

Checklist for verification of correct calibration

This document refers to: Schöner HP, Schmieder H, Chardonnet JR, Colombet F, Kemeny A (2022).

Verification of Stereoscopic Projection Systems for Quantitative Distance and Speed Perception Tasks.

Driving Simulation Conference, Strasbourg.

The extended version can be downloaded at

<https://driving-simulation.org/activity-domains/Stereoscopy and distance perception>

Simulator facility	
Nominal screen distance / geometry	cm
Date	
Experiment	
Test person #	
in situ eye distance from screen d	cm
in situ eye height e	cm
Interpupillary distance IPD = b	mm
brightness of the image	LUX (by light meter)

frequency of inspection:

- for every single participant

- for new installation or revision

useful tools:



options:

- direct measurement
- verification test number

Test No.	frequency of inspection	subject	feature	influence on	to be checked	method of verification (see reference text)	OK ?	test objects	sketch of test scene
1	The verification should be performed for every single participant of a simulator test drive.	correct location of the observer's eye point	a real-world horizon is always (automatically) on eye level. Eye point must be in nominal screen distance.	monocular and binocular distance cues	Measure the height of the horizon (or of the reference edge) above the horizontal ground plane. Both should have the same value as the eye height (v) of the observer above ground plane. Adjust seat height to fit. Alternative: Match eye level with the horizon marker on the windshield (or the levelling light) and horizon on the screen. Adjust seat height to fit. Verify observer's eye distance from the screen by comparing with a marker when observing the person from the side. Adjust longitudinal seat position / inclination to fit.	Test #1	<input type="checkbox"/>	virtual object with a distinct reference edge at projection eye level (e), with its front located in screen distance. • Permanent markers on the windshield at the projection eye level • projected markers by levelling light beamer adjusted to projection eye level, beaming from the side to the face of the observer; this can be judged by an outside operator, or by the observer himself, looking into a mirror. • projected or physical marker of correct eye position in longitudinal direction.	
5	The verification should be performed for every single participant of a simulator test drive.	stereoscopic convergence	several reference points located far away , roughly in forward direction should be seen with parallel eyes the left and right images of lines extending from the observer towards the horizon should converge in front of and diverge beyond the screen	binocular distance cues	Squint angle zero is attained, if projected distance on the screen of L/R images is equal to IPD of the observer for <i>distant</i> objects. Correct IPD setting, if necessary. road markings on the road ahead should converge in front of the screen distance, should cross at screen distance, and diverge beyond screen distance; in the far distance they should not diverge to more than the IPD of the observer The observer is expected to perceive an object on the horizon as far outside of the simulator room. The screen itself should turn invisible in stereoscopic mode. For objects beyond the screen distance, the right image should be farther to the right.	Test #5	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	distant objects (close to the horizon) in the virtual world, and straight lines on the ground plane from the observer towards the horizon	<p>For objects close to the horizon, the disparity between left and right image should be equal to individual interpupillary distance (IPD). Measure between reference edges!</p> <p>Corresponding lines in left and right images should intersect in distance of the screen.</p>
7	The verification should be performed for every single participant of a simulator test drive.	grasping distance	The ability to grasp a real object based on the visual direction and distance cues (without help of any haptic cues) uncovers incorrect calibrations of individual body measures in the near field	binocular distance cues	virtual object in reaching distance can be grasped at the location where it is expected from its visual appearance in a stereoscopic display. The observer should be able to grasp the knob or touch the screen at the correct location on the first try.	Test #7	<input type="checkbox"/>	a real object (gear shift knob, touch screen) in reaching distance, and displayed equivalently in the virtual world on the stereoscopic display	