Validity of visualization methods in driving simulation.

Master‘s Thesis of Vladislav Andreev

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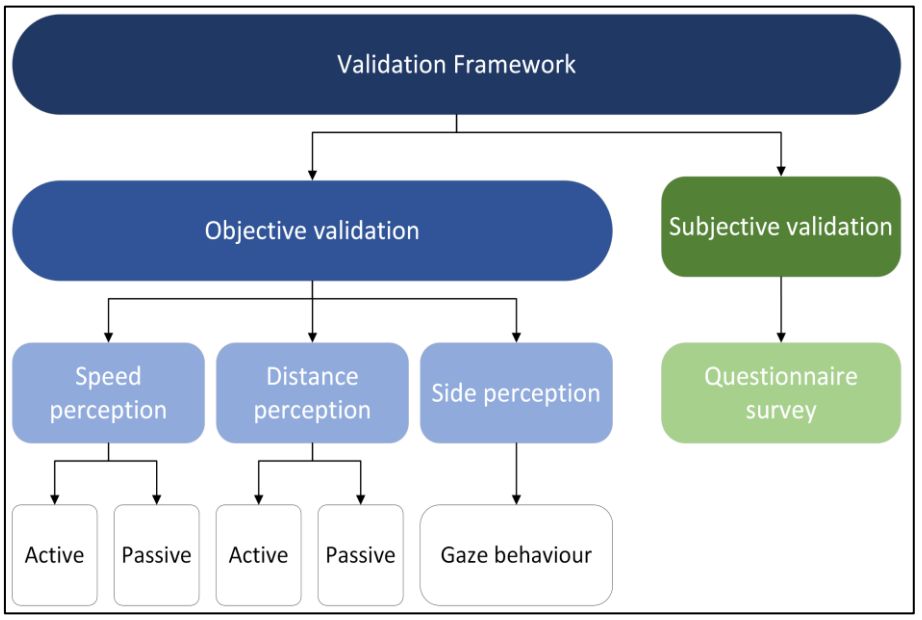
Display hardware technologies have undergone rapid development throughout the past decades. Enabling the emersion of head-mounted display (HMD) applications, including driving simulation. The HMD has the potential to be a highly immersive and flexible research tool, yet it does not come without shortcomings. A limited field of view and the presence of evidence that HMD contributes to simulator sickness presents an opportunity for a different kind of display system to be utilised as a more suitable solution for research purposes. Such a system is a wall of light-emitting diodes (LED wall), commonly used in the advertisement and entertainment industry it has the potential to overcome the shortcomings of an HMD system, as a highly immersive display system capable of providing a broad field of view.

The following hypotheses were underlying the thesis:

1. HMDs differ from LED walls regarding perception.
    1. HMDs provide better speed perception.
    2. HMDs provide better distance perception.
    3. HMDs provide worse side perception.
2. HMDs induce a higher sense of presence than LED walls.
3. HMDs induce more simulator sickness than LED walls.



The present study attempts the first-ever comparison of the presented state-of-the-art visual systems, utilizing a repeated measures-design study with 31 participants. Implementation of Bayesian hypothesis testing demonstrated the equivalence of visualization systems in sense of presence, induced simulator sickness, distance and speed perception, making them interchangeable for research connected with set measures. However, the LED wall outperformed the head-mounted display inside perception, and thus the LED wall is the visual system to use for driving tasks connected with side perception.