Connectivity will make motorcycling safer

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Motorcycles have great potential

- Ideal urban mobility
- Small space requirements
- Smart combination of leisure and commuting
- Favourable ecological footprint
CMC Objectives

Mission

• Make motorcycle riding safer
• Make motorcycles part of future mobility
  (C-ITS: Cooperative Intelligent Transport System)

How

• Joining forces, creating a *common* approach for motorcycle ITS
• Creating a common basic specification for components
• Having motorcycles integrated into global future ITS strategies
As a consortium…

- CMC is a non-profit-organisation (and no funding project)
- CMC has a global focus: international representations, meetings, activities
- Technical expertise is required
- No development of series components / no common development or bundled purchasing
- Final results of the project will be published
Mission: Integration of motorcycles in connected environment

ETSI has corrected slide in 2019 – motorcycles are included now!
Motivation: Motorcycle safety enhancement

Trend of car and motorcycle fatalities

USA
Europe
Japan

Source: International Traffic Safety Data and Analysis Group (IRTAD)
Reasons: Perception failures

Majority of accidents:
- Caused by other vehicle driver
  - 50 - 70 %

Main collision partner:
- Car
  - 60 – 90 %

Majority of collisions:
- Crossing/turning
  - 15 – 30 %
at intersections

Source data based on country specific studies (USA, Europe, Japan)
Human error

“*I never saw him*”

70 - 90 %
Perception failure by car driver

Digital conspicuity

MAI (Motorcycle Approach Indication)
MAW (Motorcycle Approach Warning)
Example scenario: Left turn without LTA
Example scenario: Left Turning Assistance

Investigation area
- Dresden, Germany
- Hannover, Germany

Source: Google Maps & GIDAS

Information
- Technical
- Medical
- Reconstruction

Database
- ≈ 2,000 traffic accidents with personal damage per year - since 1999 -
- Ø 3,500 single information per accident

Source: Google Maps & GIDAS
Example scenario: Left Turning Assistance

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Accident Causer</th>
<th>no. of accidents</th>
<th>%</th>
<th>no. of accidents</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left turn</td>
<td>OV</td>
<td>1.744</td>
<td>6.2%</td>
<td>1.244</td>
<td>71%</td>
</tr>
<tr>
<td>Left turn</td>
<td>PTW</td>
<td>206</td>
<td>0.7%</td>
<td>123</td>
<td>60%</td>
</tr>
</tbody>
</table>

The LTA could address:

- 1.244 accidents, if the accident causer is the Other vehicle.
- 123 accidents, if the accident causer is the PTW.

Efficiency of LTA in the scenario Left turn is over 70%!
Car solutions will not work on motorcycles

Tailor-made ITS technology needed

Design
- Limited space
- High vibrations
- Limitation on sensing parameters

No cabin
- Antenna positioning
- Exposed to elements (rain, humidity, etc.)

Dynamics
- Leaning in corners
- Steering by inertia
- High influence of rider

Localisation
- Width of motorcycle < 1 meter
- Vehicle movement
- Higher positioning accuracy needed
Motorcycle Day 1 applications

Applications

• Electric Emergency Brake Light EEBL
• Slow or Stationary Vehicle(s) Warning
• Adverse Weather Warning
• Traffic Jam Ahead Warning
• Road Works Warning
• Approaching Emergency Vehicle Warning
• Hazardous Location Warning

Issues

Deceleration behavior is different
Triggering conditions are different
Motorcycles can’t trigger this
Triggering conditions are different
No big difference to car
No big difference to car
No big difference to car
Triggering conditions based on cars but…

- Are triggers possible?

<table>
<thead>
<tr>
<th>Use case: Stationary Vehicle Warning</th>
<th>Car</th>
<th>Motorcycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard light on</td>
<td>✓</td>
<td>(✓)</td>
</tr>
<tr>
<td>Parking brake</td>
<td>✓</td>
<td>(✓)</td>
</tr>
<tr>
<td>Door open</td>
<td>✓</td>
<td>X</td>
</tr>
<tr>
<td>Trunk open</td>
<td>✓</td>
<td>X</td>
</tr>
<tr>
<td>Driver seat not occupied</td>
<td>✓</td>
<td>X</td>
</tr>
<tr>
<td>Proposal: Side stand</td>
<td>X</td>
<td>✓</td>
</tr>
</tbody>
</table>
Aren’t ‘wrong’ conditions sent?

<table>
<thead>
<tr>
<th>Use case: Traffic jam</th>
<th>Car</th>
<th>Motorcycle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Needs to stay in line</td>
<td>Can ride through</td>
</tr>
<tr>
<td></td>
<td>“I’m stopped”</td>
<td>“I’m moving”</td>
</tr>
</tbody>
</table>
• Day 1.5: Information with basic function & simple requirements for left turn and intersection

Car & motorcycle distance will be calculated. If below a critical threshold: Both drivers are informed.

If the car driver reacts (e.g. with throttle or brake): information will be canceled.

The scenario is considered until both passed the intersection safely.
Motorcycle Approach Warning (MAW)

• Day 2: Fully developed safety applications to go beyond information stage

Warnings are sent only in case of potential collision.

Car and motorcycle calculate the “time to collision” (TTC); If below a critical threshold, both drivers will be warned via their HMI.

If the car driver reacts appropriately, both warnings will be cancelled.
CMC roadmap – make motorcycle riding safe

See and Get Seen by others
- Motorcycle Approach Indication
- Intersection Movement Assist
- Forward Collision Warning

Motorcycle Approach Warning

Be Warned of the unexpected
- Emergency Electronic Brake Lights
- Adverse Weather Warning
- Road Works Warning
- Broken Down Vehicle Warning
- Left Turn Assist
- Intersection Movement Assist
- Forward Collision Warning
- Do Not Pass Warning
- Traffic Light Violation Warning

Lane Change Warning / Blind Spot Warning

Lane Change Warning / Blind Spot Warning

Ride with Less Stress
- Green Light Optimized Speed Advisory
- Fuelling & Charging Information
- Transit Signal Priority

Cooperated Driving
- Lane Merge Assistant
- Connected Automated Cruise Control

Safety benefit for motorcycles

Technical evolution – availability & reliability of data

ITS phase I
ITS phase II
ITS phase III

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Thank you for your attention