

In-Vitro Study of the Accuracy of Holograms Using Augmented Reality Headset HoloLens 2 and Different Trackers

Objectives: Evaluate the accuracy of holographic image projections onto a dental model using different trackers.

Materials and methods: An application has been developed for the "HoloLens 2" device that allows users to see holograms in a specific location in real time. To improve precision, an "L"-shaped tracker with contrasting stickers was produced and compared to the "Navident" dynamic navigation tracker. For calibration purposes, a pen with a cube containing contrasting stickers was created. A study was conducted to assess the accuracy of hologram projection during calibration.

Results: The average angle between the positions of the marked points during calibration and the fixed points' positions in the hologram value using the "Navident" tracker is 5.06 degrees higher than using the "L" shaped tracker. All distances between the points are statistically significant ($p < 0.05$). The average values of pen oscillation were evaluated in four-point positions during the calibration: the most accurate point average (0.57 mm) was achieved using the "L" shaped tracker, while the fourth point achieved the highest point precision average (2.15 mm) using the "Navident" tracker.

Conclusion: A holographic image is more stable when using a tracker that is angled and covered with a distinctive, non-repeating geometric pattern in contrasting colours. Calibration is an important procedure for the accuracy of the holographic image's position on the real object.