Comparing Heads-Up and Heads-Down Display Augmented Reality Navigation

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1. Problem:

Augmented reality (AR) in-vehicle navigation devices are becoming increasingly popular, yet little is known regarding their effect on driving performance and safety.

2. Goal:

Comparing the effects of heads-down display **(HDD) AR navigation devices** [state of the art, commercially available]

with

Heads-up display **(HUD) AR navigation devices** [future technology, not commercially available]

3. Hypotheses:

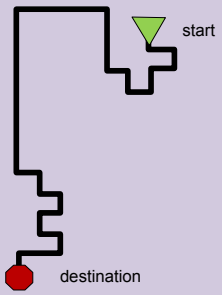
- HUD AR navigation devices will provide for better visual attention and driving performance as compared to HDD AR devices

4. Experiment design and procedure

Independent variable
- *within-subjects factor*: personal navigation aid type (HUD or HDD)

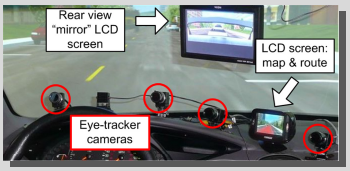
Dependent variables
- *percent dwell time on outside world*
- *subjective assessment*
- driving performance metrics

Driving scenario
- two lane city road
- traffic
- pedestrians
- unexpected events

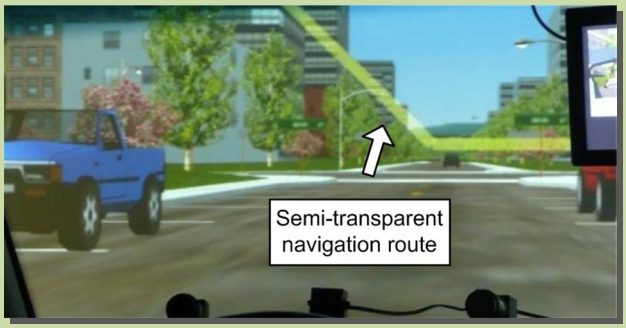


5. Research method

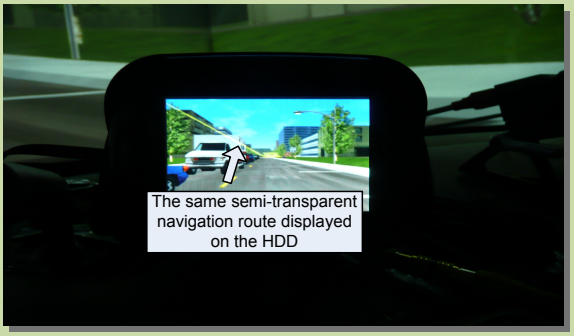
Apparatus
- High fidelity driving simulator: 180 degree view, motion platform, realistic visuals, sounds and vibration



- Eye-tracker mounted on simulator dashboard



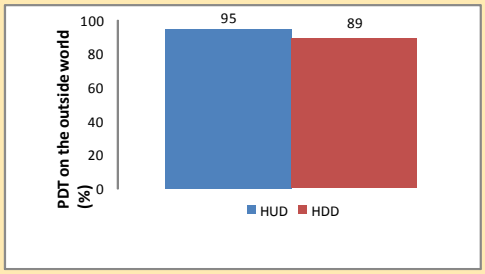
HUD AR



HDD AR

6. Results

Visual attention - After analyzing data for 1 participant:



Acknowledgements
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