Towards an Immersive Driving Simulator to Study Factors Related to Cybersickness

R. Venkatakrishnan  
Clemson University

A. Bhargava  
Clemson University

K. M. Lucaites  
Clemson University

M. Volonte  
Clemson University

Follow this and additional works at: https://tigerprints.clemson.edu/grads_symposium

Recommended Citation

This Poster is brought to you for free and open access by the Student Works at TigerPrints. It has been accepted for inclusion in Graduate Research and Discovery Symposium (GRADS) by an authorized administrator of TigerPrints. For more information, please contact kokeefe@clemson.edu.
Towards an Immersive Driving Simulator to Study Factors Related to Cybersickness


*School of Computing, *Department of Psychology

INTRODUCTION
What makes a good cybersickness testbed great? In this work, we discuss the characteristics of a realistic immersive virtual reality driving simulator developed to study cybersickness. The simulator’s feasibility was evaluated by conducting a preliminary study. Results suggest that our platform is reliable and robust.

SYSTEM CHARACTERISTICS

Multisensory Feedback
- Proprioceptive Feedback
- Passive Haptic Feedback
- Visual Realism
- Translational Audio Feedback

High-fidelity Virtual Environment
- Life-sized environment (Figure 2)
- 120 block city radius
- Gender-matched arm-length scaled self-avatar
- Legible street, speed limit and stop signs (Figure 4a)
- Realistic dynamic car properties like acceleration, braking, torque, etc.
- Concentric arrangement for uniform optic flow (Figure 3)

Data Collection
- Optic Flow Experienced - Head Sway
- Electrodermal Activity Level - Driving Statistics
- Heart Rate, BVP - Periodic Comfort Rating

PILOT STUDY
- Participants drove around the city in a virtual car using the steering wheel for a maximum of 30 minutes.
- They were tasked with finding the landmarks presented on the car screen (Figure 1c).
- The task was added to encourage participants to experience more optic flow and keep them engaged.
- Participants filled out the SSQ and provided qualitative feedback about their experience and the simulation.

PRELIMINARY ANALYSIS
- A paired samples t-test revealed significant differences in pretest ($M = 5.24$, $SD = 7.45$) and posttest ($M = 65.33$, $SD = 31.67$) SSQ total scores ($t(14) = 6.82$, $p < 0.001$), indicating that subjects got sick on experiencing our simulation.
- Participant comments described our simulation as lifelike, realistic, engaging and fun. See comments below.

PILOT STUDY
- Participants drove around the city in a virtual car using the steering wheel for a maximum of 30 minutes.
- They were tasked with finding the landmarks presented on the car screen (Figure 1c).
- The task was added to encourage participants to experience more optic flow and keep them engaged.
- Participants filled out the SSQ and provided qualitative feedback about their experience and the simulation.

PRELIMINARY ANALYSIS
- A paired samples t-test revealed significant differences in pretest ($M = 5.24$, $SD = 7.45$) and posttest ($M = 65.33$, $SD = 31.67$) SSQ total scores ($t(14) = 6.82$, $p < 0.001$), indicating that subjects got sick on experiencing our simulation.
- Participant comments described our simulation as lifelike, realistic, engaging and fun. See comments below.

"I feel like I'm actually here! I've actually seen this landmark in Washington DC, and it looks the same!"
"Everything looks so real and life-like. Is this based on a real place? Really cool!"
"I want to find all the landmarks. This is so fun and engaging!"
"This actually feels like a real car. The way it moves, stops, turns and stuff is super realistic!"
"I feel like I'm actually here! I've actually seen this landmark in Washington DC, and it looks the same!"
"This is awesome. It feels so real!"
"Woah, it feels like I'm really driving in here. If I crash, will it actually hurt? I better drive carefully in here!"
"These feel like my actual arms. Amazing!"

#060