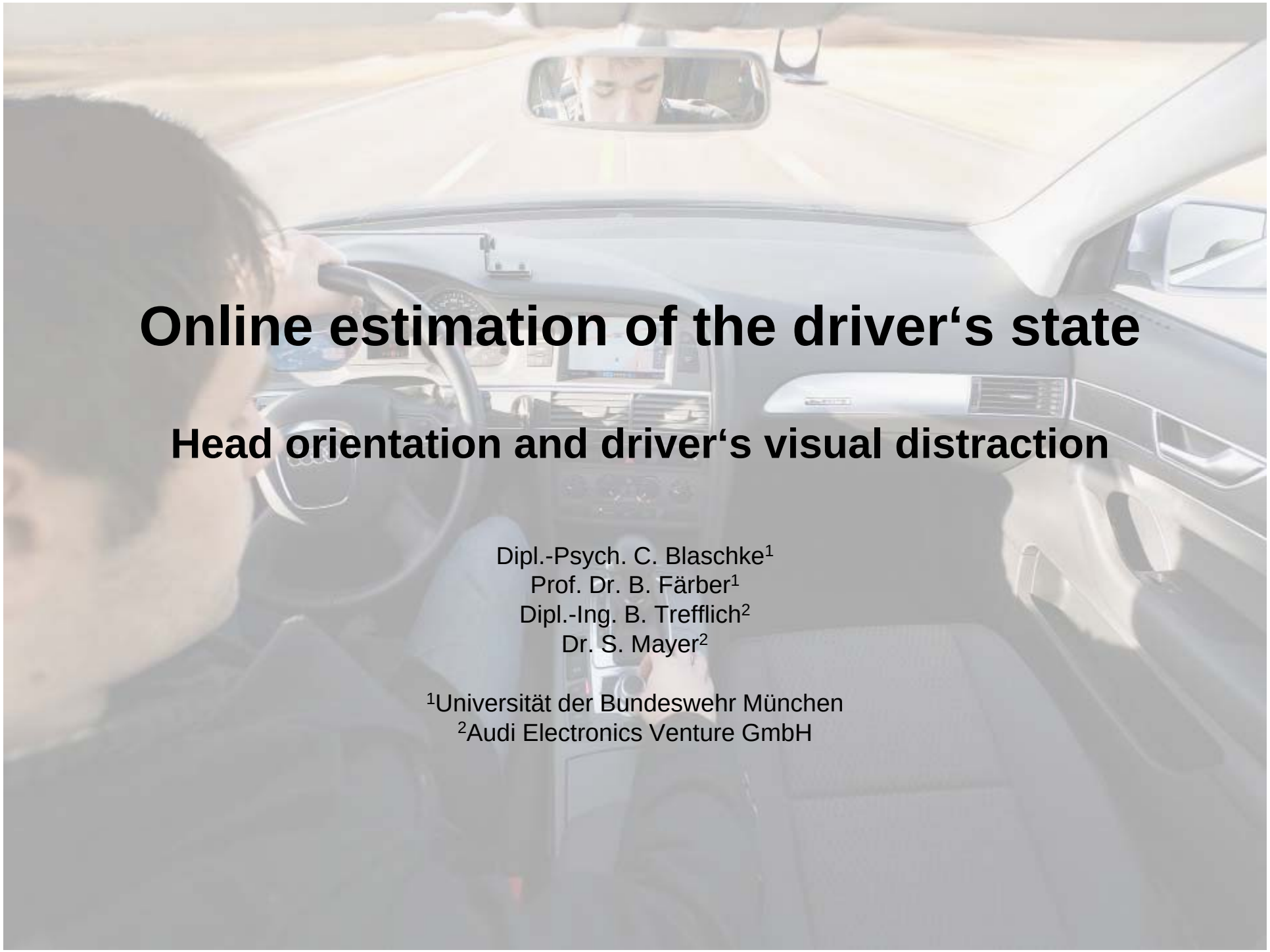

der Bundeswehr
Universität München



Online estimation of the driver‘s state

Head orientation and driver‘s visual distraction

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Problem – Lane-keeping support



- Early warnings lead to higher safety margins, but also produce more false alarms.
- Late warnings are less annoying, but the safety margin is small.

Problem – Lane-keeping support



Driver‘s state adaptive lane-keeping support:
Higher efficiency and higher acceptance
→ Online estimation of driver‘s state

Model



Perception



Cognition

Secondary task

Motor response



Monitoring driver perception



Perception





<u>Eye- vs. Head-tracking</u>

How much information about (short) visual distractions can be gained by tracking the driver's head?

- Equipment of the test vehicle
- Data collection on a (representative) route
- Set up of an head-orientation algorithm
- Evaluation of the algorithm

Test vehicle



- A6 Avant
- Facelab-System
- CAN-Bus
- Scene-Cam
- Driver-Cam



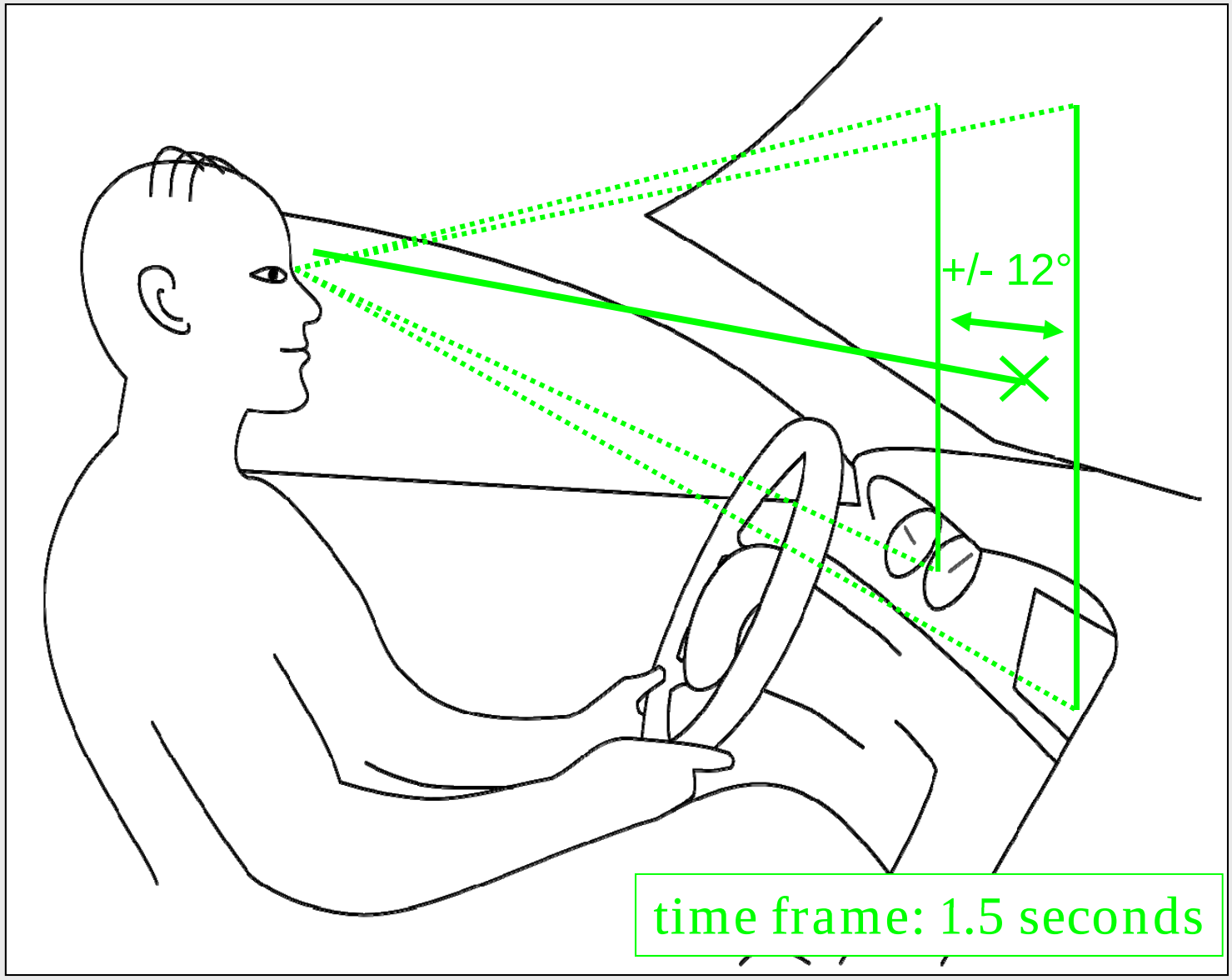


Experimental design

- 28 participants (24 – 59 years old)
- Route of 70 km
- Driving „attentively“ most of the time
- Secondary tasks:
  - IVIS-use
  - Street names

Road types	km	%
City	5,5	7,8
Small towns	16	22,5
Rural areas	31	43,7
Highway	18,5	26
Overall	71	

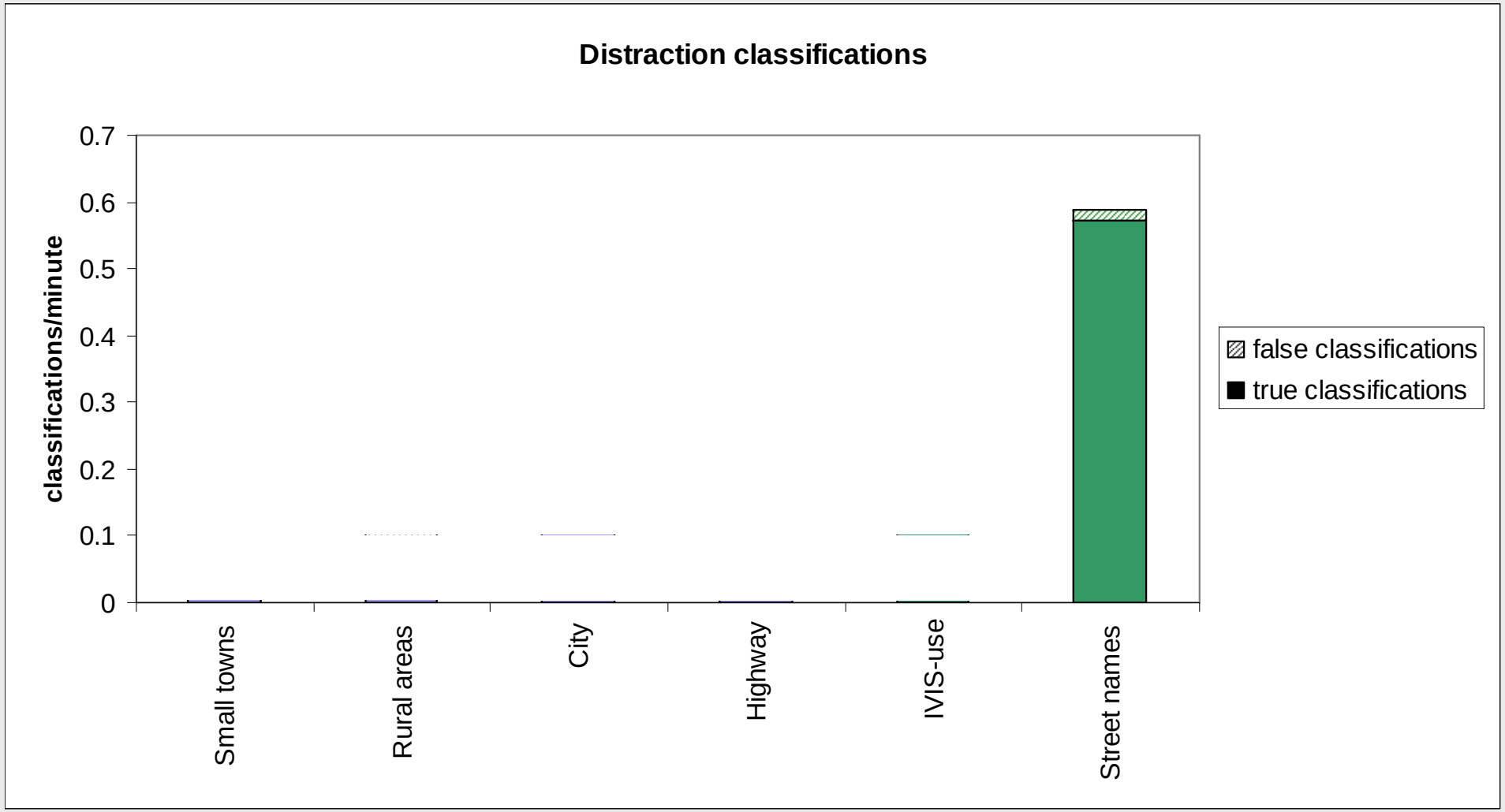
Attention-band algorithm – Illustration



Evaluation of the algorithm

- Algorithm classifies situations in which the driver is supposed to be visually distracted
  - Driver is not looking at the road ahead
    → true classification
  - Driver is looking at the road ahead
    → false classification
- Each classification was validated with the video files
- Number of classifications was relativized by exposition time
  - rural areas: more than 7 hours
  - IVIS-use: 22 minutes

Algorithm-results: +-12°, 1.5 Sec.



Example: Head-orientation during IVIS-use

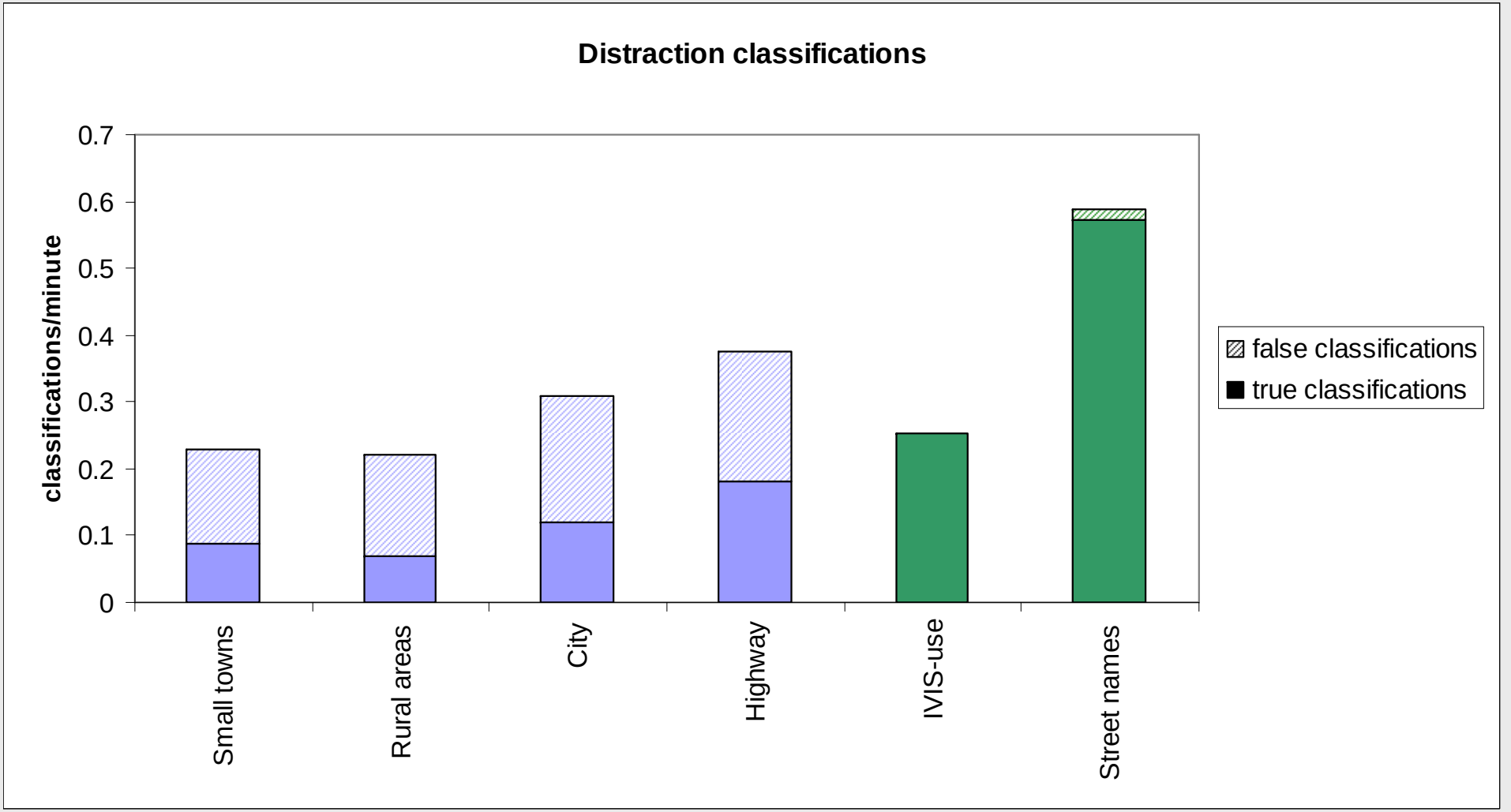
IVIS-use



attentive



Algorithm-results: +-12°, 1.5 Sec.



Discussion

- Smaller attention-band (e.g. +/-8°)

→ Many false classifications in baseline already

- Higher time limit (e.g. 2.5 seconds)
- Take distribution of head-orientation over a several seconds into account

→ Unlikely that short off-road gazes are detected

→ Algorithm not timely

→ Head-tracking does not allow for differentiated visual distraction detection

→ Eye-tracking devices are needed



Blaschke et al. (2009)



Thank you!

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