Cooperative systems for road safety
Smart Vehicles on Smart Roads
the SAFESPOT Integrated Project

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Background on cooperative systems for a safe and efficient mobility

... Need to cooperate at European level to improve road safety and traffic efficiency.

years 2002 - 2004
- Car2Car Communication Consortium was born to promote the allocation of a dedicated frequency band for inter-vehicle communication.
- The European Commission Information Society and Media opened the call for proposal FP6-ICT-Call4 on cooperative systems.
- The European Council for Automotive R&D settled the Integrated Safety Program Board to support efficient and complementary research activities.

years 2006-2008
- The SAFESPOT IP, co-funded by the EC INFSO, supported by EUCAR, started in parallel to the CVIS and COOPERS IPs.
- SAFESPOT & C2C signed a Letter of Intent for cooperation.
Cooperative Systems for road safety
“Smart vehicles on smart roads”
Detection in advance of potentially dangerous situations
to extend in space and time drivers’ awareness of the surroundings.

Consortium
52 partners from 12 European countries
• OEMs (cars, trucks, motorcycles)
• ROAD OPERATORS
• SUPPLIERS
• RESEARCH INSTITUTES
• UNIVERSITIES

Time Plan
2006-2010
The SAFESPOT Enabling technologies: Vehicle ad hoc Dynamic Network

Ad-hoc Dynamic Communication Network for information exchange

At a network level in Europe, C2C and SAFESPOT analysed and experimented protocols to provide a basic periodic message:

Cooperative Awareness Message (CAM)

CAM includes dynamic key parameters, it is broadcast every 500 ms by any node within the network, including the roadside units (RSU).

Messages are also GEO-AWARE ADDRESSING and MULTIHOPPING.

The selected radio technology is IEEE 802.11p.

SAFESPOT generated a complete set of messages as an extension of existing C2C messages.
Local dynamic maps

Evolution of the standard navigation maps to include and update in real time all safety related information on the traffic and on the environment. The information are acquired from vehicle and road infrastructure sensing platforms and are exchanged via the ad-hoc dynamic network.
The SAFESPOT Enabling Technologies: Relative Positioning

Relative Positioning among vehicles

High accuracy (0.5 m) for the exchange of **SAFETY TIME CRITICAL MSG**: SAFESPOT integrates data from different sources: road data from GPS, road landmark recognition and dead reckoning.

Most promising technique is based on dual-frequency satellite receivers combined with high-performance inertial platforms, technologies that are already available.

The challenge will be in optimisation, bringing down costs until they are comparable with the current GPS.
The SAFESPOT Scenario

The node’s platforms generate, store and exchange information about safety critical events.

- Truck hard braking ahead!
- Slippery road ahead!
- Tilted motorbike on lane ahead!
- Red light runner crossing from the right!
- Red light runner crossing from the left!

Environmental perception
- Wireless short range communication
- Vehicle dynamics control
- Wired or wireless infrastructure network
- Vehicle equipped with SAFESPROBE platform
- Non-equipped vehicle

CAR 2 CAR FORUM 2009
the European Approach
The SAFESPOT Integrated Project
The SAFESPOT Applications

SAFESPOT developed reference applications for road safety based on vehicle to vehicle and to infrastructure communications

- safety distance and speed advice
- wrong way driver detection
- obstacle detection and frontal collision prevention
- rear end collision prevention
- safe overtaking & lane change assistance
- road departure prevention
- dangerous curve warning
- vulnerable road user detection
- incident detection and warning
- warning of reduced visibility
- safety margin for emergency vehicles
- intersection collision prevention
The SAFESPOT Test Sites
The SAFESPOT Italian Site

Locations

Torino-Caselle Airport Expressway

Brescia-Padova Motorway

FIAT Centro Sicurezza Test Track
The SAFESPOIT Italian Site

Road Side Equipment

Wireless node 1

Wireless Node n

WSN GW

MAIN PC

GPS

VANET ROUTER

TRAFFIC INFO

ROAD OPERATOR CONTROL CENTRE

REMOTE MANAGEMENT

INTERNET
The SAFESPO T West Test Side

Locations

CG 22 rural roads in Brittany: RD8, RD786

Satory and La Valbonne closed test tracks

Technological park in Valladolid

Cofiroute A85 motorway close to Saumur
The SAFESPOT West Test Side

Components

On-Board Units
The SAFESPOT Swedish Test Site

Locations

Gothenburg Test Site Area

Lundby Tunnel

Storaholm Closed Test Track

Urban Area - Lindholmen
The SAFESPOT Swedish Test Site

Components

Test Site Vehicles

RSU:s
The SAFESPOT Swedish Test Site

Applications

- Frontal collision warning
- Road condition status
- Vulnerable road user detection
- Speed limitation and safety distance
The SAFESPOT Dutch Test Site

Locations

N629-Rural Road, Informative Road

Helmond-Urban Intersection

A16-Motorway
The SAFESPOT Dutch Test Site

Vehicles and Road side equipment
The SAFESPOT Dutch Test Site

Applications

- Lane change manoeuvre
- Intersection safety application
- Speed alert
- Static obstacles detection
- Abnormal road conditions
The SAFESPOT German Test Site

Locations

Intersection 61
Hamburger Str. / Gerichtsstr.
in Dortmund, Germany
The SAFESPOT German Test Site

Infrastructure (site plan)

Vehicle (Smart)
The SAFESPOT German Test Site

Applications

- IRIS - Red light violation
- IRIS - Right turn
- IRIS - Left turn
- IRIS - Emergency vehicle
- IRIS - Remaining green time
The SAFESPOT Integrated Project Perspectives activities towards future deployment of project outcomes

- Definition of sustainable business and service models of SAFESPOT functions for all stakeholders
- Identification of major enabling and disabling factors for future deployment
- Cost benefit analysis & estimation of the impact on traffic safety
CONCLUSIONS

Establishing a common architecture for cooperative systems

SAFESPOET is in the task force led by COMeSafety in cooperation with CVIS, SEVECOM, COOPERS, PRE-DRIVE C2X projects to establish a “Common “European ITS Communication Architecture”.

SAFESPOET implements a local high speed ad hoc network, as defined by C2C-CC, based on the IEEE.802.11p protocol.

SAFESPOET generated a complete set of messages (as an extension of existing C2C messages) that is offered as contribution to C2C and ETSI standardization processes.

The SAFESPOET IP, together with CVIS and COOPERS IPs will present its outcomes in the Showcase 2010 (Amsterdam, March 2010).
REFERENCES

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