Activities and Applications of the vehicle to vehicle and vehicle to infrastructure communication to enhance road safety

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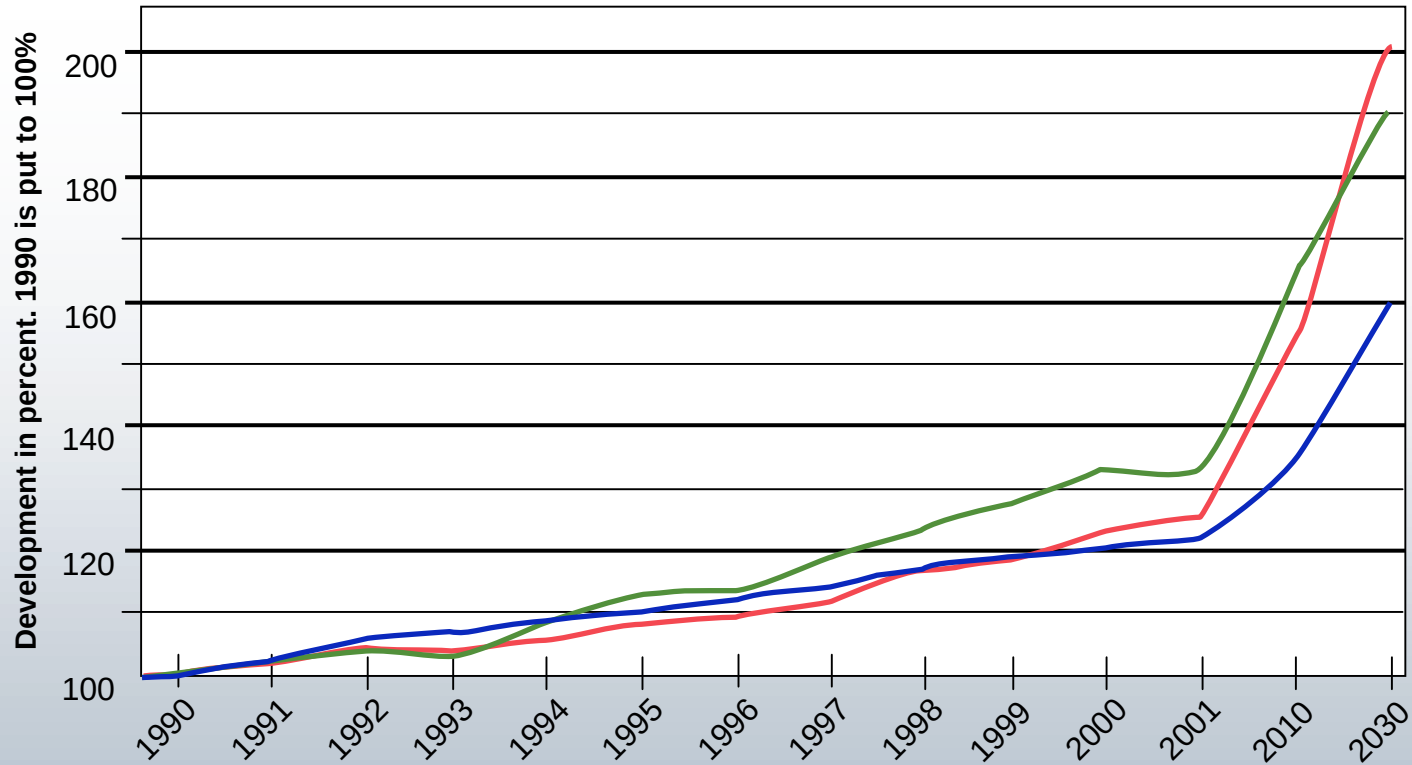
ROAD SAFETY: the dimension of the problem



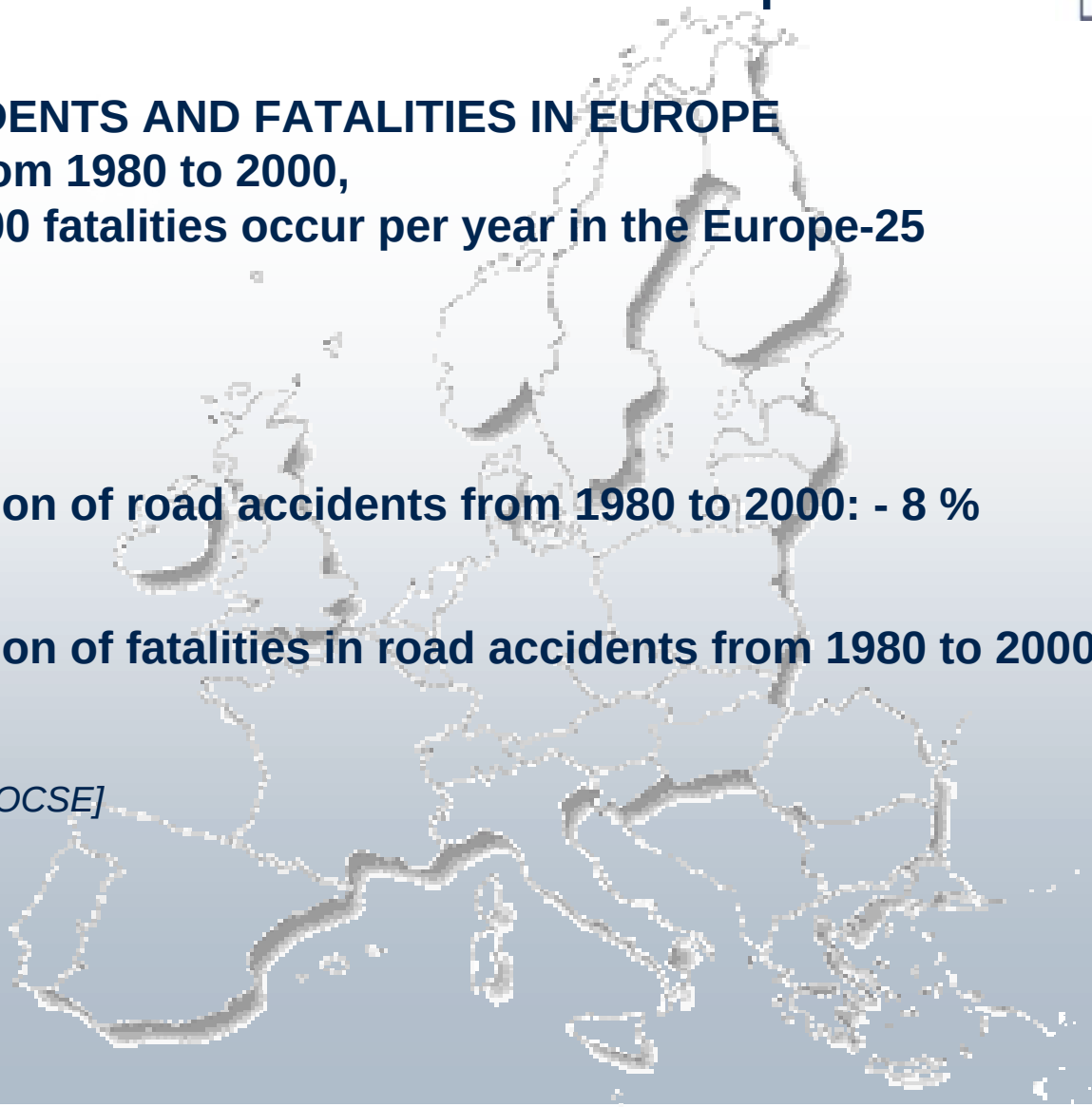
Source: 1990-2001: European Commission (EU-15), 2010,2030: DELPHI-Study (Future and Mobility)

- Economic Growth will lead to increased traffic volume
- Transport growth involves more traffic congestions

⇨ Efficiency must be improved

ROAD SAFETY: the dimension of the problem

ROAD ACCIDENTS AND FATALITIES IN EUROPE
Reduction from 1980 to 2000,
but still 50.000 fatalities occur per year in the Europe-25



- **Reduction of road accidents from 1980 to 2000: - 8 %**
- **Reduction of fatalities in road accidents from 1980 to 2000: - 39%**

[Source IRTAD-OCSE]

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ROAD SAFETY: the applications

Situations calling for more Information

What happened?

What's behind the bend?

Virtual Caravan

ROAD SAFETY: the technologies

Radar, laser scanner, ultrasonic or vision based systems support current safety and comfort applications such as

- Adaptive Cruise Control
- Parking Assistance
- Lane-keeping applications

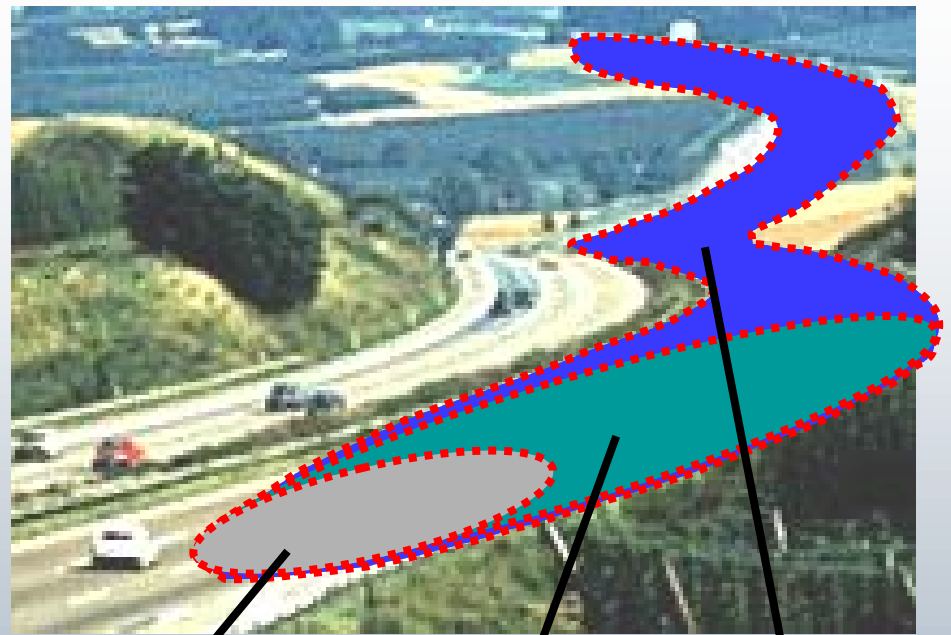
Usual sensors have disadvantages, they …

- Sense only close vehicles in the line of sight
- Don’t detect hidden and unrecognised relevant objects
- Are expensive

Extending the Driver´s Horizon:

- **look further ahead in distance**
- **get information earlier**
- **extract relevant information**

⇨ **Driver is one step ahead**

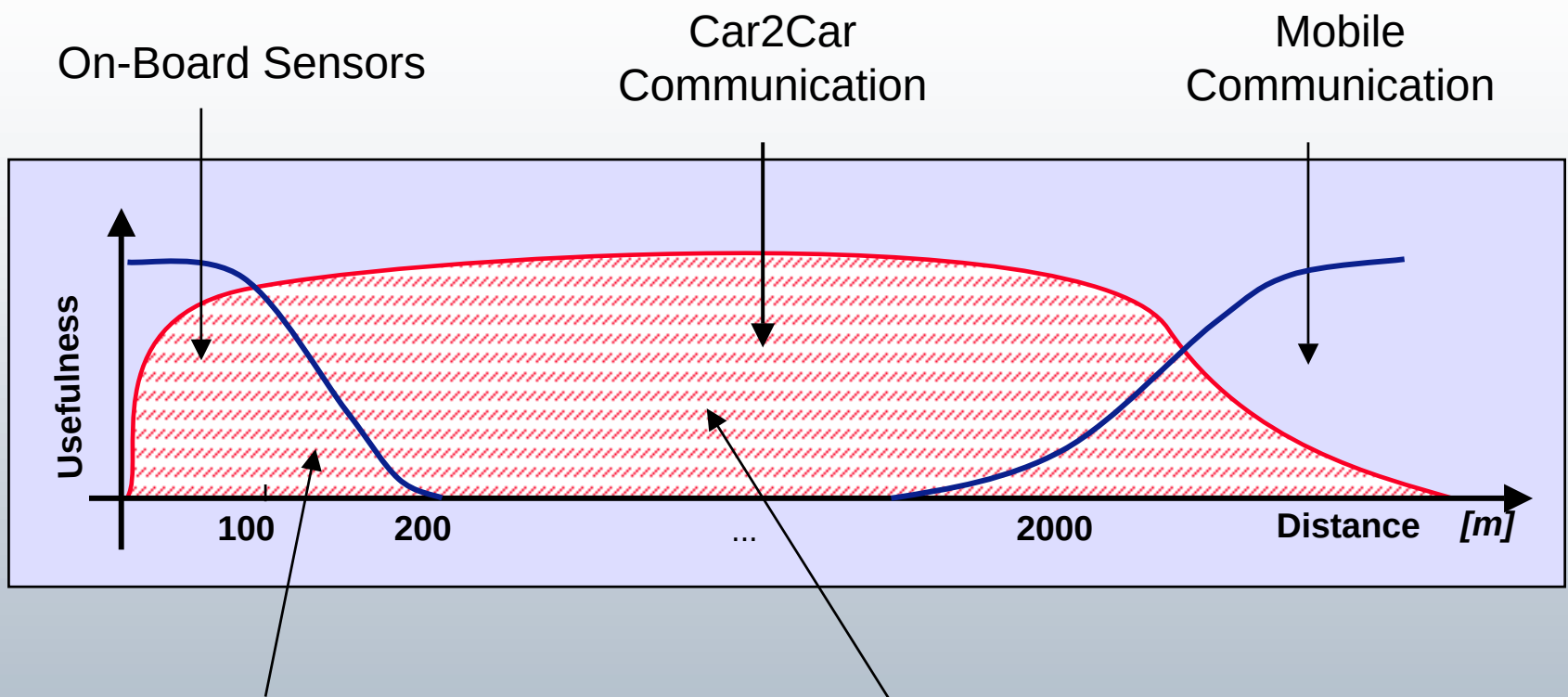


Simple sensors:
Worse than the driver

Communication:
Better than the driver

Complex sensors:
As good as the driver

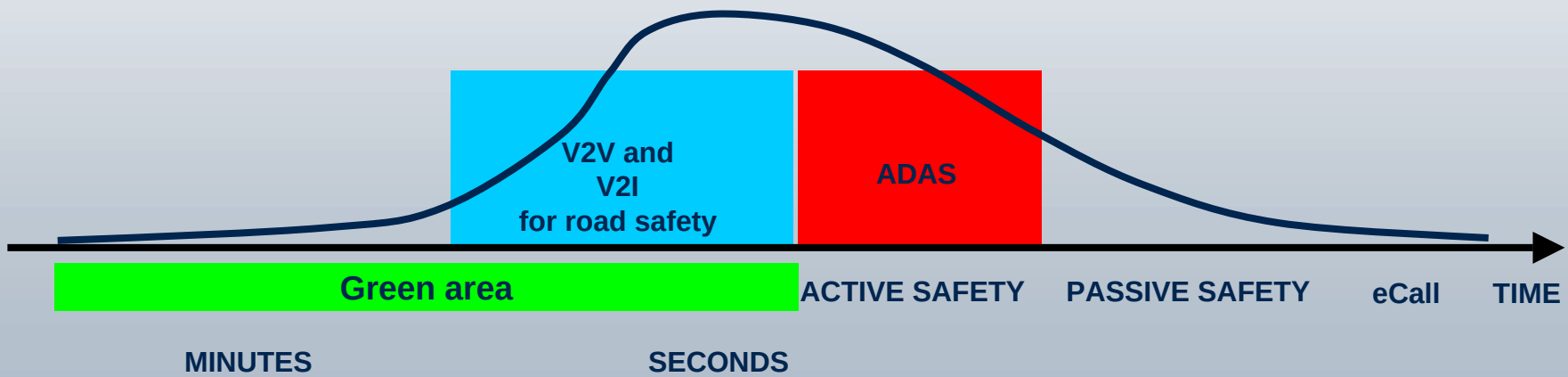
Usefulness of Car2Car Communication



ROAD SAFETY: the applications

The operability of **ADVANCED DRIVER ASSISTANCE SYSTEMS** can reach a real time “vehicle surrounding situation awareness”, but cannot cover all scenarios.
The step beyond is the extended coverage (in space and time) that can be offered by a net of cooperating vehicles and by the infrastructure to offer a complete coverage of all different potential dangerous situations and:

“to extend the time available for drivers to select and undertake the proper manoeuvre in case of a potential danger”



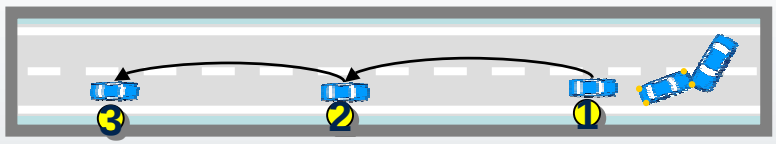
IMPACT ON ACCIDENT REDUCTION

ROAD SAFETY: C2C applications

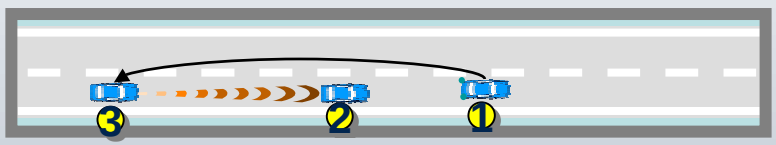
Vehicle to Vehicle Communication
the CarTALK 2000 project

(funded by the European Commission within the 5th Framework Programme)

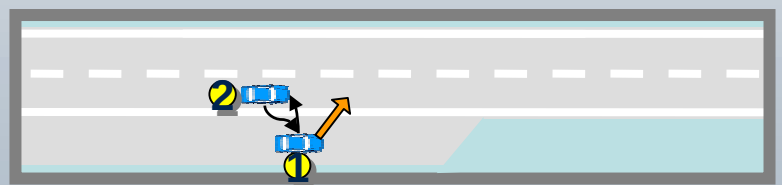
Information and warning functions

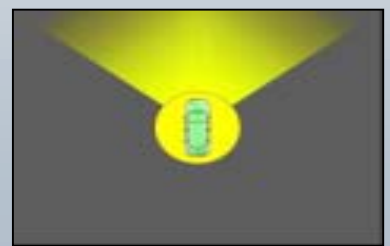


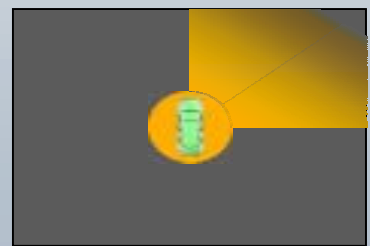
Communication-based longitudinal control



Cooperative driver assistance







Project Partners

DaimlerChrysler, Centro Ricerche FIAT, Siemens, Robert Bosch GmbH, TNO, Uni. Köln, Uni. Stuttgart

ROAD SAFETY: V2V-I applications

The **COOPERATIVE DRIVING APPLICATIONS** for road safety are characterized by a complete reconstruction of the driving context and road environment using in combination on-board sensors data and cooperative system information (ad-hoc vehicles net).

Typical **related driving scenarios** are:

- overtaking and lane changing assistance
- frontal collision prevention
- rear-end collision prevention in critical road segments (e.g. in tunnels)
- lateral collision prevention in a black spot (e.g. a junction)
- road departure prevention in a black spot
- signalling of static obstacles in a black spot like road work
- prevention of collisions with vulnerable users
- hazard and accident warning
- safe urban intersection
- speed alert and road departure prevention in curves

ROAD SAFETY: V2V-I Enabling Technologies

The **COOPERATIVE DRIVING APPLICATIONS** main building blocks:

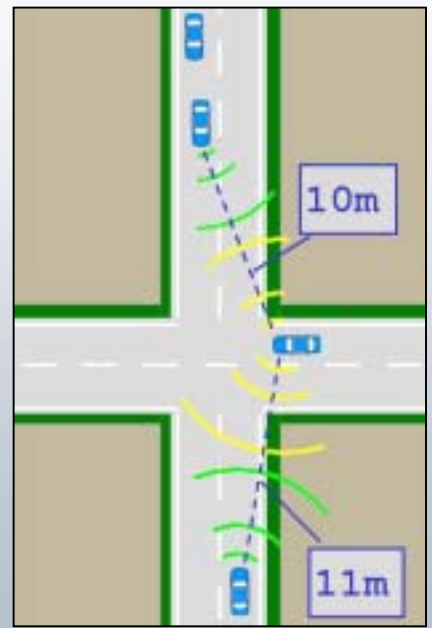
- ✓ the vehicle and the infrastructure as “sensors”
- ✓ the architecture and the **enabling technologies** for:

ad hoc dynamic vehicle-vehicle-infrastructure network

- development of flexible, dynamic data transmission protocols
- data security, anonymity and integrity issues
- routing, multihop forwarding and geo-cast techniques in vehicular ad hoc networks
- geographical addressing mechanisms

co-operative relative localisation

- relative vehicle localisation via ad hoc network
- GNSS-based relative vehicle localisation
- vehicle localisation via landmarks registered in digital maps



C2C Communication Consortium
Mission and Objectives

- to create and **establish an open European industry standard for Car2Car** communication systems based on wireless LAN components and to **guarantee European-wide inter-vehicle operability**
- to enable the development of active safety applications by specifying, prototyping and demonstrating the Car2Car system
- to promote the allocation of a royalty free European wide exclusive frequency band for Car2Car applications
- to push the harmonisation of Car2Car Communication standards worldwide
- to develop realistic deployment strategies and business models to speed-up the market penetration

C2C Communication Consortium
Working group on standardization activities

- Preparation of the communication standard based on the specifications of the Working Groups
- Observation of current standardisation activities and existing standards
- Presentation of the project results to the European standardisation bodies
- Proposals and negotiations for possible frequencies in contact with CEPT etc.

ROAD SAFETY: benefits for all actors

Drivers will drive vehicles equipped with more “robust” driving assistance systems thanks to dynamic information about the traffic, the road and the environmental conditions from the vehicle net and from the infrastructure.

Car makers will open new market opportunities offering on the market new functions for safer vehicles at sustainable costs as the “intelligence” will be distributed. The level of complexity of vehicles will be decreased, compared to autonomous solutions.

Suppliers will meet the challenge of new market opportunities being ready to offer fully developed technical solutions and actively driving the evolution in terms of concept generation, and standardisation.

Road operators and public authorities will improve road safety on motorways and urban roads via a combination of infrastructure and vehicle systems that will collect and transmit in real time traffic/weather and accident information to all road users and to traffic information centres.

REFERENCE

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