

Effects of different AR-HUDs visual forms on young drivers' attention in urban and motorway scenarios

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ABSTRACT

Existing Augmented Reality Heads-Up Displays (AR-HUDs) technology often leads to visual ambiguities, yet there's limited research on AR-HUDs with varied visual designs. This study specifically focuses on young drivers, examining the impact of both dynamic and static visual forms on their level of distraction in urban and motorway driving environments.

INTRODUCTION & BACKGROUND

In vehicular driving, attention, particularly visual attention, is crucial for safety. AR-HUDs overlay driving information onto the driver's view, enhancing visual attention management. However, striking a balance between providing visual information and maintaining driver focus with AR-HUDs is a challenge. My study investigates the impact of static and dynamic AR-HUDs on driver attention across various driving settings. Through simulated tests, this research offers design recommendations for future AR-HUD interfaces.

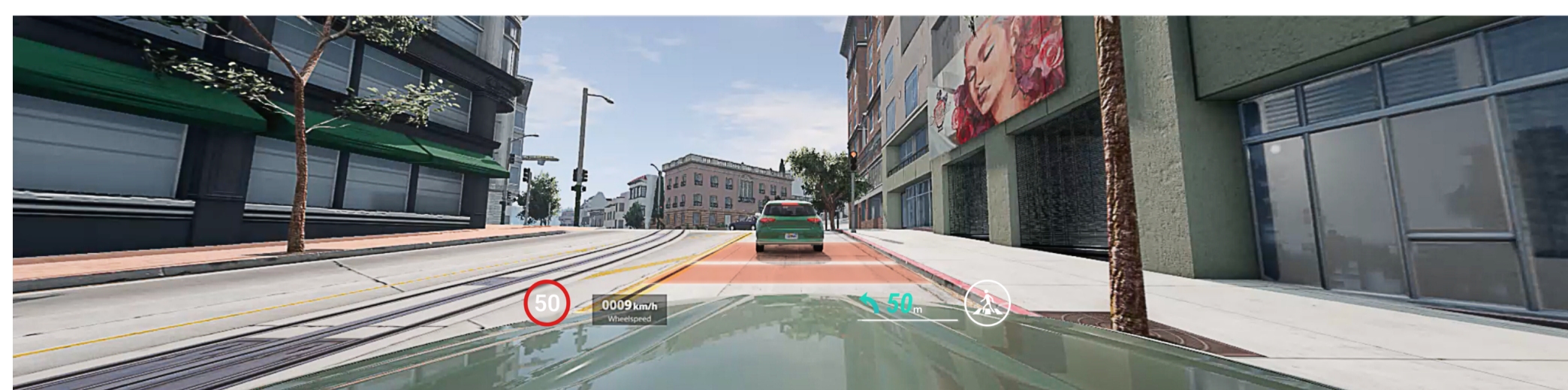
DIAGRAM / DESIGN



- ▶ Lane change instruction in motorway (Dynamic AR-HUDs)

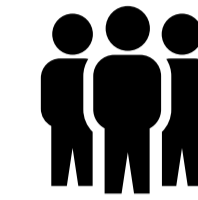


- ▶ Potential obstacles alert in urban road (Static AR-HUDs)



- ▶ Safe distance reminder in urban road

STUDY METHODOLOGY



7 participants, aged from 20 to 30 and each had a driver's license and driving experience



Experienced all three HMI designs scheme (No HUD, Static AR-HUDs, Dynamic AR-HUDs) guiding participants from urban road to motorway



Recorded the gaze behavior by Tobii Pro Glasses 3



Collected participants' perceptions from post-test questionnaire

TESTING & EVALUATION

The percentage of dynamic AOIs (Area of Interest) fixation time and responses from questionnaires were evaluated across 5 sub-task sets to determine visual distraction levels. Using a paired-sample T-test analysis, one data set was found to significantly influence the results.

For evaluating participants' situation awareness, I collected mean fixation time, fixation counts, time for first fixation in dynamic AOIs, and driving performance from another 7 sub-task sets. This analysis identified one data set with a notable impact.

Nonetheless, the statistically significant findings of this study pertain solely to urban driving scenarios. Given the inherent simplicity often associated with motorway driving contexts, future research will integrate more complex tasks into motorway scenarios for comprehensive evaluation.

Additionally, the conclusions reached in this study are constrained due to the limited sample size. Future studies will aim to recruit more participants to enhance the statistical reliability of the data.

RESEARCH RESULTS

To reduce driving distractions and enhance safety, in the future design of AR-HUDs for urban scenarios, designers can consider using static visual elements to help drivers acquire information about the external driving environment, and dynamic visual effects to help drivers identify and anticipate potential risk factors, focusing driver visual attention on the AR-HUDs.