

Augmented Reality Head-Up displays and digital rear view mirrors in cars

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• Safe ChauffeuRs in safe and hEalthy multimodal drivEr information eNvironmentS (SCREENS II)

VOLVO

- Successor of SCREENS which finished March 2023 (RISE and Volvo Cars)
- Overall goal: To develop methods, tools and guidelines as well as knowledge and understanding in creating road-safe and healthy digital information environments for the drivers.
- Three-year project, from 1 Sept. 2023 to 31 Aug. 2026
- Coordinator: RISE
- Partners: Volvo Cars, AB Volvo, Scania and Smart Eye



VOLV

smart eye

SCREEN II: Motivation



RI. Se

SCREEN II: Motivation



- Volvo XC60 equipped with an AR-HUD
 - Can give information both near-field (2 m) and far-field (8 m)
- Two routes in Gothenburg, Sweden, was used
 - 7 km away and almost the same way back
 - Each route about 10 min driving
 - The route included highway driving as well as small city/community driving

- First part navigation guided by AR-graphics
- Second part traditional turn-by-turn navigation in near-field
- The drivers were invited to come to the test car
 - They were given instructions and signed a consent form
- The driver were video recorded during the driving

- 15 drivers participated
 - 4 female and 11 males (24 to 56 years old, average age was 39)
 - At least 7 year driving experience
 - Driving at least 2 hours/week
 - Regularly used navigation
 - Most participants had used HUDs before, and four had used AR-HUD



User study on AR-HUD: Results



A two-sided paired Student T-test are statistically significant (p < 0.0001)

AR-HUD: Conclusion

- Information in the far-field i.e. AR-HUD gives:
 - More time with eyes on the road
 - Considered as increasing safety



User study on CMS

- How does Field-of-View (FOV) and camera height in CMS influence drivers' distance judgement with regard to rearward vehicles?
- How does FOV and camera height in CMS influence drivers' gap selection in potentially dangerous driving situations?
- Two cases tested.
 - Distance judgement
 - Last Safe Gap (LSG)



User study on CMS





User study on CMS: distance judgement

High Low 40 degrees 76 degrees 112 degrees

CMS: Distance judgement



CMS: Last Safe Gap



CMS: Lab set-up



RI. Se

CMS: participants

- 27 participants
 - 9 female and 18 males (23 to 64 years old, average age was 38)
 - At least 1 year driving experience

CMS: Results



- Relativ estimation error for different Field-of-View
- Negative values underestimation of distances
 - Differences significant

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- Time-to-contact for different Field-of-View given from Last-Safe-Gap
- Differences significant

CMS: Conclusion

- Height and Field-of-View investigated
 - Field-of-View had a significant impact smaller FOV increases margins and increase safey
 - Height no found effect



Thank you!

VINNOVA

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