PROJECT

INTRO

Intelligent Roads

Funding: European (6th RTD Framework Programme)
Duration: Mar 2005 - Feb 2008
Status: Complete with results
Total project cost: €3,496,456
EU contribution: €1,999,020

Call for proposal: FP6-2003-TRANSPORT-3
CORDIS RCN: 74776

Background & policy context:

At the time of this project the death toll in European Union countries annually was more than 42,000 road users, around 3.5 million were injured annually. This accounted for annual costs of over €160 billion, not counting the pain and suffering of victims and their relatives.

Studies in one EU Member State show that since 1980, crash safety improvements have reduced casualties by 15%, drink/driving measures by 11%, and road safety engineering improvements by 6.5%. There is clearly considerable untapped potential for a much greater reduction in casualties through adding intelligence to road infrastructure.

Even without safety improvements, European countries are experiencing ever increasing maintenance costs to keep the road network in a good and safe condition. The reasons for this are increased traffic volume combined with accelerated damage to road surfaces and structures due to increased gross weights and evolution of load configurations of heavy goods vehicles. With the demand for increased freight transport increasing substantially, this situation will get worse instead of better unless new approaches can be found to increase the capacity and improve the maintenance through added intelligence to existing roads rather than new roads.

In these circumstances, the target set by the EC of a 50% reduction in road deaths by 2010, was ambitious and a major challenge for the road research community as well as the road authorities and operators.

An innovative integration of existing sensor and communication technologies with road infrastructure is one way of reaching the twin goals of increased safety and increased capacity. For a relatively small cost, significant 'added value' can be obtained from existing infrastructure, achieving a cost effective solution to the problem.

The INTRO project aimed at addressing the needs of road operators and users in terms of dealing with the following main aspects:

- driver awareness of sudden changes in road safety conditions;
- driver and road operator information on pavement safety and capacity including its optimisation; and
- real-time information for road operator based on traffic data and safety status.

Objectives:

The INTRO project aimed at addressing the problems of road safety and capacity, combining sensing technologies and local databases with real-time networking technologies. This will improve both road safety and capacity by providing rapid feedback of emerging problems to maintenance authorities and road users.

Activities in INTRO focused on the following objectives:
Novel methods of surface safety monitoring:

- Integration and testing of real-time warning systems at network level to achieve a significant decrease in the number of accidents due to 'surprise effects' from sudden local changes in weather (e.g.: onset of ice and rain) resulting in low friction and hence skidding.
- Increasing drivers' attention to low road friction by only a few percent may result in a significantly higher reduction of accident rates due to its non-linear relationship.
- To reach these objectives Europe’s most advanced driving simulator will be used to optimise for driver responses to new types of information.

Traffic and safety monitoring

- A combination of different sensor data (infrastructure or in-vehicle based, weather, surface, etc.) will enable the estimations of entirely new real-time safety parameters and performance indicators to be used in traffic monitoring and early warning systems. This will result in a significant increase of traffic flow, decreased journey times and prevention of accidents, e.g. rear end collisions.

Intelligent pavement and intelligent vehicles

- Innovative use and combination of new and existing sensor technologies in pavements and bridges in order to prevent accidents, enhance traffic flows and significantly extend the lifetimes of existing infrastructure.
- A prolonged lifetime of high capacity roads could thus be obtained using novel methods for early warning detection of deterioration and damage of road surfaces.

Clustering and dissemination of results

- A synergistic clustering action led by FEHRL (Forum of European National Highway Research Laboratories) integrated results and shaped current and emerging practice with other national and international projects using the extensive network of the FEHRL institutes.
- Dissemination of results to users at a pan-European level was given a high priority in the project. This led to guidelines and implementation strategies for Intell.

Methodology:

The INTRO project focused on applying and combining existing and new sensor technologies in a holistic way in order to significantly increase capacity and safety as well as improving the well-being of road users.

Accordingly, the activities in INTRO are divided into six work packages, which are complementary and necessary in order to attain the project objectives:

Work package 1 Intelligent road systems: Current knowledge and implementation strategies
Work package 2 Novel methods of surface safety monitoring
Work package 3 Pavement conditions from intelligent pavements and intelligent vehicles
Work package 4 Traffic and safety monitoring
Work package 5 Clustering, dissemination and implementation
Work package 6 Management

WP1 sought to consolidate the current knowledge and needs for intelligent roads related to safety and capacity improvements in technical Work Packages 2-4 as well as assessing the implementation potential of project results.

Technical work packages 2-4, employed different research strategies, using problem driven innovative technological concepts combined with pilot tests in order to provide a holistic way to solve problems identified.

WP 5 provided a strong connection to WP1-4 seeking to disseminate the results of the project and explore future visions, with special regards for the needs of the project network.

Parent Programmes:
FP6-SUSTDEV-3 - Global Change and Ecosystems

Institute type: Public institution
Institute name: European Commission
Funding type: Public (EU)
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Key Results:

INTRO developed a new method for estimating travel time from unidentified probe vehicle data. The results based on simulated data showed that the method generally performs better compared to existing piecewise constant vehicle profile method. Results for identified probe vehicle method,
validated against Automatic Vehicle Identification data, showed that the mean error for speed estimated is low (5.1 – 5.8 km/h).

Data fusion is an appealing data processing technique to take into account data qualities and imperfections of each source. INTRO demonstrated that the fusion of traffic loop data and toll collection data, improves both the accuracy and the robustness of travel time estimation.

Weather conditions influence how drivers behave. INTRO research showed, free flow speed decreases during rain and snow conditionson Polish roads. However, speed difference on Swiss motorways during fine and inclement weather is relatively small. One reason could be the quality of the road. It also raised the question whether Swiss drivers keep sufficient safe distance during inclement weather.

INTRO driving simulator study of fog showed that drivers' time headway when following a vehicle at 30m visibility is less than when the visibility is 60m. One of the reasons is that drivers are looking for a visual frame i.e. the tail light of the lead vehicle, and at 30m visibility it means that following vehicles are driving too close.

**Technical Implications**

If a system could monitor traffic risk and inform drivers to the appropriate action to take, it would reduce accidents and road fatalities. INTRO has developed safety indicators for monitoring traffic risk and preliminary results on the sensitivity of the safety indicators using field data have been encouraging.

Documents:

- [FINAL SUMMARY REPORT (Other relevant documents)]

**STRIA Roadmaps:** Infrastructure

**Transport mode:** Road transport

**Transport sectors:** Passenger transport, Freight transport

**Transport policies:** Safety/Security, Digitalisation

**Geo-spatial type:** Other