

## Holographic Visualisation of 3D Point Clouds in Real-time Measurements: A Proof of Concept Study

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**Abstract :** Background: Holograms are 3D images formed by the interference of light beams from a laser or other coherent light source. Pepper's ghost is a form of hologram conceptualised in the 18th century. This Holographic visualisation with metrology measuring techniques by displaying measurements taken in real-time in holographic form can assist in research and education. New structural designs such as the Plexiglass Stand and the Hologram Box can optimise the holographic experience. Method: The equipment used included: (i) Zeiss's ATOS Core 300 optical coordinate measuring instrument that scanned real-world objects; (ii) Cloud Compare, open-source software used for point cloud processing; and (iii) Hologram Box, designed and manufactured during this research to provide the blackout environment needed to display 3D point clouds in real-time measurements in holographic format, in addition to a portability aspect to holograms. The equipment was tailored to realise the goal of displaying measurements in an innovative technique and to improve on conventional methods. Three test scans were completed before doing a holographic conversion. Results: The outcome was a precise recreation of the original object in the holographic form presented with dense point clouds and surface density features in a colour map. Conclusion: This work establishes a way to visualise data in a point cloud system. To our understanding, this is a work that has never been attempted. This achievement provides an advancement in holographic visualisation. The Hologram Box could be used as a feedback tool for measurement quality control and verification in future smart factories.

**Keywords :** holography, 3D scans, hologram box, metrology, point cloud

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