interACT

Designing cooperative interaction of automated vehicles with other road users in mixed traffic environments

Virtual Final Event

Developing interaction strategies and novel HMI concepts

Marc Kaup

Florian Weber

(19 June 2020)

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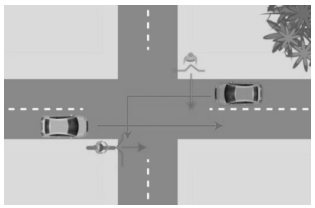
The challenge

5th Objective
Methodology for assessing the quality of interaction

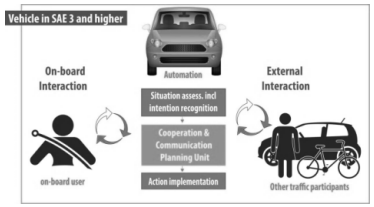
1st Objective
Psychological models

4th Objective
Novel HMI elements



2nd Objective
Intention recognition & behavioural predictions

3rd Objective
CCPU & safety layer



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Designing the interaction between AV and road user

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Interaction Strategies

Interaction Design

interACT Demonstrator

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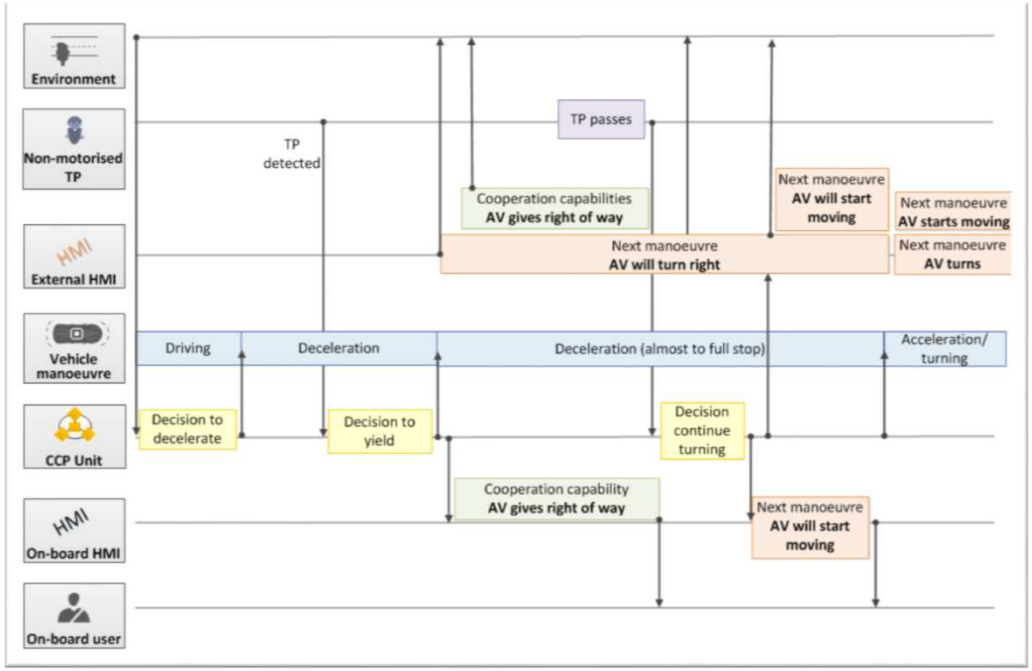
Interaction strategies derived from observational studies

Intention signaling design

Perception signaling design

Combined design



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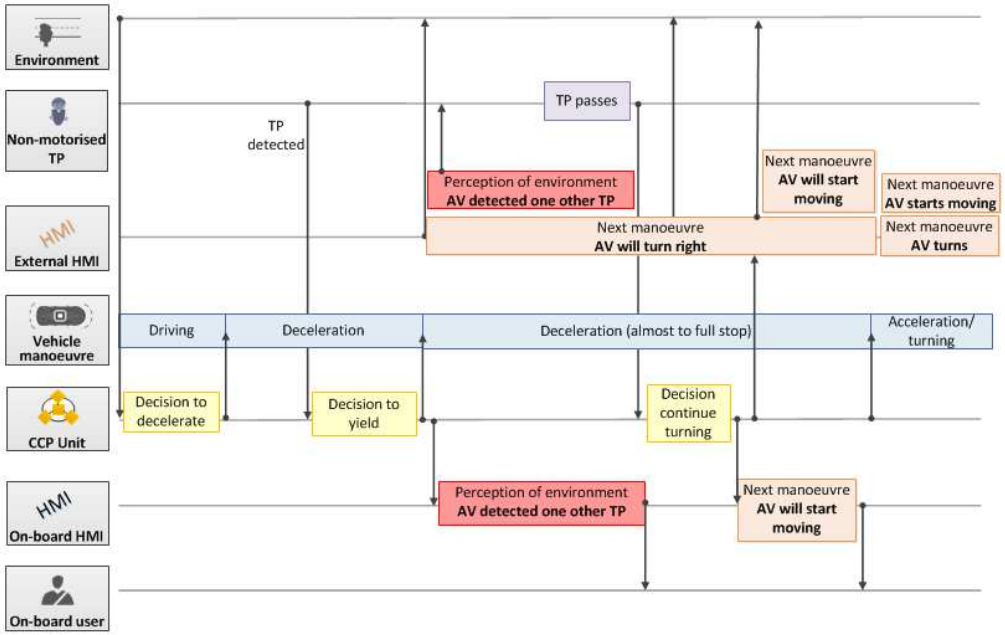

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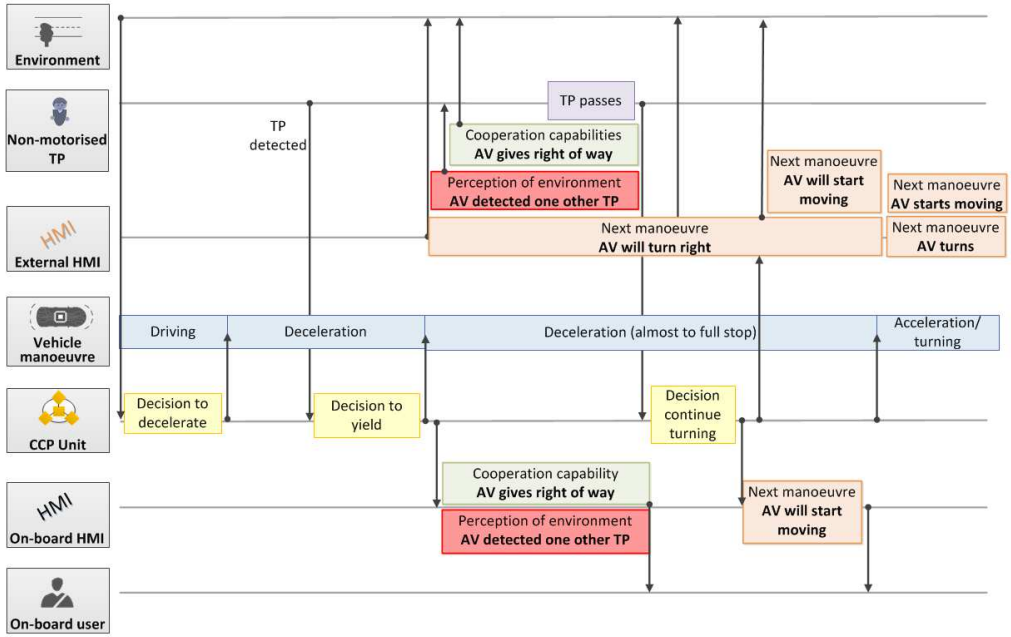

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Interaction Strategies

Interaction Design

Technology Selection

Signal Design

InterACT Demonstrator

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Interaction design display technology selection

Criteria catalogue (shortened version)

Visibility in different light conditions

Visibility at different speeds | Potential to cover 360° | Full vehicle integrability

Potential to display different signals | Dependency from language skills | Accessibility

Compatibility with existing eHMI | Compatibility with existing eHMI

Potential for universal cultural understanding

Technologies & potential signals (shortened version)

Lightband

LED Matrix | projection | Displays | Signal lamps

Abstract visual signals | text | speech | Sound signals

Directional signals | Colors | Animations

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Interaction design
selected external display technologies

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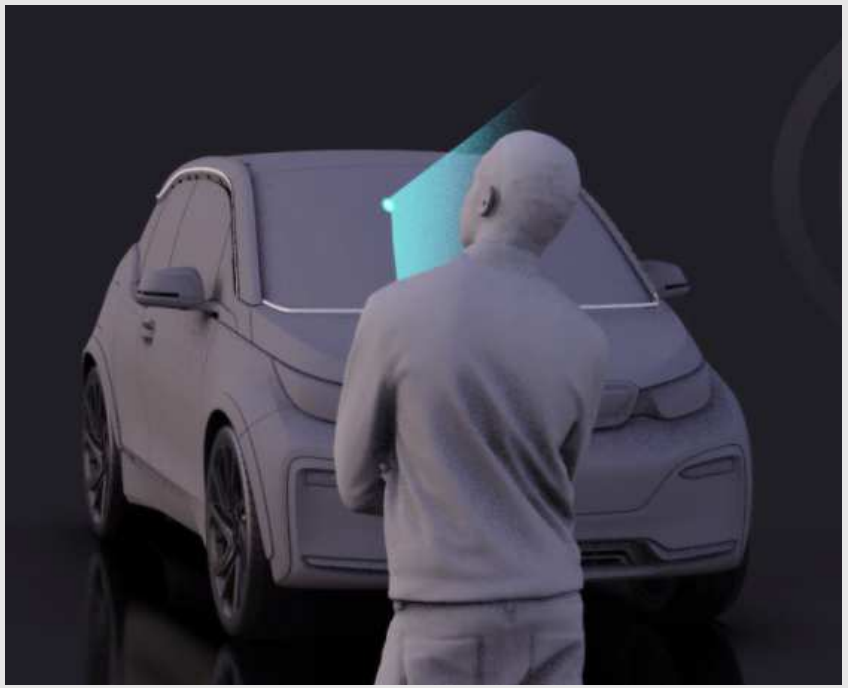
eHMI 1: 360° Light Band

eHMI 2: Directed Signal Lamp



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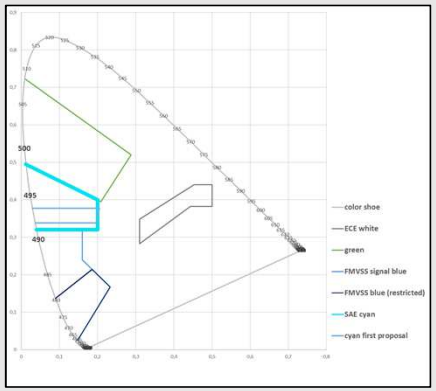
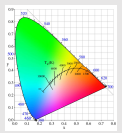
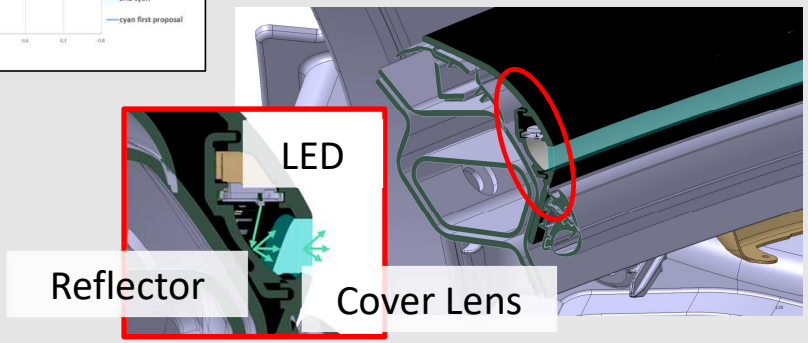
Interaction design selected external display technologies

eHMI 1: 360° Light Band







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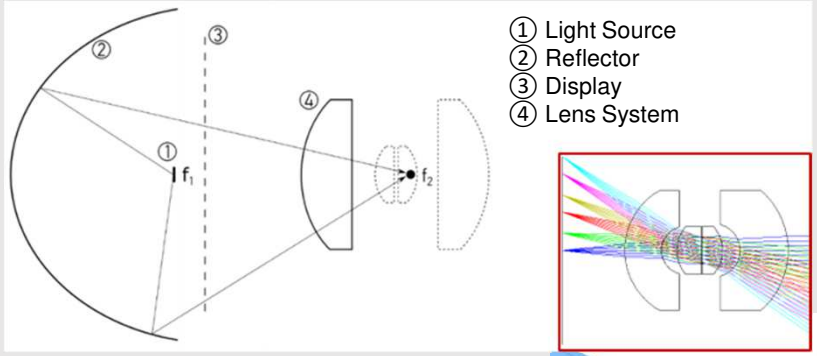
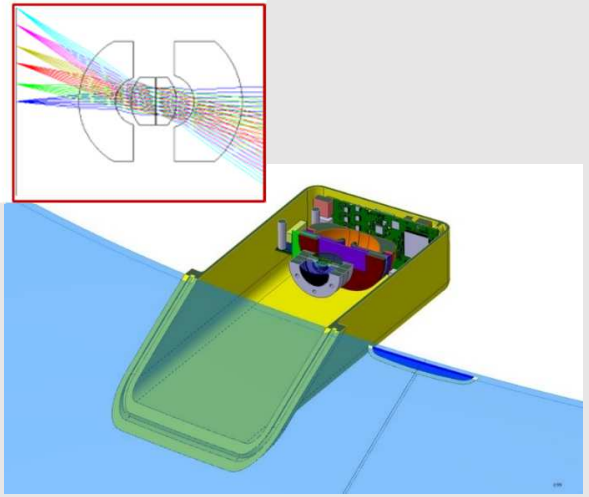
Interaction design selected external display technologies

eHMI 2: Directed Signal Lamp





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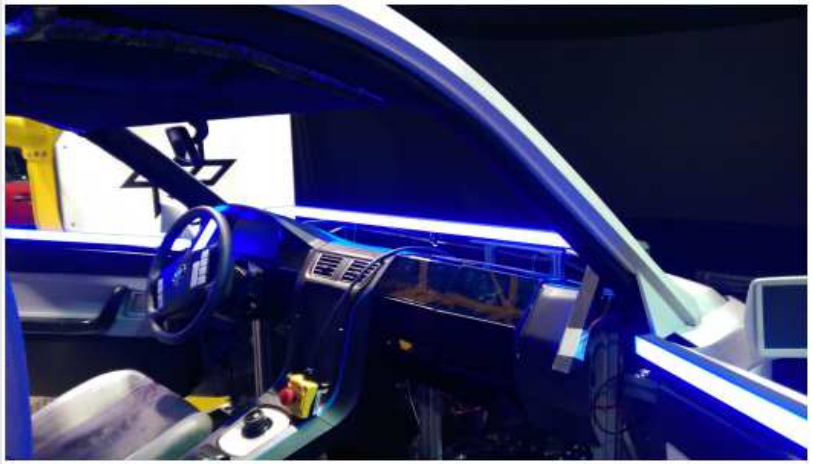
Interaction design
selected internal display technologies

iHMI 1: Automation Display

iHMI 2: 360° Light Band



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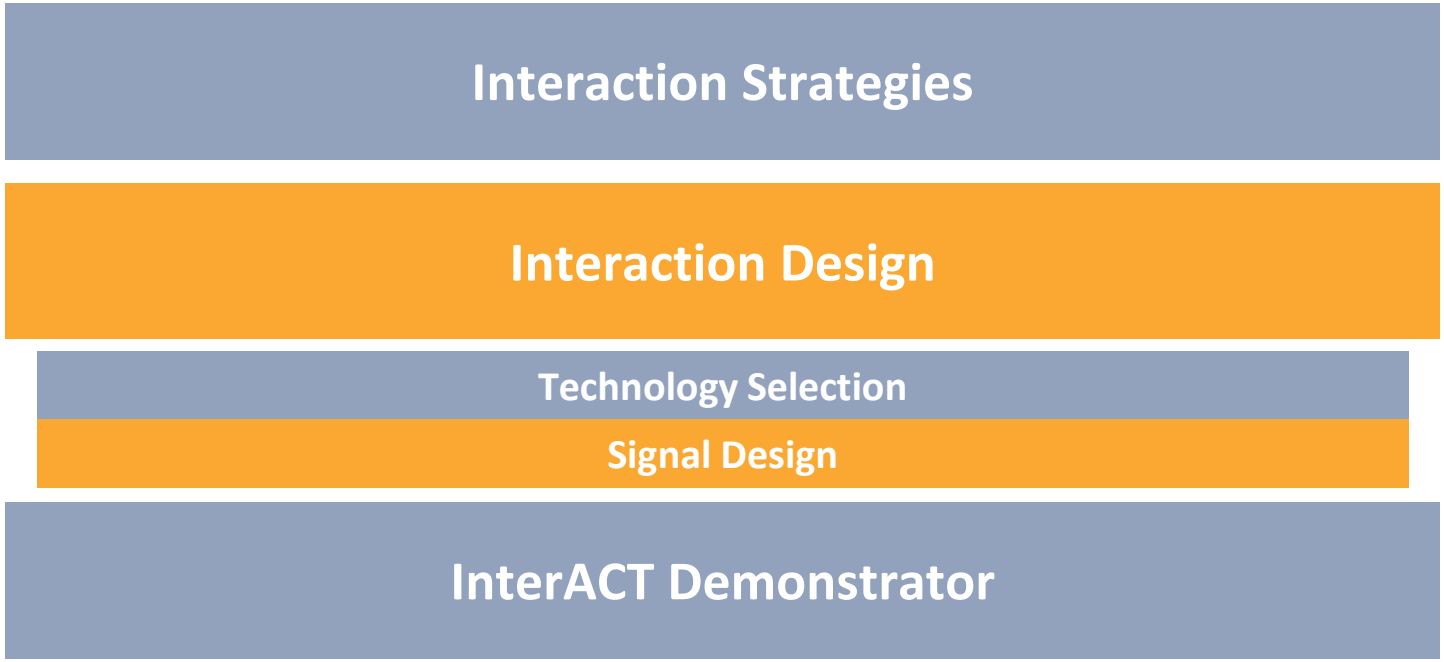

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Interaction design eHMI signals

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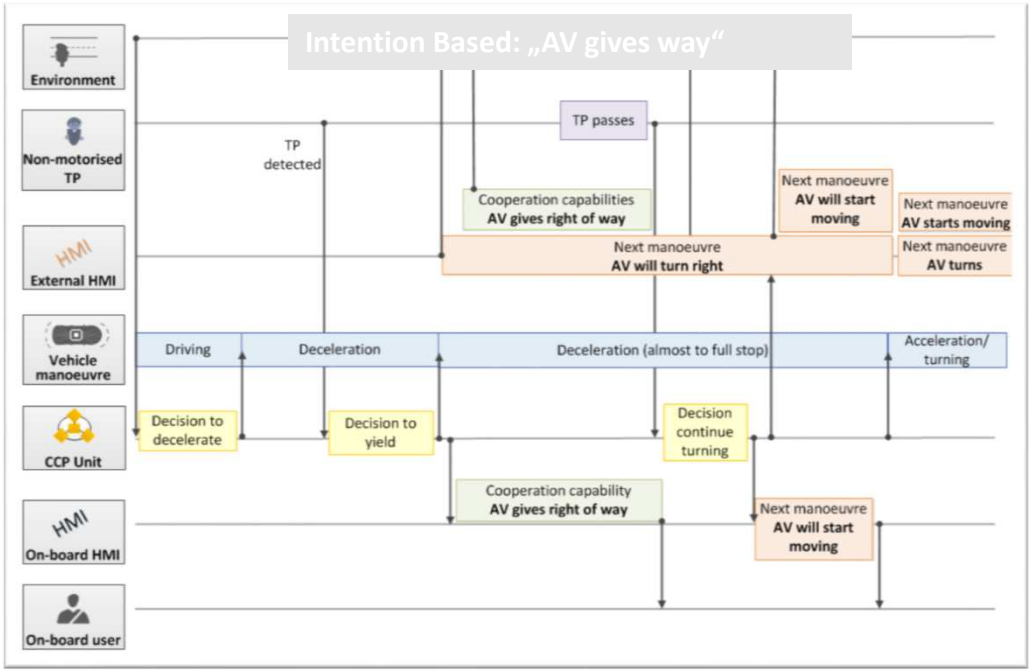

Light-band: disappears from front to back

Several signals were ruled out by user studies

Light-band: pulses slowly

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Interaction design selection of eHMI designs

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Intention based	Perception based	Combined

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Interaction design selection of eHMI designs

Main Design
Intention based

Secondary Design
Perception based

Secondary Design
Combined

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Interaction Design Flowcharts

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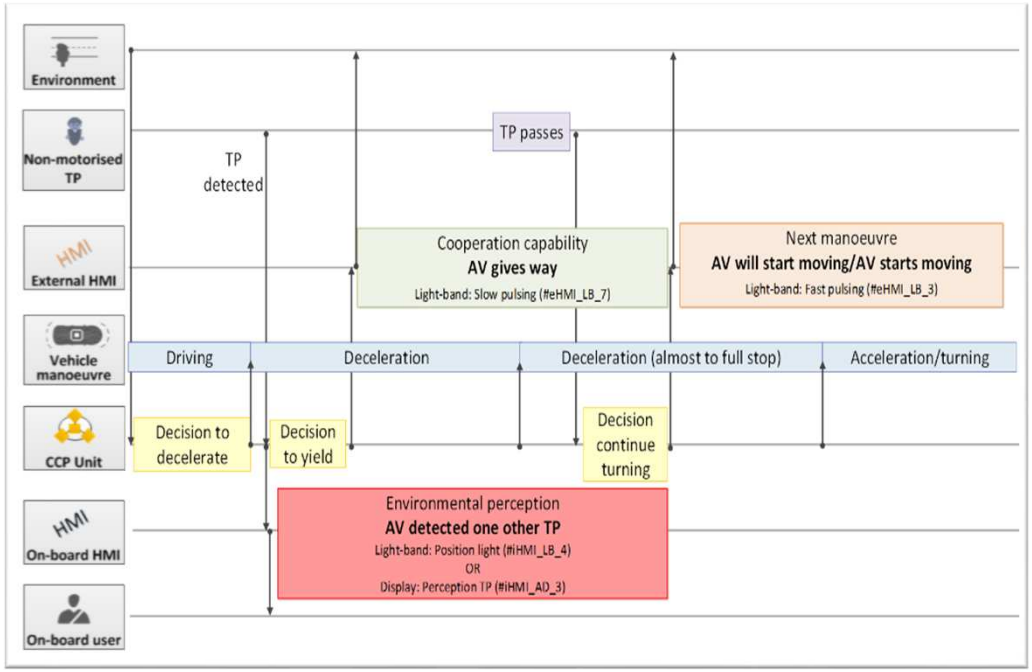
Intention signaling design

Perception signaling design

Combined design



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Interaction Strategies

Interaction Design

interACT Demonstrator

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interACT demonstrator development and integration

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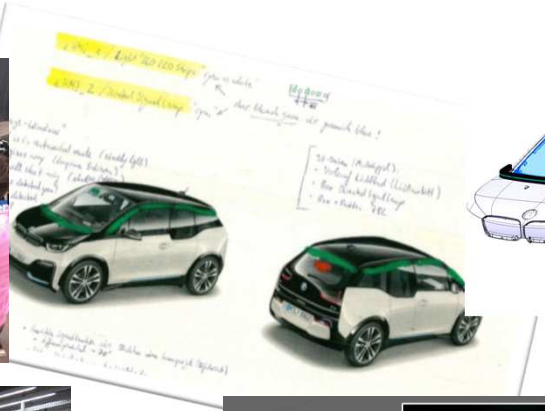

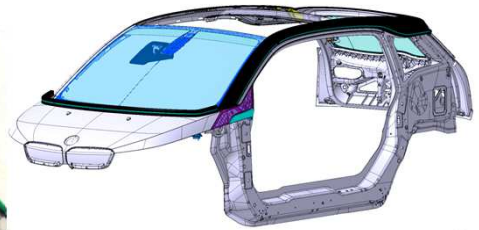

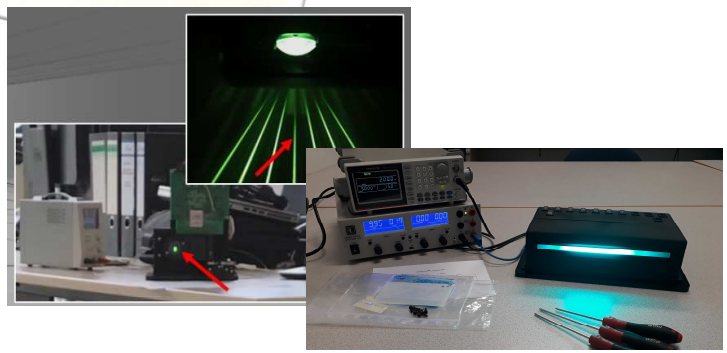

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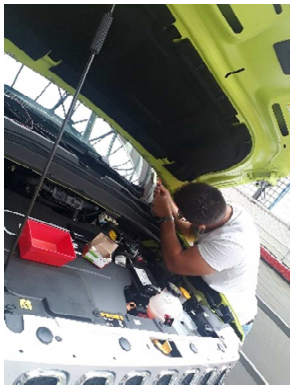

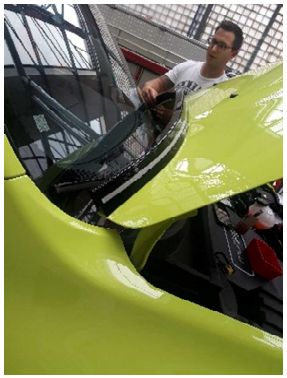

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Developing interaction strategies and novel HMI concepts – “Take-Aways”

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2 Interaction Strategies – intention based & perception based

2 eHMI technologies – 360° Light Band & Directed Signal Lamp

2 iHMI technologies – Automation Display & 360° Light Band

2 interACT Demonstrator vehicles equipped with HMI

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