Designing cooperative interaction of automated vehicles with other road users

Anna Schieben, interACT Project Coordinator
Marc Wilbrink  Department of Automotive, German Aerospace Center (DLR)

9 May 2018
<table>
<thead>
<tr>
<th>Topic</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>interACT project &amp; interACT scenarios</td>
<td>Anna Schieben, interACT Project Coordinator</td>
</tr>
<tr>
<td></td>
<td>Marc Wilbrink, WP 1 leader</td>
</tr>
<tr>
<td></td>
<td>Department of Automotive, German Aerospace Center (DLR)</td>
</tr>
<tr>
<td>First results of observational studies:</td>
<td>André Dietrich, WP 2 leader</td>
</tr>
<tr>
<td>Driver- Pedestrian interaction</td>
<td>Chair of Ergonomics, Department of Mechanical Engineering,</td>
</tr>
<tr>
<td></td>
<td>Technical University of Munich (TUM)</td>
</tr>
<tr>
<td>First results of observational studies:</td>
<td>Evangelia Portouli, WP 3 leader</td>
</tr>
<tr>
<td>Driver- Driver interaction</td>
<td>Institute of Communication and Computer Systems (ICCS)</td>
</tr>
<tr>
<td>Questions &amp; Answers</td>
<td></td>
</tr>
</tbody>
</table>
The EU project interACT

Anna Schieben, DLR
Anna.Schieben@dlr.de
interACT Project Facts

- **Programme:** EU/H2020-ART04 - *Safety and end-user acceptance aspects of road automation in the transition period*
- **Duration:** 36 months
- **Period:** May 2017 – April 2020
- **EU Funding:** 5.527.581 €
- **Coordinator:** Anna Schieben, DLR
- **Partners:** 8 industrial and academic partners from 4 European countries (Germany, Italy, Greece, UK)
- **Project Officer:** Begoña Munoz (INEA)
- **US - EU twinning project:** AVIntent (NHTSA)
Project consortium

Designing cooperative interaction of automated vehicles with other road users – the EU project interACT
Integrating automated vehicles in mixed traffic

Situation Today

Future situation: Automated vehicles in mixed traffic environments

Designing cooperative interaction of automated vehicles with other road users – the EU project interACT
Designing cooperative interaction of automated vehicles with other road users – the EU project interACT

The challenge

1st Enabler
Psychological models

2nd Enabler
Intention recognition & behavioural predictions

3rd Enabler
CCPU & safety layer

4th Enabler
Novel HMI elements

5th Enabler
Methodology for assessing the quality of interaction

Achieve a safe, highly accepted and efficient integration of Automated Vehicles in mixed traffic environment
Designing cooperative interaction of automated vehicles with other road users – the EU project interACT

Monday, May 14, 2018

The challenge

1st Enabler
Psychological models

2nd Enabler
Intention recognition & behavioural predictions

3rd Enabler
CCPU & safety layer

4th Enabler
Novel HMI elements

5th Enabler
Methodology for assessing the quality of interaction

Achieve a safe, highly accepted and efficient integration of Automated Vehicles in mixed traffic environment

1st Enabler
Psychological models

2nd Enabler
Intention recognition & behavioural predictions

3rd Enabler
CCPU & safety layer

4th Enabler
Novel HMI elements

5th Enabler
Methodology for assessing the quality of interaction
Use cases and Scenarios

interACT

Marc Wilbrink, DLR
Marc.Wilbrink@dlr.de
Use Case – Scenario – Scene

- Persists only several **seconds**
- **Snapshot** of the environment including
  - Scenery (Lane network, stationary elements, traffic lights, obstacles)
  - Dynamic elements (cars, road users)
  - All including agents

Scenario

- Temporal development between several scenes
- A sequence of scenes connected by actions & events
- Includes goals of the agents
- Spans a certain amount of time

Designing cooperative interaction of automated vehicles with other road users – the EU project interACT
Use Case

- Description of the **functional** range and the **desired behaviour**
  - Specification of system boundaries
- A use case can include **several scenarios**

Designing cooperative interaction of automated vehicles with other road users – the EU project interACT
**Must-have use cases in interACT**

<table>
<thead>
<tr>
<th></th>
<th>Use Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>React to crossing non-motorised TP at crossings without traffic lights</td>
</tr>
<tr>
<td>2</td>
<td>React to an ambiguous situation at an unsignalised intersection</td>
</tr>
<tr>
<td>3</td>
<td>React to non-motorised TP at a parking space</td>
</tr>
<tr>
<td>4</td>
<td>React to vehicles at a parking space</td>
</tr>
</tbody>
</table>
React to crossing non-motorised TP at crossings without traffic lights

Use case diagram in UML

- Shows relationship between actors
- Shows desired behaviour of the AV
- Extension point if non-motorised TP is present
React to crossing non-motorised TP at crossings without traffic lights
React to an ambiguous situation at an unsignalised intersection.
React to an ambiguous situation at an unsignalised intersection
React to an ambiguous situation at an unsignalised intersection
React to non-motorised TP at a parking space

Vehicle automation

Park in/out on parking space

Extension point
Non-motorised TP present (a)

React to crossing non-motorised TP

Non-motorised TP

On-board user

<<Extend>>

Designing cooperative interaction of automated vehicles with other road users – the EU project interACT
React to non-motorised TP at a parking space
React to vehicles at a parking space

Vehicle automation

Pass parking space
Extension point
Other vehicle present (a)

React to vehicles

a

<<Extend>>

Other vehicle

On-board user

Designing cooperative interaction of automated vehicles with other road users – the EU project interACT
React to vehicles at a parking space
Further information

- Deliverable 1.1: Definition of interACT Use Cases and Scenarios
  https://www.interact-roadautomation.eu/projects-deliverables/
Thank you!
Further information

http://interact-roadautomation.eu

Follow Us In Social Media

interACT has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 723395.