



13th ITS EUROPEAN CONGRESS

FULFILLING ITS PROMISES

Brainport Eindhoven, the Netherlands | 3-6 June 2019

Evluon Congress Center
Helmond Automotive Campus



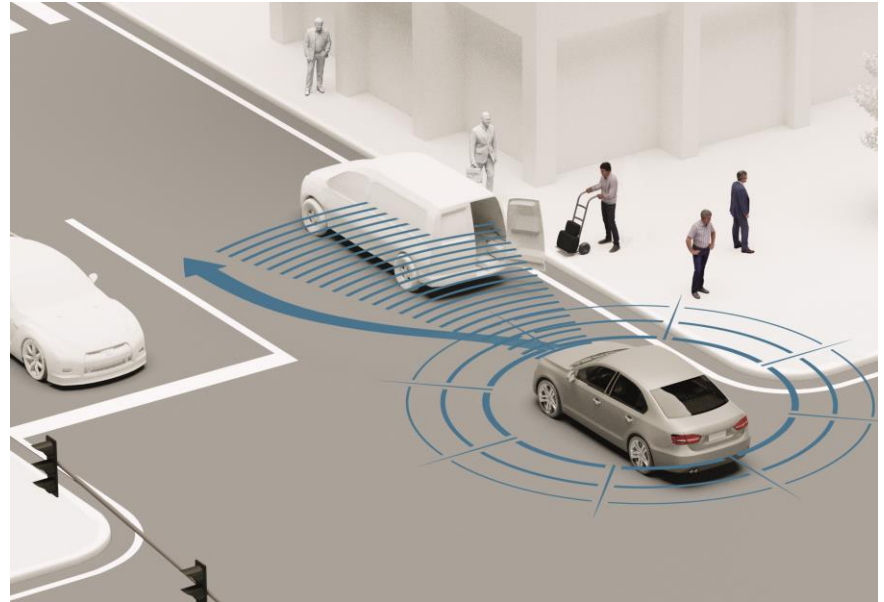
**DO WE NEED NEW HMI CONCEPTS FOR AUTOMATED DRIVING IN CITIES?
– THE GERMAN RESEARCH INITIATIVE @CITY**

Stephan Cieler, Continental Automotive GmbH

Brainport Eindhoven, the Netherlands | 3-6 June 2019

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- @CITY
- Internal HMIs
 - Work and entertainment
 - Automated and manual driving
- External HMIs
- @CITY scenario catalog































„Automated Cars and Intelligent Traffic in the City“

- Funded by German ministry of economics and infrastructure
- **UR:BAN** follow-on project
- Life span 2018 – 2022
- Seven subprojects



@CITY - Seven subprojects

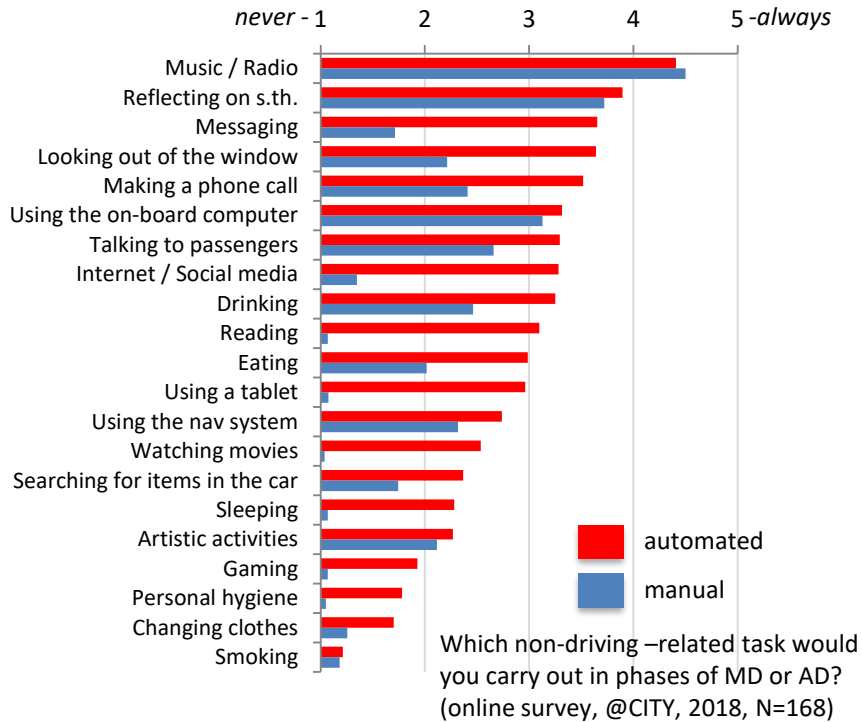
1	Detection of the environment		• APTIV •  BOSCH  DAIMLER 
2	Digital maps and localization	• APTIV •	 DAIMLER  
3	Pilot applications		  BOSCH DAIMLER    
4	Man-Vehicle-Interaction		 BOSCH    TECHNISCHE UNIVERSITÄT CHEMNITZ  TECHNISCHE UNIVERSITÄT DARMSTADT 
5	Urban junctions	 	• APTIV •   DAIMLER   
6	Urban roads		   
7	Vulnerable road users	 BOSCH	• APTIV •  DAIMLER 

Automated Driving in cities – Expected benefits

- Improved traffic flow – less congestions and shorter travel times
- Less accidents – increased traffic safety
- Synchronized traffic streams – reduced fuel consumption
- Mobility for everyone – democratization
- Non-driving related tasks possible – increased productivity



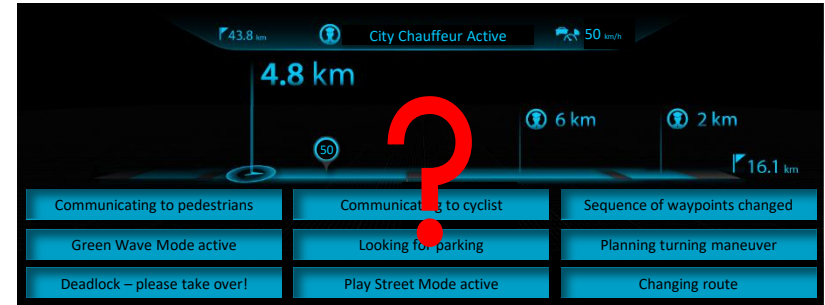
Online Survey – Non-driving related tasks



❖ New HMI solutions to enable entertainment and work

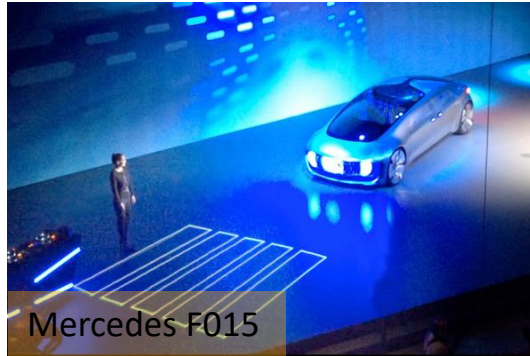
- Which tasks go well together with typical city trips? In which modalities?
- How can we assure situation awareness in case of takeovers?
- Kinetoses?

Which information does the driver / user require in the cockpit?



- ❖ **New HMI concepts geared to the information needs and capabilities of users in manual and automated mode**
 - Build up trust by representing the behavior and intentions of the system
 - Assure safe and comfortable transitions between automation levels at appropriate sections
 - Handle city specific situations (deadlocks, communicating to others, ...) in a consistent way

External HMIs – Communication with others - Examples



<https://www.technologyreview.com/5/602267/new-self-driving-car-tells-pedestrians-when-its-safe-to-cross-the-street/>



https://www.springerprofessional.de/automatisiertes-fahren/ergonomie-hmi/ford-ia-eez-automotive-auto-mit-lichtsignalen-kommunizieren/16445108?fulltextView=true&wt_eCircle_aad=897147&wt_eCircle_mvsl=1020558&wt_eCircle_ju=192532934&wt_mc=nl:red:automobil-motoren:1901044381.x



Clamann, M. (2017). Autonomous Vehicles and Human Behavior: Pedestrian Communication with Autonomous Vehicles.



External HMIs – Research questions

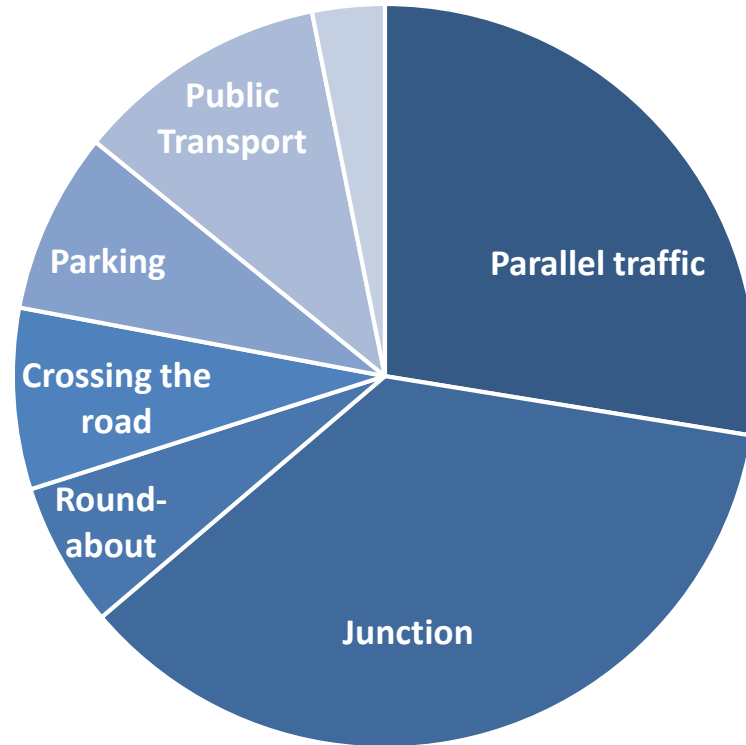
❖ New HMI solutions for external communication

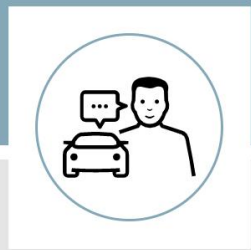
- How should automated vehicles be marked?
- Mixed traffic:
 - In which situations is implicit communication sufficient?
 - In which situations is an external HMI concept required?
- Showing intentions of the car (“Braking”) or instructions (“Walk!”)?
- Easy to understand? Also for children?
- Should the communication to other traffic participants be shown on the internal HMI?
- How should an external HMI be designed? On every side?
- Standardization of external HMIs?
- Is there a catalog of expected communication episodes?

@CITY Interaction Scenario Catalog

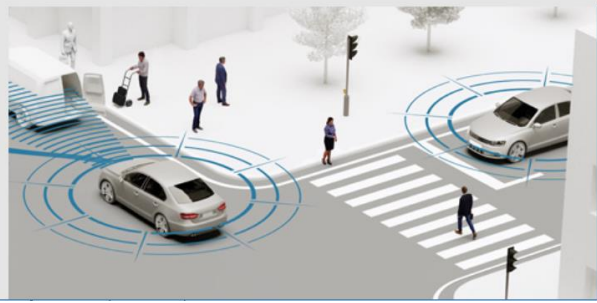
237 scenarios
(as of May 2019)

→ requirements for internal
and external HMI concepts





TP 4 Mensch-Fahrzeug-Interaktion



Automatisiertes Fahren in der Stadt wird neue Interaktionsformen zwischen Menschen und Fahrzeugen notwendig machen. Stand bislang die Interaktion des Fahrers mit dem Fahrzeug (per Anzeige- und Bedienelemente) und anderen Verkehrsteilnehmern (per Gesten, Handzeichen etc.) im Vordergrund, wird das Fahrzeug der Zukunft eigenständig mit Personen in der Umwelt kommunizieren. Die über die verschiedenen Kanäle übertragenen Informationen müssen stets situationsangemessen, verständlich und eindeutig sein – eine der zen-



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