

Intelligent Roads

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RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

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1. Project overview

The INTRO project (Intelligent Roads for Increased Safety and Capacity) aims to address the problems of road safety and road capacity combining sensing technologies and local databases with real-time networking technologies. This will improve both road safety and road capacity by providing rapid feedback of emerging problems to operation and maintenance authorities and road users.

The INTRO technical strategy comprises the following main elements:

- Dynamic estimation of the road status (traffic, road surface and pavement) using novel sensor technologies and data fusion methods.
- Real-time solutions using existing telecommunication networks.
- Enhancing dynamic measurements using existing national road databases.

2. INTRO at FeRRM 05

The INTRO launch workshop was held on June 15 in Brussels within FeRRM 05 (FEHRL Road Research Meeting, 2005), a larger event organised by FEHRL .

FeRRM 05 gave the opportunity to present findings from research activities, to discuss and reach consensus on how to transform these findings into research priorities in view of preparing the FEHRL Strategic Road Research Programme (SERRP) IV and, ultimately, to pave the way to an integrated approach in the implementation of the 7th Framework Programme of RTD and the European Research Area in the field of road transport.

The conference programme was broadened to include input from projects and initiatives other than FEHRL's.

3. Workshop objectives

Although the number of deaths and injuries on the road in Europe have fallen in recent years, due to improvements and measures such as safer cars, drink/drive measures, and road safety engineering improvements, the casualty rate is still unacceptably high. There remains considerable potential for further reduction by adding intelligence to the road infrastructure.

In addition, as a result of increased traffic volume and increased heavy freight transport by road, the costs for road maintenance are increasing. This requires new approaches for road maintenance to increase the capacity and improve road maintenance. Adding intelligence to existing roads can be a way to achieve these improvements as well as to improve safety.

Stakeholders are governments and public road authorities at all levels (national, regional, local), road operating companies (e.g. private tolled infrastructure), the European Commission, road users, the sensor industry, and the vehicle and tyre industry.

The theme of the INTRO session on FeRRM 05 was "Can new technologies make a difference?" The objective of this session was to bring together representatives of the several stakeholders and partners in the INTRO project to present their views on the problems, how the INTRO project will cover these problems, and to address current and future issues concerning intelligence of road infrastructure. The stakeholders who participated in this session included representatives from the European Commission, ERTICO (ITS Europe), national road administrations, and partners participating in the project.

4. INTRO reference group

4.1. Background information

Since 1992, FEHRL has developed a series of Strategic European Road Research Programmes (SERRPs). These have defined the research agenda for a period of years and serve as input, and therefore mirror, the Commission's framework programmes. Each programme was defined by FEHRL following consultation with national road administrations and industry bodies.

The implementation of SERRP III for the years 2002 – 2006 requires addressing immediate problems at the short term and for a longer-term basis for future issues in the mobility of Europe's citizens. It is planned that future versions of the SERRP series, setting out the intermediate research needs, will be developed with reference to the overall vision and taking into account the findings of FEHRL clustered projects.

In this respect the contribution of INTRO will be crucial for the implementation of future SERRPs with special regard to issues related to road safety. The INTRO project reference group is based upon the pre-existing stakeholder group, which has now been supplemented with a broader range of stakeholders. Overlaps are part of the process of scientific investigation to best identify and respond to the actual needs of stakeholders.

4.2. Reference group stakeholders

The workshop was well attended with the participation of more than 40 delegates representing national highway authorities, academia, industry, the European Commission and a wide range of interest groups and European organisations with a stake in road safety. Most of these stakeholders are part of the INTRO reference group.

INTRO sought to establish working relations with organisations such as CEDR, EUCAR/ACEA, POLIS, EARPA, ERTICO and ERTRAC.

- CEDR is the Conference of European Directors of Roads promoting collaboration and exchange of information and expertise amongst national road administrations.

- EUCAR/ACEA is the European Council for Automotive R&D representing the major European motor vehicle manufacturers: BMW Group, DaimlerChrysler, Fiat, Ford in Europe, Opel, Porsche, PSA Peugeot-Citroën, Renault, Volkswagen Group, Volvo.

- POLIS is a network of leading European cities and regions working together for the development of innovative technologies and policies in local transport.

- EARPA is the association of independent automotive R&D providers in Europe. The members of EARPA ranging from large commercial organisations to national institutes cover the area of road vehicle technology R&D, components and complete vehicle and in relation to the infrastructure.

- ERTICO – ITS Europe is a multi-sector, public/private partnership pursuing the development and deployment of Intelligent Transport Systems and Services (ITS). ERTICO is involved in a large number of EC funded projects on e-safety.

- ERTRAC (European Road Research Advisory Council) is a technology platform bringing together high level representatives from all road transport sectors including consumers, vehicle manufacturers, component suppliers, road infrastructure operators and developers, service providers, energy suppliers, research organisations, cities and regions as well as public authorities at both European Union and national level.

5. Workshop details

5.1. Overview

The workshop programme was organised around 8 presentations highlighting different perspectives related to intelligent roads.

André Vits, head of the unit “ICT for Transport” of DG INFSO, opened the workshop with a presentation on the e-Safety initiative pointing to the need of pan-European deployment.

The INTRO project was introduced by its project manager, Bengt Wälivaara who detailed the main project objectives. The leaders of the three key INTRO research strands - surface safety monitoring, traffic analysis and pavement condition - provided insight into emerging trends and novel concepts.

The INTRO workshop also included input from three other relevant stakeholders:

- ERTICO (see paragraph 4.2 for further details).
- The Swedish Road Administration presenting the “Intelligent Vehicle Safety Systems" (IVSS) programme
- ROC, a small enterprise involved in the INTRO project, that outlined the role of SMEs (Small and Medium Enterprises) in ITS.

The presentations were followed by a panel discussion where delegates had the opportunity to raise comments and address questions to the speakers.

Two rapporteurs (Steve Morello, ISIS and Hans van Saan, FEHRL) were appointed to summarize the key findings of the workshop and contribute to this document.

5.2. Presentations and key points raised

Introductory session

Steve Morello from ISIS (France) chaired this INTRO session and welcomed all participants and attendees. In his introduction, he stressed the importance of road safety and reducing the costs for road maintenance.

In the first presentation, André Vits from DG INFSO of the European Commission addressed the EC work programme. In this presentation the EC e-Safety initiative was highlighted. It aims at accelerating the development, deployment and use of Intelligent Integrated Safety Systems that use Information and Communication Technologies (ITC) in intelligent solutions in order to increase road safety and reduce the number of accidents on Europe's roads. Regarding the monitoring of e-Safety objectives, a road map exists whereby the car manufacturers have committed themselves to implement eCall.

Next was discussed the logical evolution towards cooperative systems in road safety and road management. Here FP5, FP6 and FP7 were/are involved. The upcoming 7th Framework Programme will stress the integration of technologies. In this programme it will be important to develop tools for the benefit of the transport industry and the community. Systems for v2i (vehicle-to-infrastructure), v2v (vehicle-to-vehicle) and v2x (vehicle-to-"all") will be addressed not as individual systems themselves, rather the effort will emphasise the interaction between the various systems.

INTRO project

Bengt Wälivaara from VTI (The Swedish National Road and Transport Research Institute) and coordinator of the INTRO project presented the INTRO objectives and targets. The INTRO project is a cooperation between road authorities, national road and/or transport research institutes, and private consulting/engineering companies. The INTRO technical strategy comprises the following main elements:

- Dynamic estimation of the road status (traffic, road surface and pavement) using novel sensor technologies and data fusion methods
- Real-time solutions using existing telecommunication networks
- Enhancing dynamic measurements using existing national road databases

A lot of information about road and traffic conditions, e.g. road friction, weather and traffic, is of interest for both the driver and the road operator.

Next the leaders of the main technical work packages within INTRO presented the activities to be carried out in their respective work packages.

First Edward Chung from LAVOC-EPFL (École Polytechnique Fédéral de Lausanne) in Switzerland stressed the importance of identifying relevant traffic performance indicators and traffic safety indicators. Next it is important to develop methodologies for monitoring traffic conditions by combining traffic data from multiple sources and weather data, and to develop methodologies for monitoring traffic safety.

Stationary road side systems as well as probe vehicles will collect and provide the required data. Challenges to face are the identification of relevant traffic performance indicators and traffic safety indicators, and the fusion of data from multi sources to obtain improved information on the performance of the system. The objective is a more intelligent road that leads to safer driving conditions and a better use of the road network.

Next Alex Wright from TRL (Transport Research Laboratory) in the United Kingdom presented the Intelligent Pavements work package. Six main types of maintenance that contribute to the core objectives of safety, serviceability and sustainability were discussed: reactive, routine, programmed, regulatory, winter service and other (weather related) calamities.

The INTRO project will consider how intelligent pavements can contribute to well-maintained highways. The emphasis will be on the assistance and benefits for the highway engineer and the road manager. Some problems in applying road sensors are cost-related issues (including installation costs) and the low coverage. The focus in INTRO will be on low cost sensors and also sensors that are not restricted to in-situ measurements. The research strategy will cover pavement systems and vehicle systems.

Markus Meissner from Arsenal Research in Austria presented the work package that covers the novel concepts for surface safety monitoring. The focus here is to provide real time information on skid resistance (friction) to both road authority and to the drivers using extended floating car data. As drivers usually do not know how to interpret friction values this needs to be "translated" to them in order to promote an appropriate driver response. This will be evaluated in driving simulator study. In the INTRO project, there is a summer and a winter test pilot where friction data from the test vehicle's CAN-bus will be used by the means of a GIS based tool that will be developed in the project.

Next, Rigobert Opitz from ROC (Rigobert Optiz Consulting & Engineering) in Germany presented the role of SMEs in ITS. Here the role that SMEs can play in the development of sensors and processing was pointed out. Participating in EC projects requires a lot of preparation and investment that can be a real challenge for a SME. Looking for partners can be helpful in this respect. As a success story for a SME ITS project, the EC Top Trial project was presented. As a recommendation it was mentioned that SME's should have a guaranteed share in EC projects and that the payment structure should be modified to take account of cash flow needs for small enterprises.

ERTICO and e-Safety

Peter Van der Perre from ERTICO (ITS Europe), based in Belgium, showed how ERTICO is involved in several strategic road safety activities. Some e-Safety projects in which ERTICO is involved were presented. The PReVENT project form the vehicle

manufacturers is the development of a kind of "virtual safety belt" collision avoidance and pre-crash systems. GST is a Global System for Telematics, an open market for on-line safety systems (e.g. eCall). AIDE is an integrated, multi-modal and adaptive HMI (human-machine interface) project in which all car manufacturers are involved. Next challenges now are the systems for v2x, the vehicle to "all" systems. However, here are still a lot of open questions. It is recommended that when public authorities participate in "intelligent roads" projects, their participation is active as there is a demand from society. Also of importance is the close involvement of standardisation bodies. Standardisation should even be an outcome of the projects.

IVSS programme (Sweden)

The last presentation was from Anders Haggård from Vägverket (Swedish Road Administration) who presented the Swedish IVSS programme (Intelligent Vehicle Safety Systems). Sweden is an R&D leader on global automotive safety. The IVSS research agenda focuses on seven main areas:

- Driver support & human-machine interaction system
- Communication platform, internal and external
- Sensors and embedded systems
- Intelligent roads and informatics
- Dependable and fault-tolerant systems
- Crashworthiness bio-mechanics, and
- Vehicle dynamic safety systems

The IVSS programme offers a unique opportunity for cooperation between car manufacturers and the Swedish road authority. Opportunities are open and proposals to participate in the IVVS programme are welcomed.

5.3. Panel discussion

Besides the panel discussion, there was an active audience participation in the discussions. It was brought up that there are many (international) projects that focus on road safety. This stresses the importance of "show and share" of the results of projects. Dissemination activities should have a vital role in these projects. Cooperation and exchange of information is important.

Often cooperation between parties can be an obstacle. In the eCall project the car manufacturers have committed themselves to implement eCall. Public bodies can monitor this.

For the INTRO project, it was suggested to keep in touch with tyre manufacturers as there are very interesting and promising developments in this field.

In the INTRO project among other things there is a focus on ‘inexpensive’ in-situ sensors. However, road works (road blocks) are becoming more and more expensive and are becoming less acceptable due to heavy traffic flow conditions. The lifetime costs of sensors (all-in) are of significant importance.

For SMEs participating in EC projects it is important to invest in building up a network. Also the linguistic problem requires attention.

Standardisation in v2v, v2i and v2x is vital, this will be enforced by the EC in future EU-projects. Therefore, it is crucial that stakeholders now define their needs in this field.

5.4. Key conclusions

The following key conclusions can be drawn from the presentations, the questions and the discussions within the sessions:

- Intelligent roads can help road authorities to better maintain highways and include whole-life-costs.
- Determination of pavement failures from probe vehicles is an innovative approach, and if successful will cater for the road authorities' needs.
- Cooperation between car manufacturers and public bodies is important and is vital in v2i and v2x developments.
- Standardisation in v2v, v2i and v2x is vital for the success in the implementation and application of these systems.

6. Dissemination

Dissemination activities announcing the workshop were carried out both at national and European level. The FEHRL office in Brussels promoted the workshop Europe-wide by using existing channels of communication (i.e.: mail lists and web site).

The workshop was also publicised at European and national conferences, seminars, workshops and meetings in which INTRO partners participated.

The workshop on intelligent roads was highlighted in all press announcements published in European specialised magazines (i.e.: The Parliament Magazine).

7. Proceedings

The booklet of pre-proceedings that was distributed to delegates on the first day of the conference included most of INTRO presentations.

The complete presentations can be downloaded from www.fehrl.org and are available on the CD-Rom of FeRRM 05 proceedings.

A brief article on the outcomes of the workshop was included in the September issue of FEHRL news.