BMWi Funded Project Ko-PER
Compendium and Digest

BMWi Förderprojekt Ko-PER
Leitfaden und Übersicht

Dr. Reiner Wertheimer
Management & Consulting
If cars could only talk to each other...

In 2007 and 2008 when I campaigned for a joint project “Coop-PER” and devised its basic ingredients in cooperation with very few key partners, I could hardly forebode that

as of March 2013, Jennifer Healey, an outstanding research scientist at Intel, would give the following talk @ TED promoting the very idea of cooperative driving...

http://www.ted.com/talks/jennifer_healey_if_cars_could_talk_accidents_might_be_avoidable.html

- Jennifer Healey is concerned with affective computing and develops mobile internet devices of the future.
- “TED is a nonprofit [initiative/organization] devoted to “Ideas Worth Spreading”. It started out in 1984 as a conference bringing together people from three worlds: Technology, Entertainment, Design.”
Existing driver assistance and active safety systems (e.g. ECC/ESP, ACC and EBA), already significantly reduce the frequency of accident types in comparatively simple traffic scenarios (e.g. single vehicle driving accidents, rear-end collisions, etc.).

Hence, the relative incidence of accidents in complex traffic situations increases continuously.

Complex situations often require a virtually complete representation of the local driving environment and thus tend to overburden drivers as well as “self-sufficient” on-board vehicle perception systems.

Because of occlusions and unexpected behavior of fellow road users, human drivers (and purely intra-vehicle perception systems as well) are often caught by surprise.

Temporary inattentiveness is an added factor in case of humans.
Basic Motivation of Ko-PER (Slide II)
Major Accident Types (Germany, 2012)

Accidents with personal injuries:
total (100% = 206,696)

In town/village (68,9 %)
Rural roads w/o highways (25,1 %)
Highways (6,0 %)

Type of accident
- Turning off the road (Abbiegeunfall)
- Turning into the road/crossing (Einbiegen/Kreuzen)
- Vehicles moving along in carriageway (Längsverkehr)
- Crossing the road (Überschreitenunfall)
- Driving accident (Fahruntfall)
- Other accident (Sonstiger)
- Stationary vehicles (Ruhender Verkehr)
One Major Result of Ko-PER
Decisive Reduction of Safety-Critical Situations

Accidents with personal injuries in town/village (Germany, 2012)
Source: (German Federal Statistical Office)

<table>
<thead>
<tr>
<th>Type of accident</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Turning off the road</td>
<td>11%</td>
</tr>
<tr>
<td>Turning into the road/crossing (Einbiegen/Kreuzen)</td>
<td>13%</td>
</tr>
<tr>
<td>Vehicles moving along in carriageway (Längsverkehr)</td>
<td>21%</td>
</tr>
<tr>
<td>Crossing the road</td>
<td>26%</td>
</tr>
<tr>
<td>Moving along</td>
<td>4%</td>
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<tr>
<td>Driving accident (Fahrunfall)</td>
<td>8%</td>
</tr>
<tr>
<td>Other accident (Sonstiger)</td>
<td></td>
</tr>
<tr>
<td>Stationary vehicles (Ruhender Verkehr)</td>
<td></td>
</tr>
</tbody>
</table>

Assessment of potential benefit
Result of extensive driving simulator studies (IZVW)

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The Ko-PER “Pyramid”
Layers of Information Processing

Use Cases
- Intra-Vehicle Perception & Self-Localization
- Intersection-based Local Perception

Safety Functions
- Intra-Vehicle Perception & Self-Localization
- Inter-Vehicle (Cooperative) Perception
- Scene Interpretation
- Risk Analysis
- Driver Intention
- MMI

Use Cases
- Safety Functions
Ko-PER Building Blocks: From Sensor Data to Situation Awareness

Perception Network Intersection

In-Vehicle Perception

High Precision Self-Localization

Wireless I2V and V2V Communication

Inter-Vehicle Sensor Data Fusion / Cooperative Perception

Situation Analysis

HMI Composition / Effectiveness

Preventive Safety Functions

September 19, 2013

Ko-PER: Compendium and Digest
Mixed-Team Life-Demos as of Today
Featuring Vehicle and VRU Safety in Longitudinal and Intersection (IS) Traffic

• Team 1: Daimler, Delphi, driveU & MRM (IS)
  – V2X cooperative vehicle safety at intersections
  – 2 scenarios: left turn and crossing with occlusion

• Team 2: BMW (Ko-PER) & BMW (Ko-TAG) or MRM (IS)
  – V2V or I2V cooperative VRU safety in longitudinal and IS traffic
  – 3 scenarios: 1 VRU safety in longitudinal traffic
  – 2 VRU safety at intersections with & without Ko-TAG

• Live Demo Team 3: CSEI (car) & HSA (PED @ intersection)
  – I2V cooperative pedestrian safety at intersections
  – 1 scenario: right turn (car) with hidden pedestrian
  – Intersection recognizes pedestrian’s intention
Ko-PER is indebted to the Bundesministerium für Wirtschaft und Technologie (BMWi) for co-funding this project with about 6 mio. Euro.

Ko-PER is highly grateful to the city of Aschaffenburg and in particular to her major, Klaus Herzog, for her/his quite non-bureaucratic response to Ko-PER’s request to ‘conquer’ one of her busiest intersections.

Ko-PER thanks the University of Applied Sciences Aschaffenburg for hosting the Ko-FAS final presentation.
Now Enjoy
Live Demonstrations, Poster Sessions and Lively Discussions
given by the three funded projects

Ko-TAG, Ko-KOMP and Ko-PER

affiliated in

Project Initiative Ko-FAS