boundaries, our color threshold is directly derived from automotive regulations and adapted for real-world conditions in the hue-saturation-value (HSV) color space. Lamps are paired using color cross-correlation symmetry analysis and tracked using Kalman filtering. A tracking-based detection stage is introduced to improve robustness and to deal with distortions caused by other light sources and perspective distortion, which are common in automotive environments. Results that demonstrate the system's high detection rates, operating distance, and robustness to different lighting conditions and road environments are presented.


Abstract: A crucial factor in traffic safety is driver behavior. A better understanding of driver actions will help in determining the most common reasons for car accidents. Therefore, research in this field helps to reduce accidents due to driver distraction. This paper presents Argos, which is a complex and powerfully computerized car to help researchers in the study of car driver behavior. The Argos system is an improved in-vehicle data recorder (IVDR) that allows recording many kinds of alphanumerical data such as the speed (vehicle data), the point of gaze (driver data), or the current distance to lateral road marks (environmental data). In addition, Argos can record up to nine simultaneous video images which are synchronized with the alphanumerical data. Argos can also generate and record different kinds of in-car light and audio stimuli, allowing an experiment supervisor to interact or to schedule specific actions to take place during an experiment.


Abstract: In adverse weather conditions, in particular, in daylight fog, the contrast of images grabbed by in-vehicle cameras in the visible light range is drastically degraded, which makes current driver assistance that relies on cameras very sensitive to weather conditions. An onboard vision system should take weather effects into account. The effects of daylight fog vary across the scene and are exponential with respect to the depth of scene points. Because it is not possible in this context to compute the road scene structure beforehand, contrary to fixed cam-
era surveillance, a new scheme is proposed. Fog density is first estimated and then used to re-
store the contrast using a flat-world assumption on the segmented free space in front of a mov-
ing vehicle. A scene structure is estimated and used to refine the restoration process. Results are
presented using sample road scenes under foggy weather and assessed by computing the visibil-
ity level enhancement that is gained by the method. Finally, we show applications to the en-
hancement in daylight fog of low-level algorithms that are used in advanced camera-based
driver assistance.

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Abstract: The agent computing paradigm is rapidly emerging as one of the powerful technolo-
gies for the development of large-scale distributed systems to deal with the uncertainty in a dy-
namic environment. The domain of traffic and transportation systems is well suited for an
agent-based approach because transportation systems are usually geographically distributed in
dynamic changing environments. Our literature survey shows that the techniques and methods
resulting from the field of agent and multiagent systems have been applied to many aspects of
traffic and transportation systems, including modeling and simulation, dynamic routing and
congestion management, and intelligent traffic control. This paper examines an agent-based ap-
proach and its applications in different modes of transportation, including roadway, railway,
and air transportation. This paper also addresses some critical issues in developing agent-based
traffic control and management systems, such as interoperability, flexibility, and extendibility.
Finally, several future research directions toward the successful deployment of agent technol-
ogy in traffic and transportation systems are discussed.

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Toledo-Moreo, R.; Pinzolas-Prado, M.; Cano-Izquierdo, J.M.; , "Maneuver Prediction for Road
Vehicles Based on a Neuro-Fuzzy Architecture With a Low-Cost Navigation Unit," pp.498-
504.
Abstract: Collision avoidance is currently one of the main research areas in road intelligent
transportation systems. Among the different possibilities available in the literature, the predic-
tion of abrupt maneuvers has been shown to be useful in reducing the possibility of collisions.
A supervised version of dynamic Fuzzy Adaptive System ART-based (dFasArt), which is a
neuronal-architecture-based method that employs dynamic activation functions determined by
fuzzy sets, is used for maneuver predicting and solving the problem of intervehicle collisions on
roads. In this paper, it is shown how the dynamic character of dFasArt minimizes problems
caused by noise in the sensors and provides stability on the predicted maneuvers. Several ex-
periments with real data were carried out, and the SdFasArt results were compared with those
achieved by an implementation of the Incremental Hierarchical Discriminant Regression
(IHDR)-based method, showing the suitability of SdFasArt for maneuver prediction of road ve-
hicles.

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Abstract: Many system-development projects today are mainly driven by the complexity of their software interacting with sensors or actuators in an embedded context. Autonomous vehicle development is a domain where it seems inevitably necessary to apply modern development techniques to cope with complexity, increase development efficiency, and ensure appropriate quality. Furthermore, changes that are triggered by customers or inventions of competitors, as well as bugs, enforce a comprehensible, if necessary, yet agile development process with stringent quality management. In this paper, we describe the agile efficiency- and quality-focused change management mainly based on scenario-driven regression simulation used in the CarOLO project for the development of an autonomously driving vehicle to compete in the 2007 Defense Advanced Research Projects Agency (DARPA) Urban Challenge program. The main contribution is the demonstration of the modern software engineering techniques' applicability to develop distributed embedded systems.

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Abstract: Recently, several algorithms for deciding whether all origin-destination (O-D) flows are reconstructable based on the measurement of a subset of link flows have been proposed in the literature. The algorithms discussed in this paper have been introduced as algebraic and topological approaches by their corresponding authors. However, a detailed discussion on the properties of the results delivered by the considered algorithms, including statistical properties of the corresponding estimated O-D flows, is still lacking. This paper closes this gap by providing an interpretation of the algorithms demonstrating their potential when jointly applied and elucidating the properties of the results provided by the algorithms.
Research Program

VisLab Intercontinental Autonomous Challenge

The VisLab’s intelligent vehicles will leave for an intercontinental trip never tried before: from Italy to China, 13,000 km without any driver. And the electronic pilot will be powered by solar energy.

San Diego, California, February 20, 2010 --- The official presentation of the experiment that University of Parma’s VisLab will start next July 10th has just ended; it demonstrates a big step forward in the driver assistance technology developed in the last 15 years by the Italian research laboratory. VisLab, thanks to an important grant received from ERC (European Research Council) is performing research aimed at providing vehicles with perception capabilities in order to reduce the number of road accidents and –as an ultimate goal- even for completely autonomous driving. VisLab’s project was further selected by ERC to represent European research at an international level; the presentation was held at the European Community booth at AAAS (American Association for the Advancement of Science) at the presence of Dr. Pablo...
Amor, Head of ERC grand management Department, and VisLab’s coordinator Prof. Alberto Broggi.

As one of the project’s intermediate steps (the project runs from Dec 2008 to Nov 2013) VisLab is going to test the results with a 13,000 km trip from Italy to China. “Besides moving autonomously –project coordinator Alberto Broggi explains- the vehicles will record all data throughout the trip (7 cameras, 6 laserscanners, GPS, IMU, and complete vehicle odometry) creating a unique database that will allow us to virtually travel the whole trip a number of times; the experience obtained on such a long and extreme trip will allow us to validate the systems that we develop with respect to both software (we will have to face very different situations and road scenarios) and hardware (the systems will be continuously stressed for 3 months in extreme road and environmental conditions).”

The event will also have a remarkable strategic importance from an industrial point of view: the vehicles (Porter Piaggio), conveniently chosen of reduced size and electrical, will be ready to be used to automate goods handling in last mile urban areas.

The energetic supply from renewable sources will make this kind of mobility sustainable and environment friendly. In particular, the automatic driving system will be energy-autonomous, being powered by a solar panel installed on the vehicle roof.

Moreover VisLab’s technologies tested from Italy to China may be transferred to other vehicles and applied to other fields as agriculture, earth moving, constructions, in extreme environments, … where the employment of a vehicle able to move without any driver will bring remarkable economical as well as social advantages.

The driverless vehicles that will traverse Europe and Asia towards Shanghai are two, implementing different technological solutions: “boosted” the former, bringing scientific experiments to the limit; more conservative the latter, ready to be industrially exploited.

The adventure will start from Italy on July 10, 2010 and will end in Shanghai, China, on October 10, 2010 at the 2010 World Expo, where the vehicles will be displayed. Media coverage and logistics will be dealt with by an exceptional partner: Overland, with a longtime experience on adventurous trips and extreme challenges.

Besides stopping in the main cities reached during the 3 months trip in order to offer technical demonstrations and explanatory presentations, the experiment will be considered as finished once that some Italian goods, loaded in Italy on one of the automatic vehicles, will have, first time in history, reached their destination after a 13,000 km ground trip with no human driver.

“I’m particularly proud that ERC selected my project –concludes Alberto Broggi- as it gives us the opportunity to push our research towards topics that usually companies in this field avoid to consider, since they don’t offer a short term applicability. This fact will provide clear advantages to us in the near future, when autonomous vehicles will be of direct interest to vehicle companies.”
Follow the tests and the Challenge in real-time

If you want to witness the greatest challenge so far in the field of mobility, see how the vehicles move autonomously, interact with the engineers that will be following the vehicles, discuss about the great potential of this technology, please refer to this web page and stay tuned at vis-lab.it: a specific website (www.IntercontinentalChallenge.eu) is now online with news, feeds, video streaming from the vehicles while driving to Shanghai!

Update from VisLab website: (viac.vislab.it)

The expedition will leave Parma on July 26. The four electric autonomous vehicles will be followed by four RVs, and three support trucks. The mission will be headed towards Belgrade, where the first demonstration will take place.
## Officers and Committee Chairs

### Officers

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### Committee Chairs

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