



SARI: HOW TO INFORM DRIVERS AND ROAD MANAGERS MORE EFFICIENTLY ABOUT HIGH LEVEL RISK OF VEHICLE LOSS OF CONTROL

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ABSTRACT

The SARI project, whose objectives are supported by the PREDIT¹ programme, aims to bring about a significant reduction in the number of loss-of-control accidents by providing drivers with better information about the driving difficulties they will have to confront.

The project essentially targets secondary roads, as the behaviour of drivers on such roads is mainly determined by the road itself rather than by other drivers. Some of the characteristics of these roads should lead drivers to modify the way they drive in order hazards.

The objective is to relate a level of risk of loss of control to the characteristics of the road in order to identify information that helps drivers move from the situation of normal attention to one of increased attention and lead them to modify their behaviour.

THE PROBLEMS, STAKES AND OBJECTIVES

Problems

Accidents on French rural roads were responsible for about 4,000 deaths in 2004, i.e. 68% of all road deaths. Many of these accidents involved drivers leaving the road. The fatal accident risk on rural roads is between 4 and 6 times higher than on motorways. The types of hazard present on rural roads have been identified. More than 80% of accidents on rural roads belong to the following categories: single vehicle accidents; head-on collisions; and collisions at intersections.

These types of accidents are directly linked to the control of trajectory². Driver behaviour always plays a role, however driver behaviour is partly determined by the characteristics of the road which may either trigger an accident or increase its severity.

Road safety can be improved in a number of ways; the road itself can be upgraded (road markings, traffic signs, change of layout, etc.) as can its immediate environment (installation of safety barriers, removal of obstacles, etc.). Pavement maintenance, traffic management and travel aid can also make a contribution.

Providing drivers with better information about the state of the road and the difficulties that might arise from this is also a solution. It may provide a means of optimizing road improvements if as a result trajectory is effectively controlled.

Stakes

The SARI programme aims to reduce the number of accidents by warning drivers of a real difficulty that is approaching and which is difficult to perceive and by providing information that will help them adapt their driving in accordance to the difficulty.

The programme essentially targets drivers who are not adequately aware of the risks they are taking and drivers whose behaviours differ from those anticipated by the road manager.

¹ PREDIT: Programme français de Recherche, d'Expérimentation et D'Innovation dans les Transports terrestres

² Trajectory: this consists of the positions occupied by the vehicle with respect to the road and its temporal derivatives (speed, acceleration and jerk)

Subsequent to the trials that have been conducted it should be possible, by observing vehicle trajectories, to quantify the manner in which design characteristics modify driver behaviours. From the economic standpoint, the costs and benefits associated with the introduction of information systems must be compatible with rural road maintenance and improvement budgets.

Road managers will be responsible for implementing the road information and its reliability and updating. This aspect will be analyzed in order to determine the main problems involved.

Objectives

It has been decided that the SARI project will deal with the difficulties associated with:

1. Physical discontinuities in the road which cause vehicles to accelerate (or decelerate) rapidly³;
2. Discontinuities in road visibility and comprehensibility, which may be made more serious if other vehicles are present (intersections, etc.);
3. Deterioration caused by wind and rain.

For each of the above difficulties SARI should:

- extend our knowledge about the behaviour of drivers and their vehicles with regard to the difficulties encountered on the road;
- develop techniques for identifying and characterizing these difficulties (test vehicles)
- identify new types of information which can be provided to drivers so as to warn them about the hazardous nature of the driving situation;
- evaluate, by means of full-scale trials, the effectiveness of the information and the media used to transmit them, in particular how it influences driver behaviours.

RESEARCH THEMES

For each of the difficulties covered by the SARI project, a team has been set up which has organized itself to achieve the objectives of the project. Two teams started their work at the beginning of 2005 (RADARR and IRCAD), the third team started one year later. (VIZIR).

In addition, another team has also been created to ensure methodological consistency between the three themes covered by the project and examine the issue of acceptability to drivers and road managers (AJISE).

“Physical discontinuities on the road”

The work for the theme known as RADARR “Research into Attributes for Advanced Diagnosis of Road Discontinuity” involves the implementation of a system of information along road routes in order to warn drivers of a risk that they may lose control of their vehicle. The risk in question is due to a physical disruption of the route on a secondary road.

Initially, the most extreme trajectories of vehicles is being identified and quantified for bends that have been ranked according to their level of danger. A new video tool is being developed for this purpose and the images that are recorded will be analyzed to extract the vehicle trajectories. This tool is being tried on one more sites to be selected on the basis of their road characteristics.

In a second phase, vehicles which are instrumented to enable their dynamic stresses and control operations to be recorded will run on the same sites. A level of accident risk is being established on the basis of an analysis of their trajectories and a comparison with the extreme trajectories.

³ Discontinuity: when conditions change from normal to degraded either suddenly or imperceptibly

“Discontinuities resulting from poor weather”

The theme IRCAD (Informing Road users about the Risk of Discontinuity in the Route due to poor weather) complements the previous one and deals with the risk of a sudden deterioration of skid resistance as a result of rain which may be aggravated by wind.

Devices that are able to assess the level of risk on a route is being produced in an initial research and development phase. The information systems to be installed will depend on these devices. Two functions will be developed:

- The detection of zones with poor skid resistance;
- Evaluation of the risk of vehicle loss of control.

“Discontinuities in the legibility of the environment” and “Information about the presence of other road users”

VIZIR aims to investigate road visibility along routes, and in addition three types of visual risk associated with interurban road situations: intersections and summits on a straight road. The work programme has been devised in order to develop a methodology and diagnosis tools that can be used for a road route, in order to propose a set of solutions that can reduce the danger at potentially accident-causing locations. The objective of these tools is to describe the visual perception provided by a road environment with reference to three aspects: first, in terms of visibility/legibility of the environment, second in terms of the trajectories that are generated (for vehicles), and last in terms of analysis of the road scene upstream of a difficulty.

AJISE : Utility of information and acceptability to road users and managers

The objectives of this cross-cutting topic are:

- to evaluate the acceptability of the solutions proposed by the three other SARI themes as a function of their respective aims; acceptability in legal terms, and to individuals and society and from the economic standpoint.
- in order to permit this to specify experimental methods for application in the field.

CONCLUSIONS

The SARI project, which was launched at the beginning of 2005, should be an important stage in the contribution of roads to road safety.

SARI is an important stage for our understanding of the influence of roads on driver behaviour. The conduct and analysis of vehicle trajectories at experimental sites will permit researchers in human and social sciences to better evaluate the way drivers take account of the information they receive.

Obviously, the nature and content of the message that is delivered will also be evaluated. The comparison between the results obtained from the SARI project and what is already known and what will be learnt from the SAFEMAP project in which in-vehicle information is provided should be interesting and innovative. New prospects for road signing should be opened up.

SARI is opening the way for future cooperation between the road and vehicles. The project will investigate the possibility of transmitting and displaying information in vehicles in order to warn drivers more effectively about difficulties on the road.

The collaboration and involvement of local and regional authorities in the project is vital in the context of trials that are to be conducted on secondary roads. In the longer term, the deployment of the tools and methods produced by SARI for their own needs will demonstrate the success of the project.

SARI is presented on website www.sari.prd.fr