Cooperative Systems’ applications to improve Road Safety: the WATCH-OVER project

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OUTLINE

- The WATCH-OVER European project
- Requirements for the communication technology
- Vehicle to VRU cooperative system from OEMs’ point of view
- VRU to vehicle cooperative system from PTWs’ point of view
Design and development of a cooperative system based on communication and vision sensor technologies for the prevention of accidents involving vulnerable road users in urban and extra-urban areas.

**PROTECTOR** European project: selected the most promising sensor technology (among radar, vision, infrared)

**SAVE-U** European project: developed the first detection system vision based

**WATCH-OVER** European project: is developing a VRU detection system based on a new generation of CMOS cameras and on communication technology.
WATCH-OVER consortium

Project co-funded by the European Commission Information Society and Media and promoted by EUCAR.

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<th>COMPANY</th>
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<td>Centro Ricerche FIAT</td>
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<td>DaimlerChrysler AG</td>
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<td>Piaggio &amp; C. S.p.A.</td>
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<td>Robert Bosch GmbH</td>
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<td>MIRA Limited</td>
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WATCH-OVER activities

- Definition of the relevant scenarios of use and of user requirements (April 2006)
- Specification of system architecture (June 2007)
- Development and validation of the systems components (February 2008)
- Cooperative system integration and validation (December 2008)
WATCH-OVER requirements for the communication technology

- low cost: acceptable cost for a wearable device as vehicles, motorcycles, bicycles and pedestrians should be enabled to communicate with each other
- low complexity of the communication protocol
- low power consumption
- precise distance measurement
- high reliability of the signal recognition objects should be unambiguously identified
IEEE.802.11p radio technology with the following main characteristics (in respect to WATCH-OVER):

- not affordable cost for devices to be used by vulnerable users
- high complexity of the communication protocol (this characteristic is not problematic to be used for WATCH-OVER)
- not affordable power consumption for devices to be used by vulnerable users
- no precise distance measurement (should be integrated with positioning systems)
- high reliability of the signal recognition (as for WATCH-OVER, network nodes should be unambiguously identified)

*Note: need for a dedicated frequency band*
IEEE802.15.4a Chirp Spread Spectrum Transmission rates four times higher than WI-FI, halving power consumption:

- low power consumption, low cost
- precise distance measurement
- high reliability of signal recognition

In the project Robert Bosch GmbH develops a second generation automotive high-dynamic CMOS multi-purpose camera.
### WATCH-OVER system human machine interface

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<th>Variable</th>
<th>Description</th>
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<tr>
<td>Position X</td>
<td>VRU longitudinal position relative to car coordinate system</td>
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<tr>
<td>Position Y</td>
<td>VRU transversal position relative to car coordinate system</td>
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<td>Object Image Height</td>
<td>Height of the detected VRU</td>
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<tr>
<td>Classification</td>
<td>VRU type: PTW or pedestrian</td>
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<td>Time to collision</td>
<td>Time To Collision</td>
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<tr>
<td>Risk Level</td>
<td>0: no risk, 1: avoidable collision, 2: unavoidable collision</td>
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Both pre-crash and warning strategies are under definition.

The HMI strategies are under investigations in simulated scenarios (MIRA test track and Uni. Stuttgart driving simulator).
OEMs’ view on cooperative systems for vulnerable road users (VRU)

- UWB communication technology for VRU detection
- 802.11p communication technology for V2V & V2I multi-hop

on cars:
- vision & communication detection system for pedestrians and PTWs
- and
- C2C&CALM platform for information propagation
Mid term:

- Interesting results are expected from WATCH-OVER project in terms of exploitation for PTW market

Long Term:

- V2V-V2I communication system as a common platform suitable also for PTWs (e.g. Piaggio via SAFESPOT)
- Be part of V2V communication architecture and protocol design in order to ensure compatibility and standardisation for PTW application (all PTW manufacturers via C2C CC)
- Make V2V commercially available on PTW in order to achieve improved PTW safety which can only be achieved through active cooperation with the car sector
REFERENCE

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