PRAKTIKUM MEDIENGESTALTUNG
AMBIENT INFORMATION VISUALIZATION OF VEHICLE STATES

**Lecturer:** Prof. Dr. Andreas Butz  
**Person in Charge:** Jingyi Li, Sarah Theres Völkel
Many courses take place online while the LMU is closed. As lecturers, we ask for your forbearance if things don’t always go perfectly and hope for your constructive cooperation. In this situation, some rules also apply online that would be clear in real life, but which we would like to explicitly point out here:

1. In live events, we ask that you be disciplined with audio (usually off) and please turn on your camera when possible.
2. The recording or forwarding of events by participants is not permitted.
3. The distribution of content (video, audio, images, PDFs, etc.) in channels other than those intended by the author is not permitted.

Anyone who violates one of these rules must expect to be excluded from the event in question and we reserve the right to take further steps. We are looking forward to the joint experiment “Online Semester” with everyone else.

- Find kickoff slides on the course website
- Type questions in the chat

RULES FOR ONLINE COURSE
Topic
How to use ambient information visualizations (IV) to subtly communicate various vehicle states to drivers/passengers?
Background

1. Automated Vehicles
2. Ambient Light Displays
3. Ambient IV Concepts for Brand Identity
Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles

(SAE, 2018)
Automated Driving (L3-L5) 
Non-Driving-Related Tasks (NDRTs)

• Doing nothing
  “Interestingly, doing nothing specific was the most observed activity in our subway observation. This highlights the need for a relaxing environment (seat position etc.) for automated cars.”

• Entertainment, Physical Needs, Watching out of the Window

• Productivity, Communication, Use of Mobile Devices

➢ How to communicate the states (current trajectory/battery volume and potential intention) of automated vehicles to driver/passengers during NDRTs/not driving?

Investigating User Needs for Non-Driving-Related Activities During Automated Driving

(Pfleging et.al., 2016)
AMBIENT LIGHT DISPLAYS:
turn-by-turn navigation, lane change decisions, motion sickness, situational awareness, driving speed and experience

[Matviienko et al., 2016]
[van Huysduynen et al., 2017]
[Karjanto et al., 2018]
[Wang et al., 2017]
[Löcknen et al., 2020]
Ambient Lights for Turn-by-Turn Navigation

**RGB LED** (steering wheel/ Arduino Mega )

- Navigation aids in the periphery (left or right turns)
  - color set
    - yellow-yellow-green (YYG)
    - white-white-green (WWG)
  - brightness progression
    - static-blinking-static (SBS)
    - static-blinking-blinking (SBB)
  - position
    - on the steering wheel (OSW)
    - next to the steering wheel (NSW)

*NaviLight: Investigating Ambient Light Displays for Turn-by-Turn Navigation in Cars* (Matviienko et al., 2016)
Ambient Lights for Enhancing Situational Awareness

LED
(dashboard/Arduino/Perspex)
- Autonomous driving mode:
  - the lights turn blue
  - the brightness changes from low to high repeatedly
- a car in front
  - the lights turn into white to indicate that the vehicle can “see” the vehicle

CID
- ego car’s position
- front cars position
- the curvature of the road
- the driving mode etc.

Designing for Enhancing Situational Awareness of Semi-Autonomous Driving Vehicles
(Wang et al., 2017)
Ambient Lights for Eliminating Motion Sickness

Peripheral visual feedforward system (PVFS)

(rear-seat passenger/ 32 LED lights)
• two displays, right and left (140 degree)
  o from the bottom to the top
  o notify right or left turns
  o a speed of 50 cm/s
  o a unit of eight LEDs
• diffused on a 3D-printed cover
  o for primary task (watching video)
• blue lights in the periphery
  o efficiently discriminated

The effect of peripheral visual feedforward system in enhancing situation awareness and mitigating motion sickness in fully automated driving

(Karjanto et al., 2018)
Ambient Lights for Positive Driving Experience

**LED** (a-pillar/ led strip)

- the light moved at a speed proportional to the driving speed
  - the light moves faster as the vehicle accelerates
- the light is made to move at a higher speed compared to the driven speed
  - to increase the optical flow/ the illusion that the vehicle is actually driving at a higher speed
  - cautious drivers reduce the actual speed
  - satisfaction for drivers who prefer more sensation of driving

(van Huysduyuen et al., 2017)
Ambient Lights for UX and Trust

Virtual light bars (driving simulator)

- possible conflicts (with the cyclist)
  - red bar highlights the position of potential conflicts
    - The width of this bar corresponds to the distance and size of the object.
    - fade in when the object is detected
    - fade out when the object is no longer in conflict.

- future driving route (of the own vehicle)
  - a white bar at low brightness

- entire display turn red when the vehicle needs to decelerate to avoid conflicts
  - brightness corresponds to the force

Increasing User Experience and Trust in Automated Vehicles via an Ambient Light Display

(Löcken et al., 2020)
AMBIENT IV FOR BRAND IDENTITY
Roof with Fiber Optic Lights
ROLLS-ROYCE PHANTOM
Active Ambient Lighting
MERCEDES-BENZ S500
Challenges of Ambient Lights

• Seen as a distraction
• Active head movement
• Inducing more stress
• Outdoor light conditions (e.g., daylight, night, an alley)
• Different mental models of color-coding between designers and users
• Delivering richer information
• ...

Challenges as well as opportunities for improvement or other solutions.
1. Analyse and select one “design pattern”;
2. Develop your information visualization (IV) concept of vehicle states;
3. Implement your concept.

Approach
1. Design

**Pattern**

Analyse and select one “design pattern” for your information visualization (IV) concept;

2. Ambient IV

**Concept Design**

Develop your IV concept of vehicle states based on the selected design pattern;

3. Simulated Demonstration

Format follows concept.

Implement/demonstrate your concept with projection, virtual reality, etc.
ORGANIZATION
**SCHEDULE**

**Date:** Wednesday, 12:00 - 14:00 c.t.
**Location:** Virtual Course (& possibly at Frauenlobstr. 7a)

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**Concept Phase**

- Concept Development by Sarah: Design Thinking & Brainstorming (11.11.2020)
- *****Tutorial:** Concept Development Process of Automotive Ambient IV (18.11.2020)
- Meeting with Tutor: Group Discussion (09.12.2020)

**Implementation Phase**

- Concept Presentation (16.12.2020)
- *****Tutorial:** Implementation Process of Automotive Ambient IV (13.01.2021)
- Meeting with Tutor: Christmas Theme (23.12.2020)
- *****Tutorial:** Video production (20.01.2021)

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**Final Presentation (10.02.2021)**

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** *** to be discussed ** 

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LMU München – Medieninformatik – Praktikum Mediengestaltung – WS20/21
To develop ambient IV concepts for communicating vehicle states to drivers/passengers.
Final Documentation

be handed in via Uni2Work before **17.02.2021**

- **Mandatory Documentation**
  1. Video clip of prototype demonstration (.mp4, about 5 mins)
  2. Prototype project file (e.g., .unity, .ino, .xd)
  3. Final presentation slides (.pdf)

- **Optional Submission**
  (in addition to the mandatory documentation)
  - Physical prototype to be implemented in the car (e.g., Arduino boards, LED, Tablets)

Format follows concept.
Find your team member now/ later in Slack.
Slack workspace link in the chat.

Groups of Two/ Three

Bachelor
• Medieninformatik
• Informatik

Master
• Mensch-Computer-Interaktion
1. Randomly paired up in two/three in breakout rooms.
2. Introduce yourself to the other member.
   a) What is your name?
   b) What is your major?
   c) What are your hobbies?
   d) Where are you now?
   e) For the sake of normal lunchtime at noon, shall we postpone our following meetings to 14:00-16:00 ct., every Wednesday?
3. After 10 minutes, get back to the main room and introduce the member you met to everyone. (better with your camera on ;)

“Introducing Each Other”
ICE-BREAKER😊~20 mins
Next Meeting online (zoom link via email)
Date: Nov. 11th, Wednesday, 12:00-14:00 c.t.

Tasks till next session:
To read/ desktop search related work/ commercial concepts of in-car ambient IV
12. https://www.osram.de/os/applications/automotive-applications/interior_ambient_rgb.jsp
13. Your reading/ desktop searching…. 

References
QUESTIONS?