Designing cooperative interaction of automated vehicles with other road users

25 September 2018
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<th>Topic</th>
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<td>interACT project &amp; system architecture for automated vehicles</td>
<td>Anna Schieben, interACT Project Coordinator</td>
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<td>interacting with other road users</td>
<td>Robert Markowski, WP 3</td>
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<td>Department of Automotive, German Aerospace Center (DLR)</td>
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<td>Advanced pedestrian intention recognition for automated vehicles</td>
<td>Johannes Ruenz, BOSCH</td>
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<td>interactions</td>
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<td>Recognizing the traffic situation: Rule-based reasoning in combination</td>
<td>Dr. Evangelia Portouli,</td>
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<td>with ontology representation</td>
<td>Institute of Communication and Computer Systems</td>
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<td>Questions &amp; Answers</td>
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The EU project interACT

Anna Schieben, DLR
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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)
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

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

The challenge
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

The challenge
Achieve a safe, highly accepted and efficient integration of Automated Vehicles in mixed traffic environment
System Architecture for Automated Vehicles Interacting with other Road Users

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Highlevel Architecture

- Sensing
- Perception
- Enablers
- Situation Awareness
- CCPU
- HMI
- Vehicle

Designing cooperative interaction of automated vehicles with other road users – System Architecture for Automated Vehicles Interacting with other Road Users
Middleware: Robot Operating System (ROS)

- different components are communicating with each other
- publisher-subscriber pattern
- messages define interfaces
- encapsulating components
- programming languages: C++, Python and Java
Sensing & Perception

Sensing
- Localisation Sensors
- Object Detection Sensors
- Cooperative Sensors

Perception
- Localisation
- Traffic Participants Tracking
- Static Obstacle Detection
- Pedestrian Intention Feature Recognition
- Dynamic Object Classification
- Motorised TP Intention Feature Recognition

Designing cooperative interaction of automated vehicles with other road users – System Architecture for Automated Vehicles Interacting with other Road Users
Situation Awareness & Enablers

**Situation Awareness**

- Traffic Participants Behavior Prediction
- On-Board User Monitoring

**Enablers**

- Scenario Catalogue
- Interaction Strategies Catalogue
CCPU, HMI & Control

CCPU
- Situation Matching
- Interaction Planning
- Trajectory Planning
- Safety Layer

HMI
- HMI Controller
- Internal HMI Actuators
- External HMI Actuators

Control
- Vehicle Control
- Vehicle Actuators

Designing cooperative interaction of automated vehicles with other road users – System Architecture for Automated Vehicles Interacting with other Road Users

Wednesday, September 26, 2018
Interaction Planning: Integrated Planning of Internal and External Communication
Safety Layer: Ensure Safe Behavior in Emergency Situations

figure from interACT D3.1