



FINDING A BETTER WAY

Issues Related to the Driver Distraction Detection Algorithm AttenD

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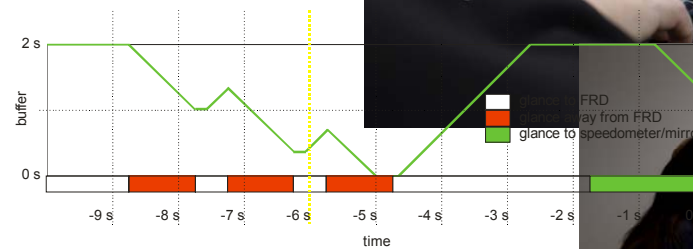
Outline of Presentation

Introduction

Driver Distraction Detection

AttenD

Discussion AttenD



Introduction

prevalence of IVIS and ADAS
increases in today's vehicles
most support systems help
when situation critical already



Photos © Katja Kircher

possible to mitigate already
before things become critical?

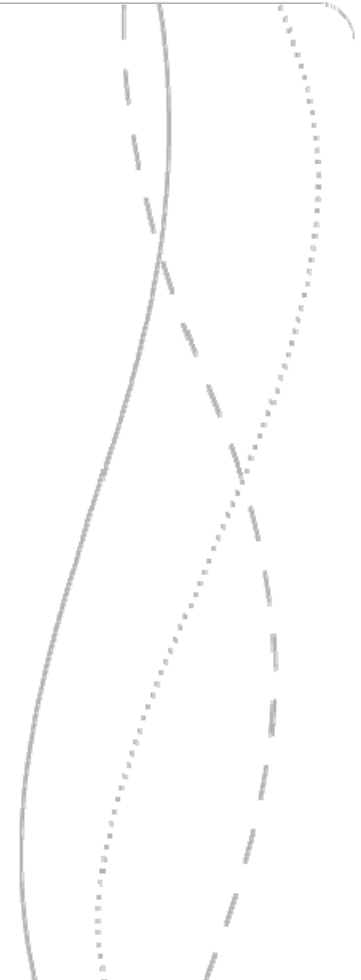
Glance Behaviour and Traffic Safety

- secondary task engagement affects driving and eye gaze behaviour
- longer glances away from road detrimental for safety
- repetitive glances away from road detrimental for safety

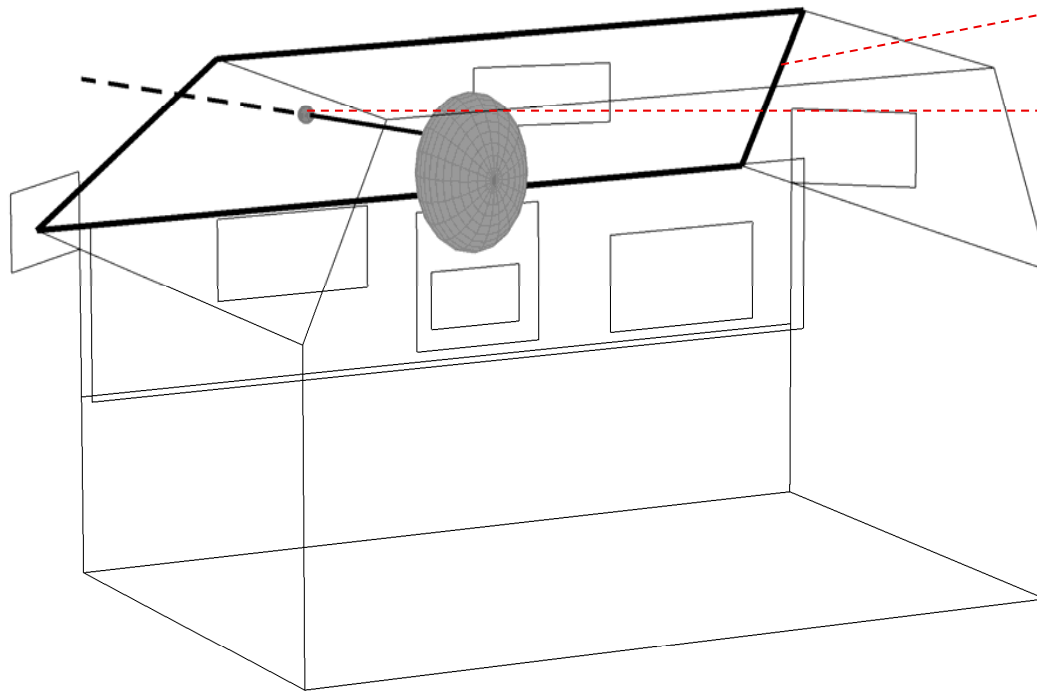


AttenD - Assumptions

- driver's attention directed towards same target as driver's gaze
- single long glances away from road as sign for driver distraction
- repeated glances away from road as sign for driver distraction
- glances to speedometer and mirror necessary for safe driving



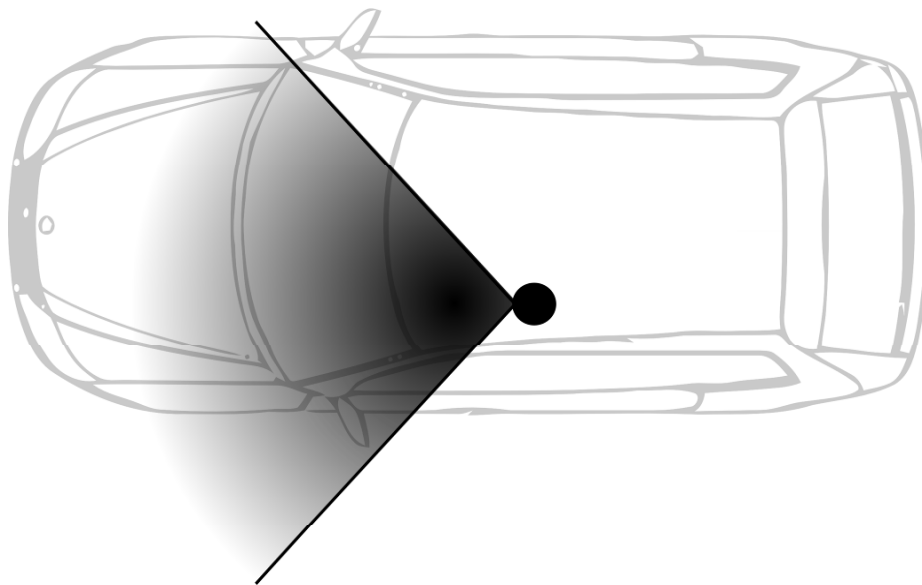
AttenD – Basic Functionality



- world model with different "zones"
- driver's gaze intersects with at least 1 zone at a time
- works on raw gaze data, not on fixations
- takes both glance and head direction into account

AttenD – FRD

"Field Relevant for Driving"



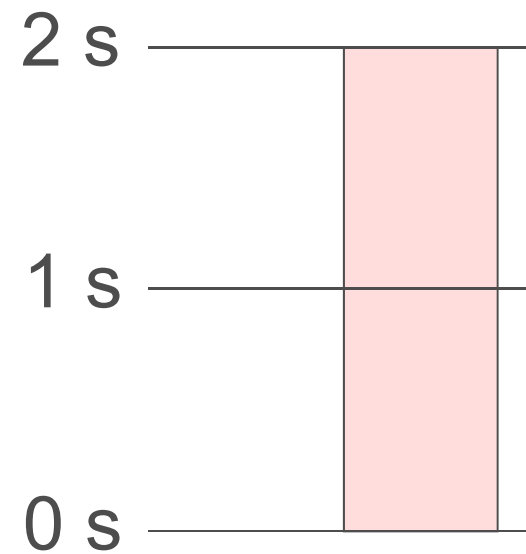
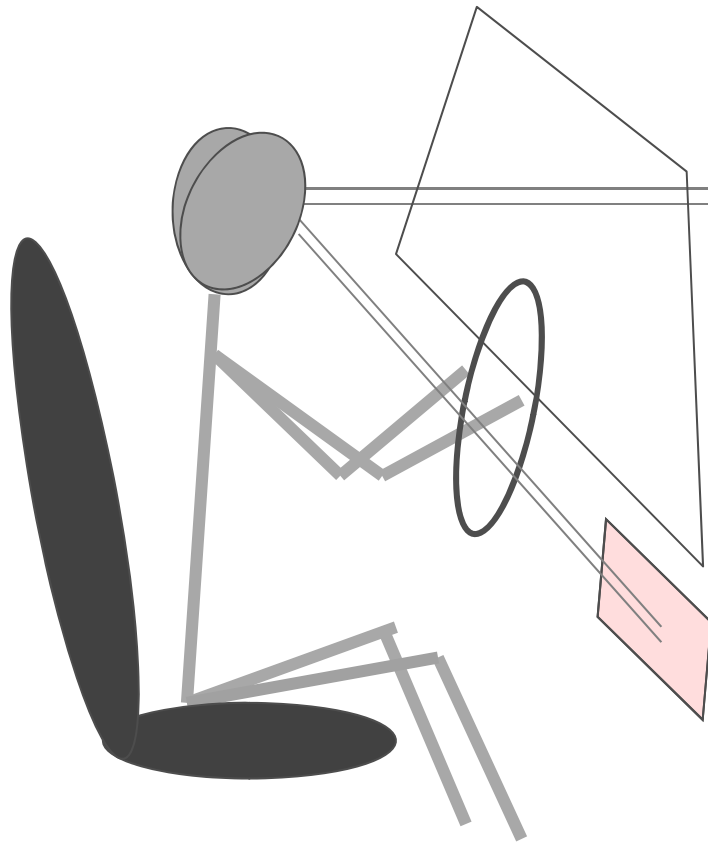
gaze direction

intersection of windows
and a cone of 90° forward
around "straight forward"

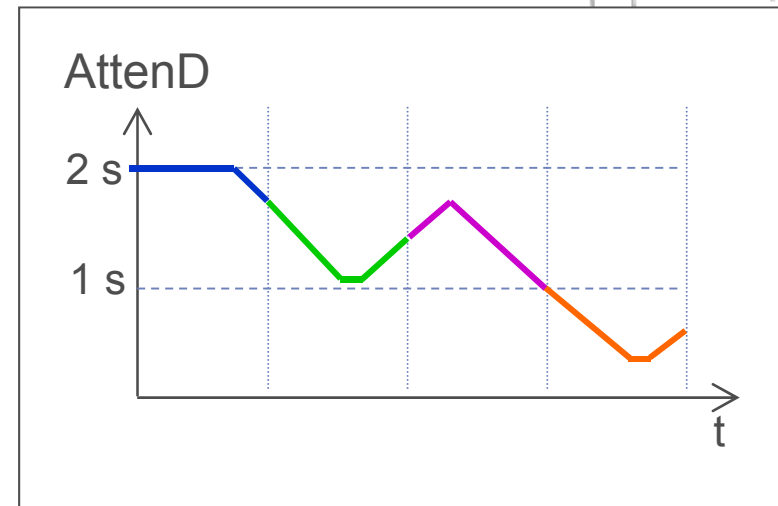
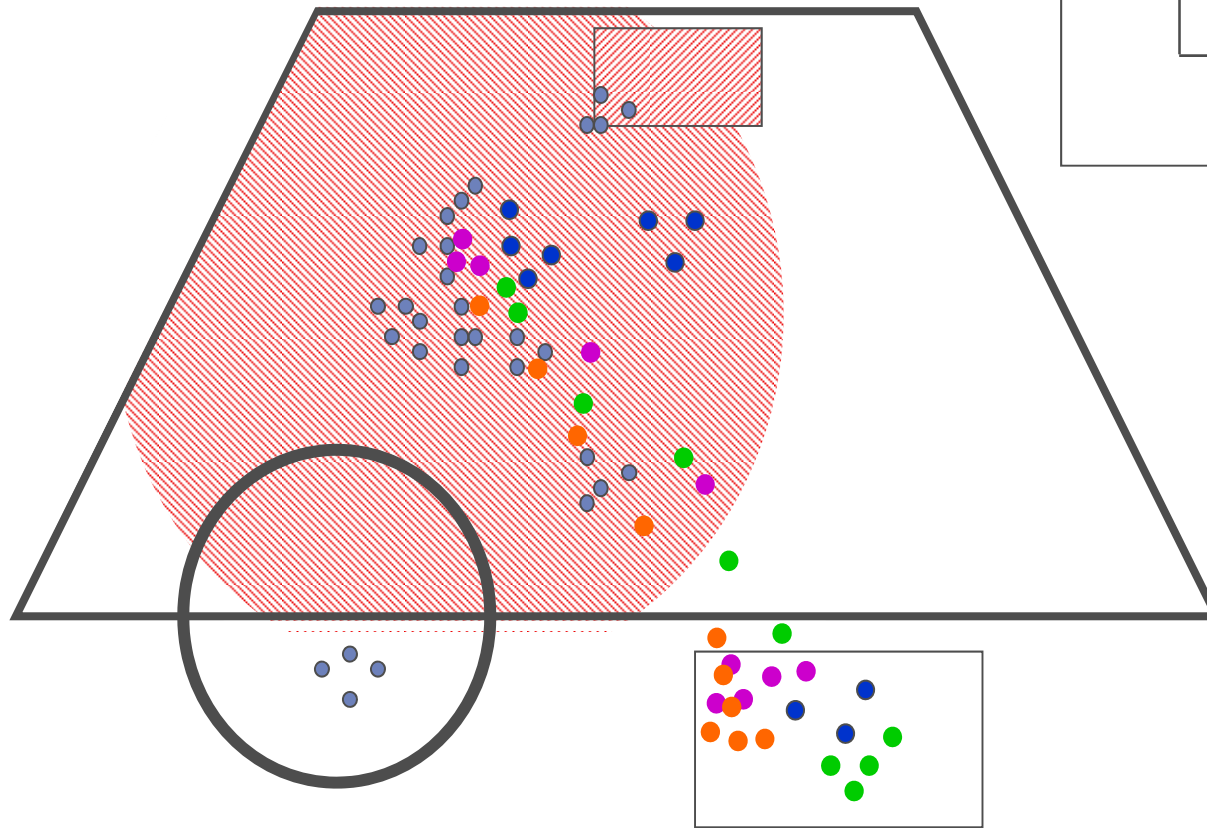
head direction

90° forward, except
downward limit at 22.5°

AttenD Algorithm



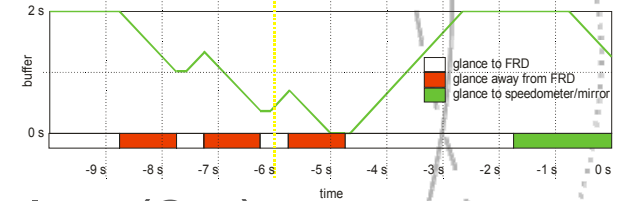
Explanation of Analysis



AttenD – Eye Tracking Available

eye glance inside FRD

- buffer increases in real time up to max value (2 s)
- latency phase for physiological/psychological adaptation (0.1 s)



eye glance outside FRD, not on mirror/speedometer

- buffer decreases in real time down to 0 s
- no latency phase

eye glance on mirror/speedometer

- buffer remains at current value for average glance time (1 s)
- after this, buffer decreases in real time

AttenD – FRD

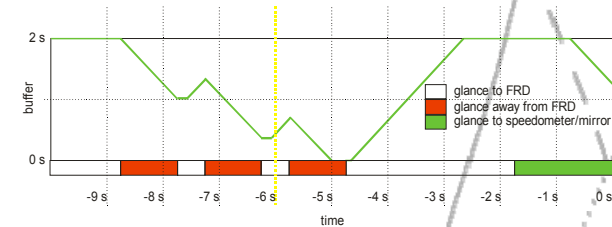
Time Buffer – No Eye Tracking

head tracking available

- simplified FRD is used
- no zones for head tracking
 - no mirror/speedometer differentiation

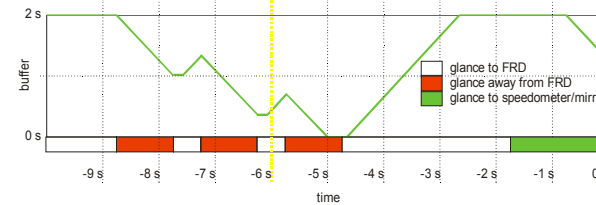
all tracking lost

- last tracked head direction within a maximum angle (20°)
 - buffer remains at current value
- last tracked head direction outside of this angle
 - buffer decreases in real time



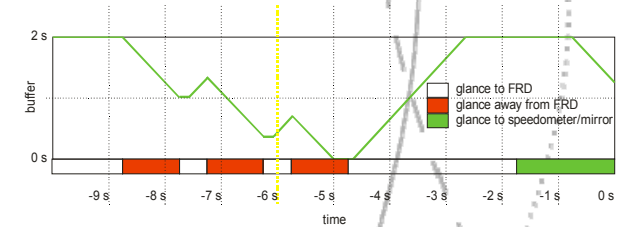
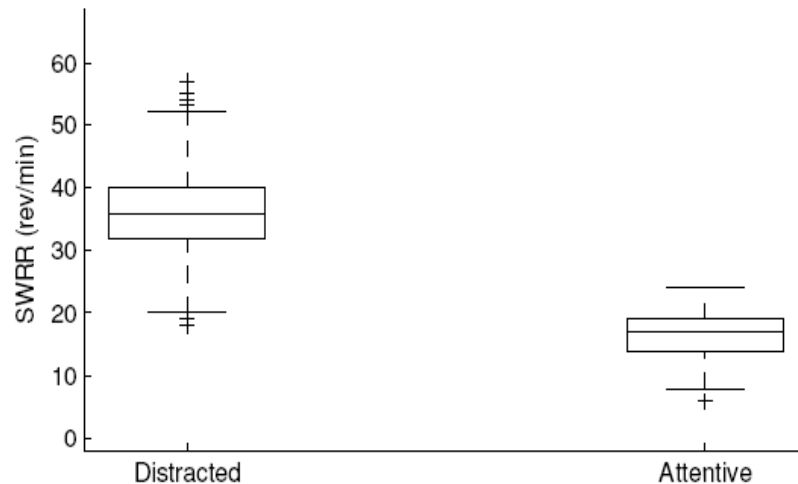
AttenD – Discussion

- World model as basis →
≥ 2 fixed cams needed
- Head direction not a sensitive substitute for gaze
- Raw gaze data – saccades included, but construction of fixation algorithm avoided
- Buffer size of 2 s – reasonable?
- Increments and decrements in real time (adjust to experience, complexity, glance angle, ...?)
- Prolonged visual time sharing accounted for
- Capability to react to sudden changes in attention



AttenD – Algorithm Modifications

- further input sources, e. g. CAN?
(SWRR varies with "AttenD-distraction")



- further input variables (saccade speed, saccade distance, ...) → include cognitive distraction?
- adaptation of different AttenD features to local situation?

Conclusions

- AttenD is a promising algorithm with built-in flexibility
- AttenD has the potential to detect both short term and more long term distractions
- Adaptation to an environment without world model is possible



Further Questions?

For further questions on the study contact

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