Exposure to secondary tasks in Germany: Results from Naturalistic Driving Data

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Background

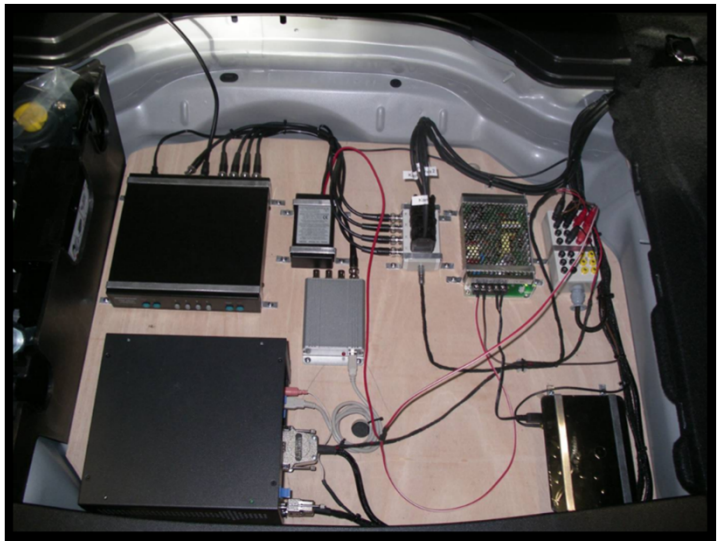
Data collected in euroFOT is used as Naturalistic Driving Data:

- FOT on impact and usage of navigation systems
- N=47 drivers participating for 3 months
- All vehicles are BMW series 5 fully equipped with driver assistance systems
- Continuous logging of CAN and video data

Data analysis

Frequency of distracted driving is assessed with two approaches:

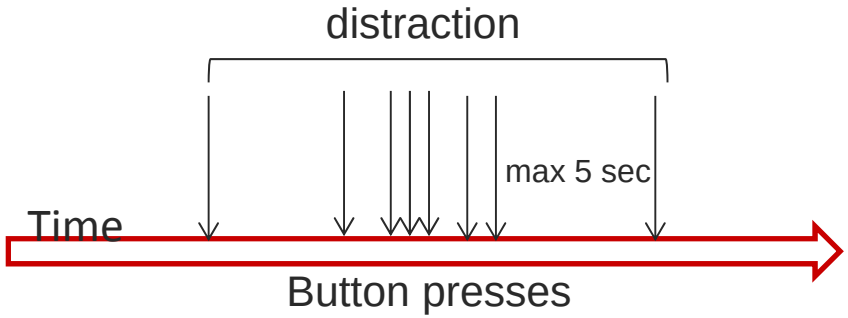
Based on CAN-data



Based on video

CAN-data: Coding of distraction

- **Continuous information for usage of hands-free phone equipment**
- **Information for single button presses:**
  - Button presses are merged into periods of distraction

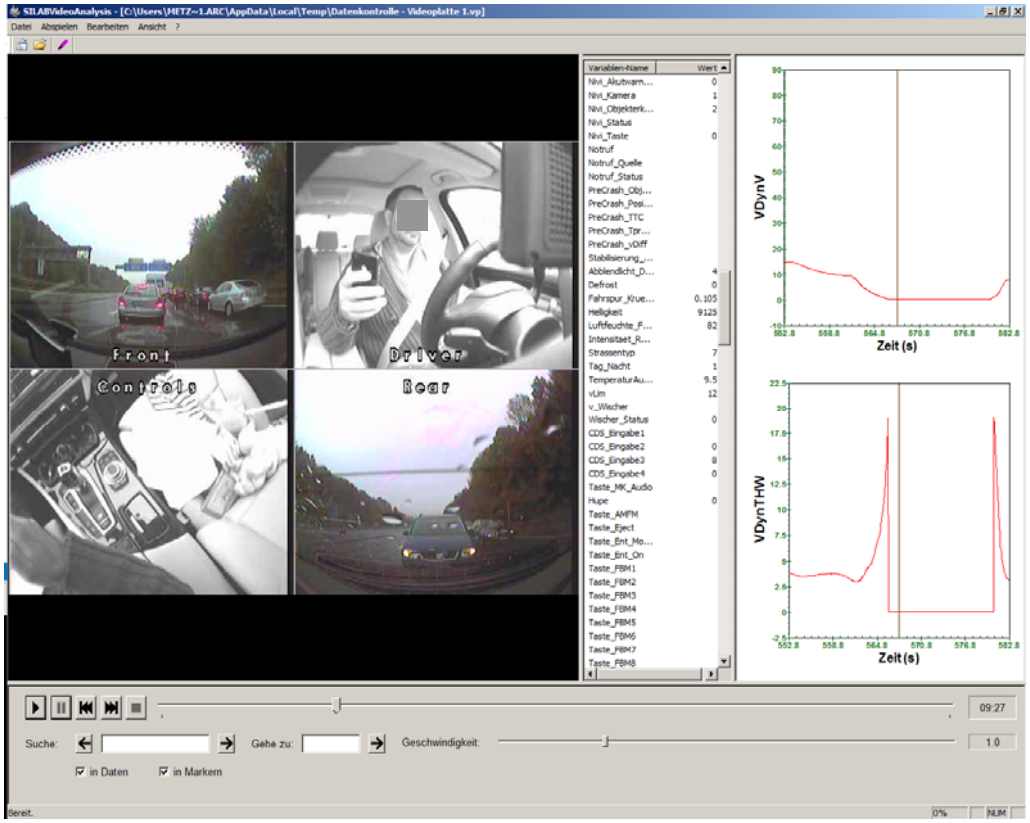


  - Single button presses -> duration of 2.5 sec

- **Total database (ca. 383 000 km) is used**

Video: Coding of distraction

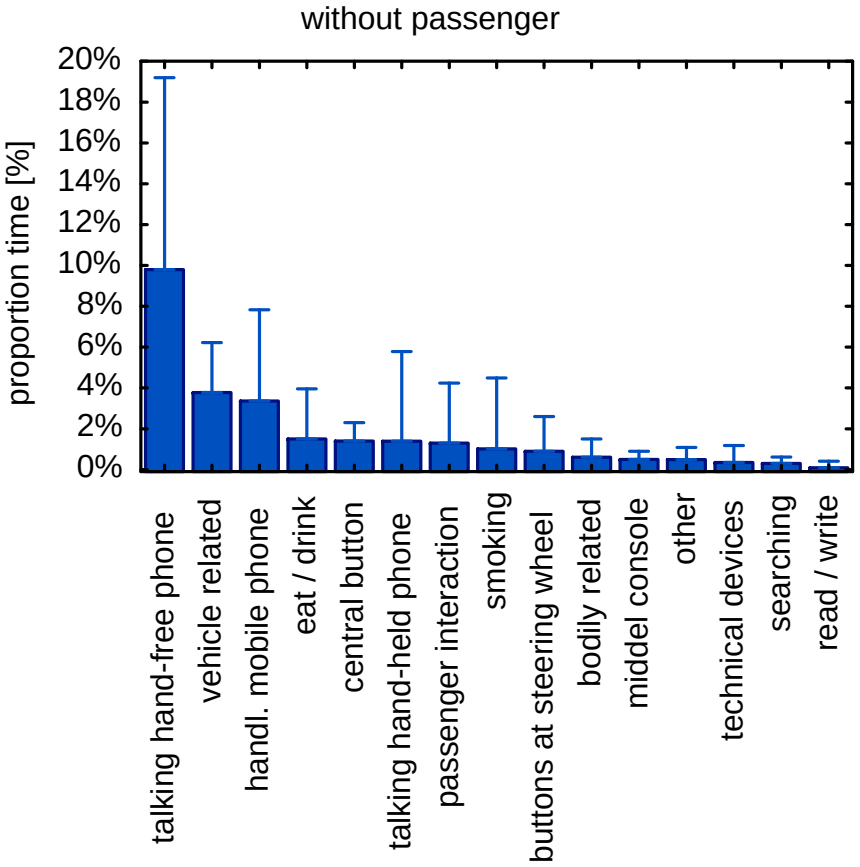
- **Subsample of trips is coded**
- **Selection of trips based on several criteria:**
  - Sufficient number per driver
  - With & without passenger
- **Subsample:**
  - Between 7 and 9 trips per driver
  - Mean=446 km per driver
  - In total ~20 000 kilometers 256 hours coded

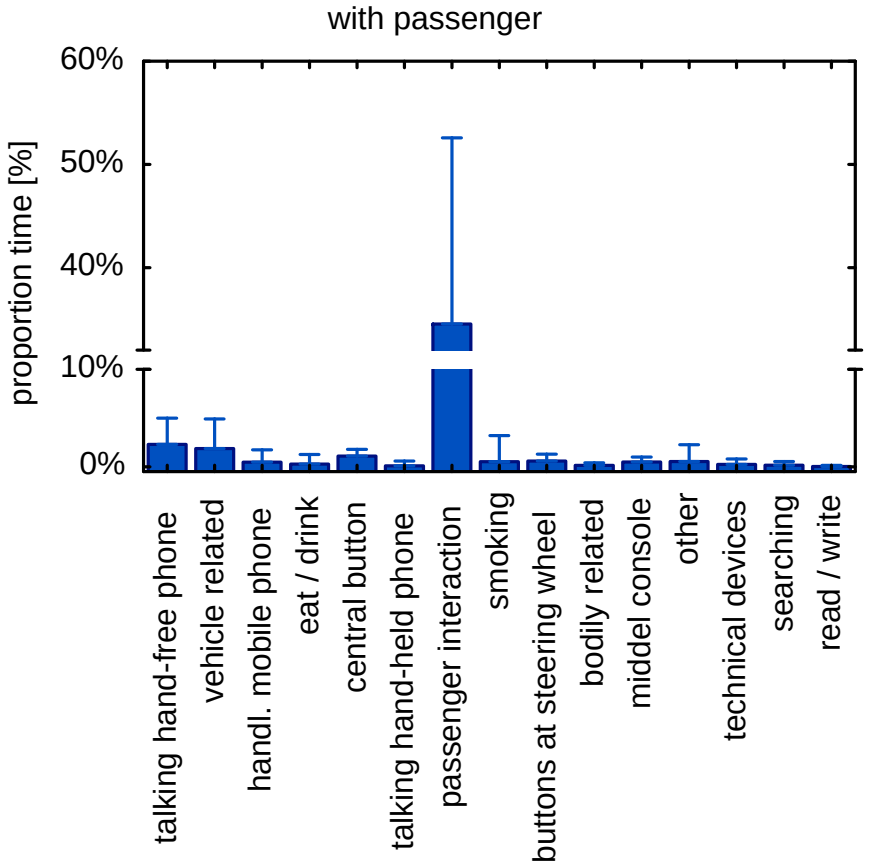


Secondary tasks

Secondary task	Source	Examples / explanation
Talking on hands-free phone	CAN	Microphone is open
Inputs via central controller	CAN	Inputs to central infotainment system
Inputs with buttons at middle console	CAN	Pre-selected radio stations
Inputs with buttons at steering wheel	CAN	Incoming calls, volume etc.
Handling mobile phone	Video	All types of inputs (smartphones!!)
Talking on hand held phone	Video	
Handling of vehicle	Video	Central controller, windows
Eating / drinking	Video	
Reading / writing	Video	Reading from / writing on paper
Smoking	Video	Whole process
Other technical devices	Video	Mobile navi, computer
Passenger related	Video	Talking, looking at passenger
Related to body	Video	Applying make up, cleaning nose
Searching / rummaging	Video	Looking in bag, on the floor etc.

Time spent on different secondary tasks



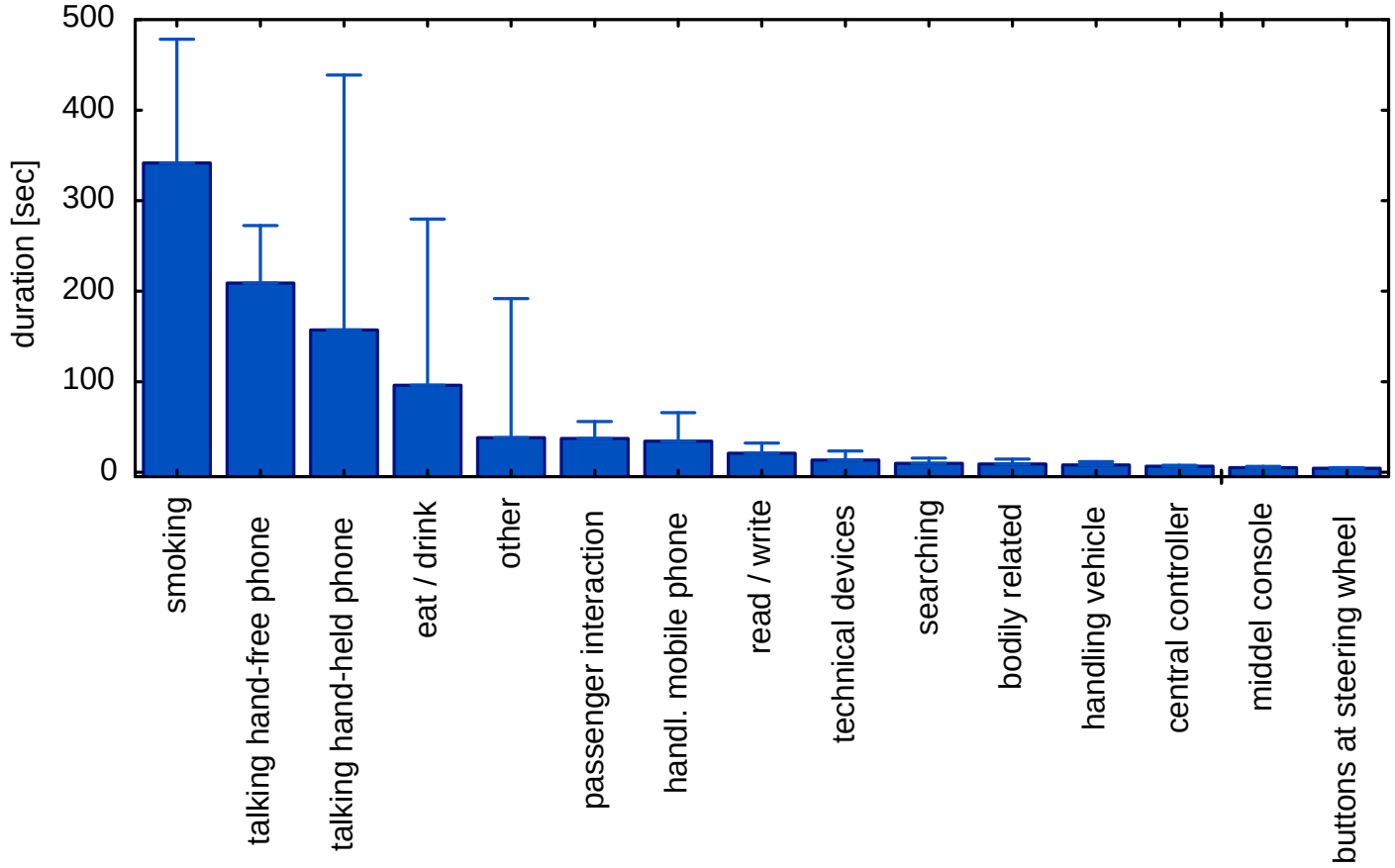


Most frequent secondary tasks:

Without passenger: talking on hands-free phone (10%), vehicle related inputs (4%), handling mobile phone (3%)

With passenger: Interaction with passenger (35%), talking on hands-free phone (2%)

Duration of secondary tasks



Mean duration of secondary tasks:

Smoking takes the longest (5 ½ min), followed by talking on the phone (hands-free: 3 ½ min; hand-held: 2 ½ min);

Handling of mobile phone takes 35 sec, vehicle related inputs less than 10 sec;

Distraction in different maneuvers

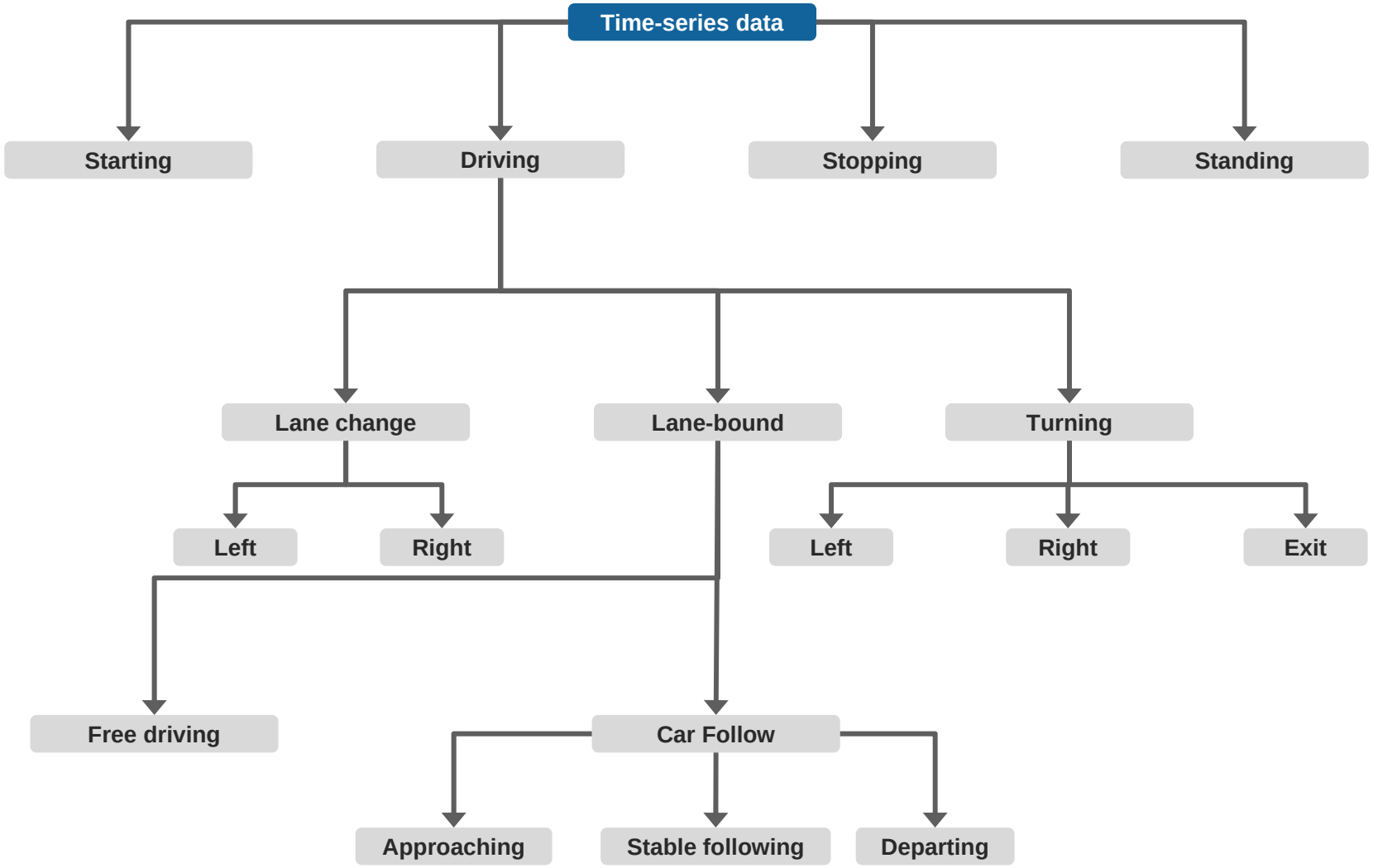
Approach:

- Trips are divided into sequence of driving maneuvers.
- Algorithm is used that differentiates maneuvers based on objective time-series data.
- Proportion of maneuvers with distraction is calculated for each maneuver type.

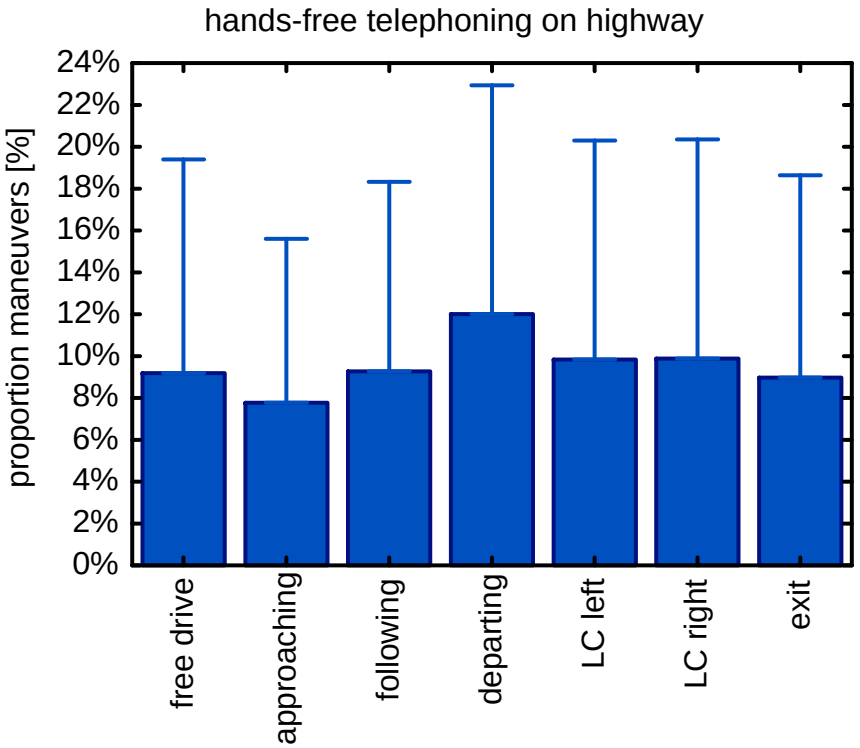
Whole database is used for analysis:

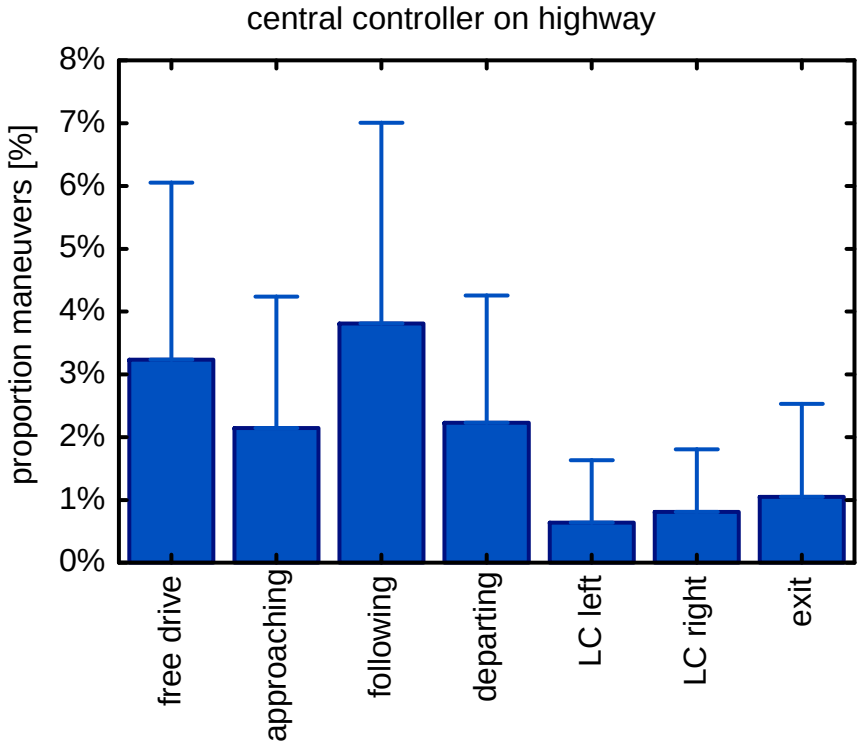
- Frequency of hands-free telephoning
- Frequency of inputs to central infotainment system (central controller)

Distinguished maneuver types



Distraction in maneuvers: highway



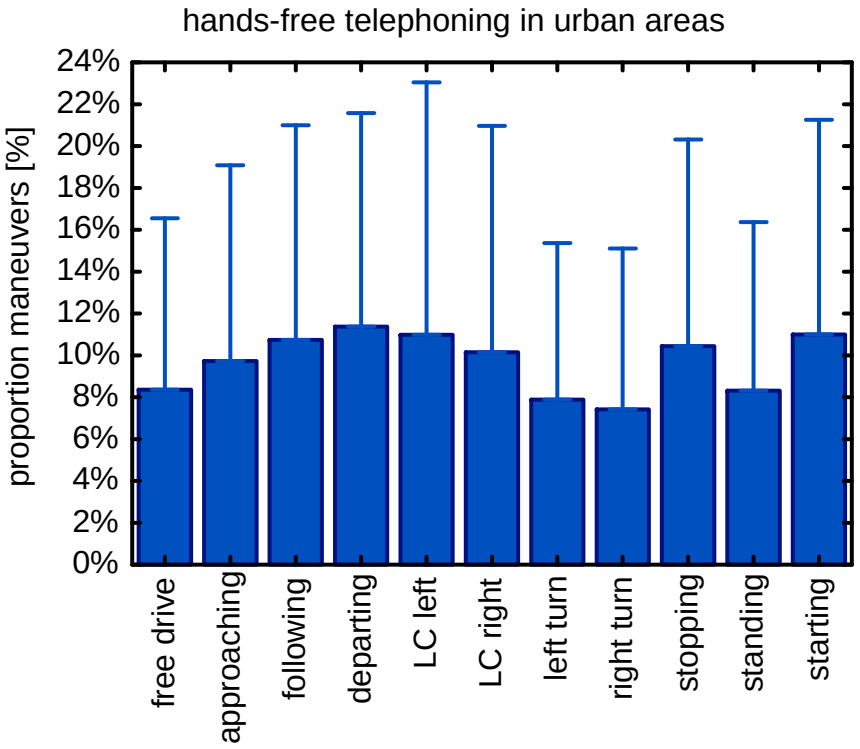


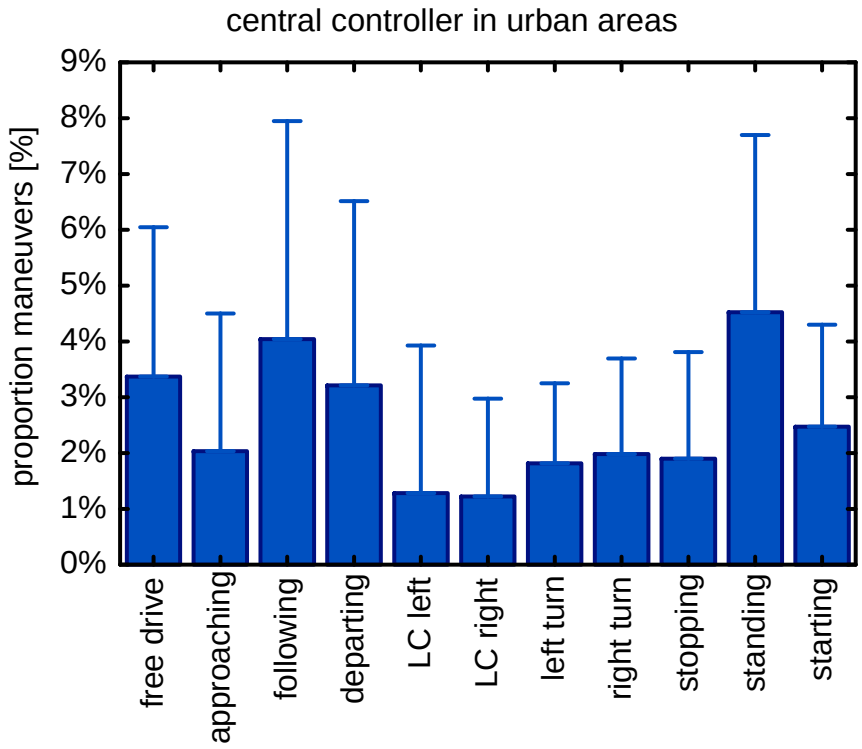
Frequency of distraction differs significantly between maneuver types:

Telephoning most frequent during departing, least frequent during approaching and exits;

Inputs via central controller most frequent during following and free drive, least frequent during lane changes and exits;

Distraction in maneuvers: urban areas





Frequency of distraction differs significantly between maneuver types:

Telephoning most frequent during starting and departing and least frequent during turning;

Inputs via central controller most frequent during standing and following and least frequent during lane changes;

Summary (1)

For German sample, most frequent secondary tasks are:

1. Interaction with passenger (35% of time if passenger is present)
2. Talking on hands-free phone (10% of time, no passenger present)
3. Handling of mobile phone and vehicle related inputs (3-4% each)

Passenger influences frequency of distraction:

- Because of passenger interaction, the overall proportion of distraction is higher in trips with a passenger present
- With passenger, frequency of other secondary tasks is significantly reduced

Mean duration of distraction varies:

- Smoking, telephoning and eating take the longest (1 ½ till 5 ½ minutes)
- Handling of mobile phone takes more than ½ minute, vehicle related inputs less than 10 seconds

Summary (2)

Driving task influences frequency of distraction:

- Distraction is more likely during low demanding maneuver types (e.g. departing, stable following, free drive).
- Distraction is less likely during complex maneuver types (e.g. lane change, exit from highway).
- Impact of maneuver type is more pronounced for more complex secondary task (inputs via central controller).

This implies that drivers attend to distracting activities in a situationally aware manner.

Any questions?

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