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The French Progam La Route Automatisée

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One of the many Intelligent Transportation Systems research programs that have been launched worldwide is *La Route Automatisée*. RA aims to improve French urban and extraurban mobility. In this installation of the ITS department—written in cooperation with the IEEE Intelligent Transportation Systems Council—Jean-Marc Blosseville and Michel Parent describe their view of the future in France and how RA will change mobility there.

Upcoming articles will focus on different research programs worldwide and will describe current trends and the prospective future. For further information or to make suggestions, contact me at broggi@ce.unipr.it; www.ce.unipr.it/broggi.

—Alberto Broggi

La Route Automatisée (Road Automation) is the French public research program on driving assistance and automation. RA's goal is to study and evaluate technologies to

- improve safety, comfort, and infrastructure efficiency;
- reduce nuisances such as noise, traffic congestion, and the automobile's encroachment on living space and daily activities;
- reduce ecological damage such as air, soil, and water pollution; and
- provide transportation for all.

RA's main support comes from three government organizations: Inrets (Institut National de Recherche sur les Transports et leur Sécurité, www.inrets.fr), Inria (Institut National de Recherche en Informatique et Automatique, www.inria.fr), and the LCPC (Laboratoire Central des Ponts et Chaussées, www.lcpc.fr). Major assistance comes from three top-level engineering schools: Ecole des Mines de Paris, Ecole Nationale des Ponts et Chaussées, and Ecole Nationale Supérieure des Télécommunications. To carry out RA research, these organizations founded the LaRA consortium (www.lara.prd.fr) in 1997. However, most LaRA members have been involved separately in driving-automation programs, such as Prometheus, since the mid '80s.

Because the consortium primarily involves public institutes, most of its operation is publicly funded. However, the consortium has received grants for various programs from agencies from other European Union countries and from the European Union and is working with a number of major corporations. For example, the latest of these programs, Carsense, started in January 2000 and is funded by the European Union as part of the IST (Information Society Technologies) program. Besides the LaRA consortium, Carsense involves three car manufacturers (BMW, Fiat, and Renault) and five component manufacturers (Thomson, Autocruise, TRW, IBEO, and Daimler-Jena). The program investigates sensor fusion in vehicles for low-speed driving automation (such as in stop-and-go traffic).

Up to now, LaRA has used a scenario approach to organize its research. This approach aims to determine typical configurations that justify the introduction of RA technology, taking into account user needs and environmental constraints. To develop the scenarios, LaRA used a methodology based on functional system analysis (see Figure 1). The consortium attempted to identify common elements among the scenarios to minimize the number of functions to develop. In this article, we discuss the top two levels of our methodology: context and scenarios.

The context

The French road network is large (approximately one million km), and only a small proportion of it (12,000 km) consists of superhighways. It is less safe than the networks of other European countries. In France, traffic accidents are a major problem, inflicting an annual cost of 20 billion Euros (over US$22 billion). Most casualties occur on rural roads. However, the severity of accidents involving trucks on superhighways is a major concern.

Other traffic problems are concentrated in sprawling conurbations. City centers no longer have a monopoly on business and industrial activities. These activities are becoming dispersed—less, however, than housing. This decentralization is occurring in varying degrees in all countries; for example, the US is ahead of Europe, while in Spain urban sprawl is less important than in France. In France, decentralization affects greater Paris much more than any other major city.

People use their cars much more than public transportation. Driving distances are increasing (+40% in 12 years), and the types of origins and destinations are diversifying (for example, malls, gyms, schools, and friends' homes). Trips within town centers are decreasing, and trips in outer zones are increasing considerably. Congestion occurs mainly in these suburban areas. Other areas of concern are pollution, nuisances, and the future of public transportation, mainly because of reduced use and funding problems.

There are other topics for which no consensus exists regarding their importance or solution: the future of town centers; the

reduced mobility of disadvantaged groups such as the elderly, handicapped, or poor; and the role of infrastructures in economic development.

Scenarios

In response to these considerations, LaRA has identified four scenarios. Scenarios A and B aim to increase safety on rural roads and medium- and long-distance superhighways. C and D aim to substantially improve overall capacity, safety, air quality, and public transportation.

Scenario A: Improving safety on rural roads. National and local roads in rural areas account for a little less than half the length of the French network but approximately 70% of all accidents. Because of this network's length and the traffic's diversity, full automation is not possible; RA can consider only functions that improve safety. Initial research has concentrated on designing an information aid that helps drivers control their speed and direction. This information aid could later evolve toward a fully automated system.

Scenario B: Automated trucking on medium- and long-distance superhighways. Superhighways should be extremely safe at all locations and times. However, increasingly fast and heterogeneous traffic causes multiple collisions. Some of these are very severe and attract much media attention. Because heavy trucks cause many serious accidents, light-vehicle drivers are becoming increasingly intolerant of them. This situation applies particularly to the French North–South superhighway axis and to some orbital roads around conurbations.

So, this scenario has three main objectives:

- Reduce superhighway accidents, particularly those involving heavy trucks.
- Reduce the duration and variability of travel time by increasing and controlling traffic flow. This can economically justify automation costs.
- Improve road-transport productivity.

(Some lesser but still important objectives are to reduce pollution and nuisances, particularly on urban and mountainous roads.)

One possible part of a solution is to provide separated automated lanes for trucks when widening the road. Trucks could then drive at higher speeds and in platoons.

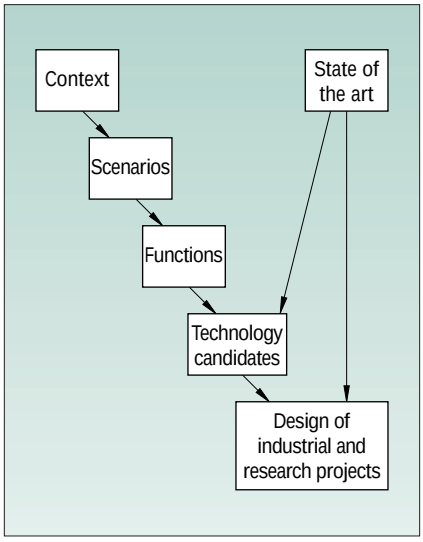

Figure. 1. The methodology, based on functional system analysis, that LaRA used to develop scenarios.

Scenario C: Mobility in conurbations. The outer zones of conurbations are increasingly encountering congestion, accidents, air pollution, and ineffective public transportation. RA would facilitate journeys within these areas. RA research would concentrate on the outer rings of conurbations (the circular highways around cities): although these are non-dense areas, they carry a rapidly increasing amount of traffic. The goals would be to supply new transport types that add capacity, to reduce and guarantee travel times, to reduce accident causes, and to reduce air pollution.

Moreover, RA could provide a solution for public transportation in parts of those outer zones where mass transit is unsuitable. Public-transportation vehicles would retain the familiar advantages of automobiles: flexibility, comfort, and door-to-door service.

Scenario D: Automatic shuttles in urban sites. This last scenario employs public vehicles to improve personal mobility in urban environments. In particular, it considers two applications of low-speed automation: local access to mass-transportation systems and travel in dense urban centers.

Local access to mass-transportation systems. In the outer zones of conurbations, journeys to and from subway and train stations are often long and inconvenient. They usually require private cars, and parking at the station can be difficult. Such disadvantages decrease public transportation's attractiveness and use. RA's objective here is to provide easy access between a station and the origin or final destination, at distances of a few hundred meters to several kilometers. In other words, RA wants to encourage the use of urban mass transportation by avoiding the need to use private cars. Increased mass-transportation use will reduce traffic congestion, air pollution, and land use.

One solution is to use a few automated public vehicles that take people to or from stations, alleviating parking problems. Such a solution has operated since early 1999 in a suburb of Rotterdam, The Netherlands. ParkShuttle automated vehicles from Frog Navigation Systems (www.frog.nl) take passengers between a public-transportation station and a business park.

Such an application could supply service similar to or even better than private cars, in terms of simplicity of control and parking ease. Moreover, public vehicles could be designed to minimize their negative impact on the environment and land use.

Travel in dense urban centers. Small vehicles designed for urban centers (for example, the CyCab—see www-lara.inria.fr/cycaba) could employ RA techniques to relieve traffic congestion without sacrificing mobility. Such an RA system must cover all motorized movements of people and goods. It must also encourage economic development in zones where the government wishes to minimize or prohibit the use of traditional vehicles. RA vehicles would provide good service with minimum harmful effects (design goals include small size, low speed, low or no pollution, safety, and quiet operation). Finally, the system could connect with fast mass transportation.

LaRA's analysis of these scenarios has led to these conclusions:

- RA technology has great potential for all aspects of mobility, and automation could be a good direction for improving private and public transportation (which can become more individualized).
- Designing scenarios seems a good way of proceeding toward a global strategy.
- Identifying intermediate steps is the cornerstone; low-speed automation seems to be a good idea.

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