Japanese-German Research Cooperation on Human Factors in Connected and Automated Driving

Progress report at Steering Committee

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Work packages and tasks

- **WP1 / Task A: External communication**

This WP/Task investigates effective ways to functionalize automated vehicles to be communicative with surrounding road users (e.g. pedestrians, cyclists) for safe and efficient traffic coordination. Understanding cultural differences in external communication in both countries is one of the focuses.

- **WP2 / Task C: Education and training**

This WP/Task investigates education and training of potential users required for safe use of the systems. Existing education opportunities in both countries are considered for implementation.

- **WP3 / Task B: Drivers' interaction with automated systems**

This WP/Task investigates driver-system interactions in transitions between various levels ranging from Level 0 to Level 4 on restricted motorways as well as in local urban traffic. This work package understands human limitations and explores solutions for the safety problems.

Collaboration partners

	Japanese members	German members
■ External communication	**Task A** • Keio U • Tokyoto BS Co.	**WP1** • TU Chemnitz • TU Dresden • Ulm U • TU Munich • DLR
■ Education and training	**Task C** • U of Tsukuba • Kumamoto U • Tokyoto BS Co.	**WP2** • TU Dresden • TU Munich
■ Drivers' interaction with automated systems	**Task B** • AIST • U of Tokyo	**WP3** • TU Munich • Ulm U

Biannual workshops

- **CAD JapanGermany – HF Workshop#1**

  - November 11, 2019   Tokyo
  - Kick-off and exchanging research plans of both sides
  - Lab visits and meetings (full day)
      November 15   Keio University
      November 18   AM: University of Tsukuba, PM: AIST

- **CAD JapanGermany – HF Workshop#2**
  - May 11-13, 2020   3-4 hours of web meeting each day
                          (originally planned to be held in Ulm)
  - Exchanging research progresses of both sides
 - Discussion for next actions

WP1/Task A: External communication

■ **Germany: TUC, TUM, TUD, UU and DLR**

a. What do drivers use to predict cyclist behaviour?

b. What requirements for external communication result from a multi pedestrian environment ?

c. Does context influence comprehension of eHMI icons?

d. When and why do drivers decide to behave cooperatively?

e. Extraction of interaction and cooperation patterns in mixed urban traffic.

■ **Japan: Keio U**

f. Understanding communication between road users and low speed AVs in last-mile services.

g. Investigation of negative effects of communication between AV and surrounding road users.

a.

b.

c.

d.

Illustrative and simplified

e.
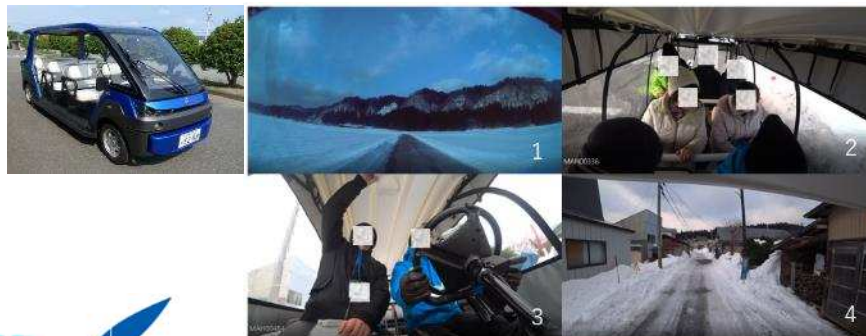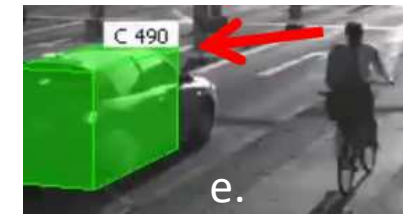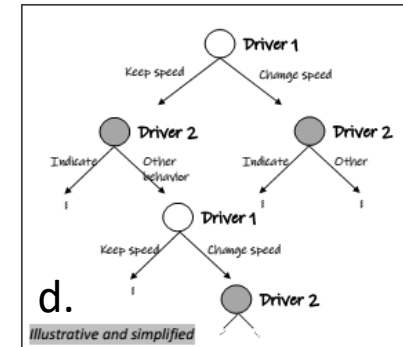
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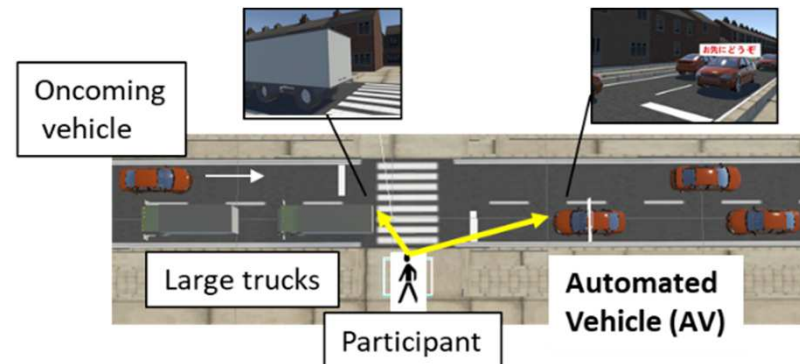
g.

WP2/Task C: Education and training

■ **Germany: TUM and TUD**
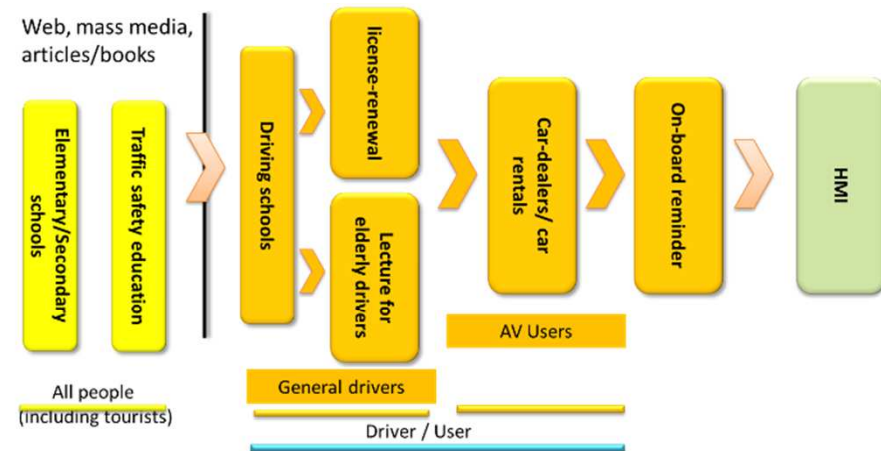
  a. Literature review

  b. Investigation of impact on driving schools
     (practical considerations)

    ※ Automated driving not yet implemented
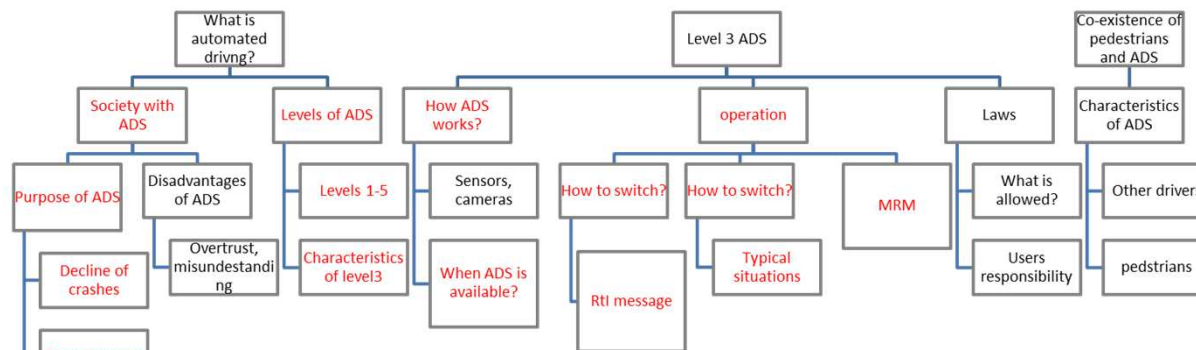   in driving schools.

■ **Japan: U of Tsukuba and Kumamoto U**

  c. Establishing an education strategy

  d. Investigation of education contents

b.

c.

d.

SIP Cabinet Office

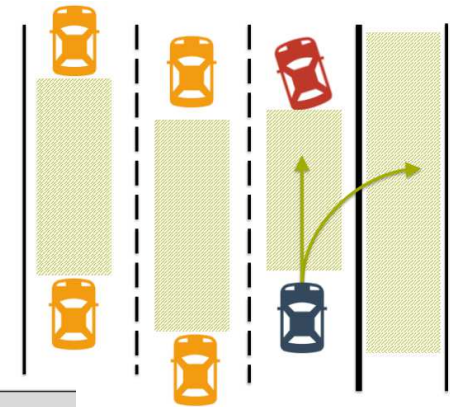Federal Ministry of Education and Research

WP3/Task B: Drivers' interaction with automated systems
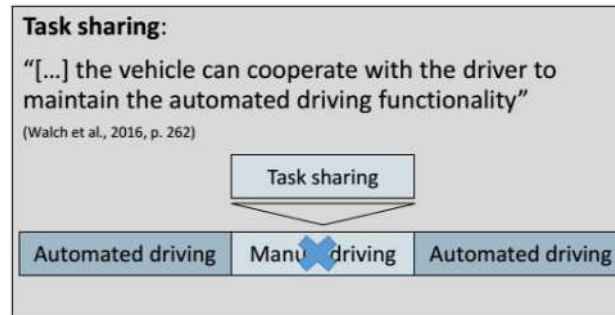

a.

■ Germany: TUM and UU

a. How should Minimal Risk Maneuvers be designed and how should MRM be communicated to the driver?

b. Investigation of the transition and task switching process. Use and investigation of task sharing.

■ Japan: AIST and U of Tokyo

c. Investigation of protocols for safe transition from Level 3/4 to manual.

d. Investigation of HMI supporting driver's OEDR task and driver-initiated transitions

Task sharing:

"[...] the vehicle can cooperate with the driver to maintain the automated driving functionality"

(Walch et al., 2016, p. 262)

Task sharing		
Automated driving	Manual driving	Automated driving

b.

c.

Undetected motorcycle | Intrusion from non-priority road
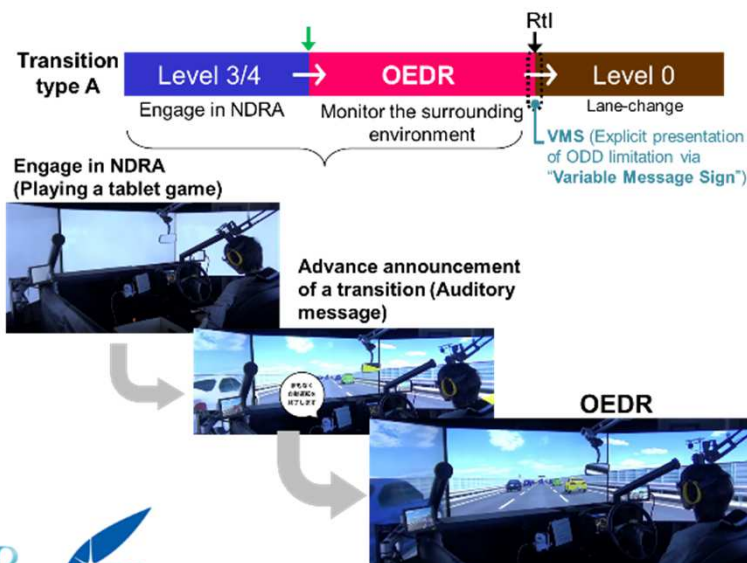
d.

Next actions

- More frequent communication for each WP/Task will be planned.
- Series of webinars will start (see below). The webinars will be open to students and maybe to public.
- Exchanging staff and students is postponed due to COVID-19.
- Joint workshops at international conferences are postponed or transferred to online.
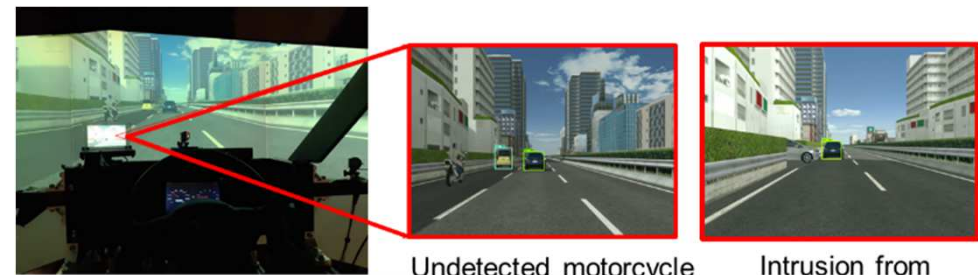- CAD JapanGermany-HF Workshop#3 will be held in the fall 2020. We want to have an in-person workshop in Tokyo and the decision will be made later.

Possible topics of webinars by German partners.

	Possible lectures (web or visit)	Lecturer	Time (min)
TUM	Shared Control paradigms for automated driving	Klaus Bengler	
	Wizard of Oz experiments	Klaus Bengler	
TUChemitz	-Human Factors in Automated Driving/Systems (visit/web), -Research Methods (Video Simulation, Psycho-physics, Driving Simulator,···) (visit) -Comfort and Driving Style (visit/web) -Interaction between highly automated cars and VRU (visit/web)	Ackermann, C. Krems, J.	45 to 120
Ulm U	Cooperative Human-Machine Interaction	Martin Baumann	60
	Interaction and cooperation between vehicles from a psychological human factors perspective	Linda Miller	45
	Driver-vehicle interaction and transitions during automated driving	Jasmin Leitner	45
TU Dresden			
DLR	Webinar eHMI: Results of the EU-Project interACT Webinar / joint workshop: implicit communication, interaction and cooperation --> Human performance, models (patterns, indicators), methodologies	Wilbrink, M. / Oehl, M. Schießl, C. / Theisen, M.	45 to 60

Possible topics of webinars by Japanese partners.

	Possible lectures (web or visit)	Lecturer	Time (min)
U of Tsukuba	Human-automation interaction (web)	Makoto I.	45
	Shared Control (visit)	Yuichi S.	45
	Education and Training for Automated Driving (visit)	Huiping Z.	45
Keio U	Design and evaluation of HMI of I2V Cooperative Safety System (web)	Tatsuru Daimon	60
	Deployment of connected and automated vehicle in Rural Japan -Strategic spatial planning, governance and	Tomoyuki Furutani	60
Tokyo U	Evaluation of HMI for ADAS/CAV	Kimihiko N.	60
U of Kumamoto	Effects of Learning Media	Yoshiko G.	45
AIST	ISO21959 Part 1 and Part 2 Human performance and state in the context of automated driving	Satoshi K.&Klaus Bengler	60
	Innovation and Invention (MOT)	Satoshi K.	45
	Human-Centered Engineering: Practical applications	Satoshi K.	60
	Summary of SIP-adus Phase 1 & Phase 2 projects	Satoshi K.	90
	Visual attention in experimental psychology	Ken Kihara	45
	Driver behavior model	Toshihisa Sato	60

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Coordinators' overall opinions

Satoshi Kitazaki

- The collaboration has been successful and will continue growing to produce several joint research.

- It is a great contrast that the research in the German consortium tends to be science oriented, whereas the research in the Japanese consortium tends to be solution oriented. Integration of findings from these two strategies will strengthen safety and comfort of automated driving.

Klaus Bengler

- Since the 2019 kickoff the collaboration network could be further established on the individual level – regardless COVID19
- Project type and collaboration format receive great interest and positive feedback in the international community
- The national research discussion benefits from this international collaboration