Docket #: S19-059

Improved Virtual-to-Real Alignment for Augmented Reality

Researchers at Stanford have developed a software application solution to the spatial computing problem of aligning virtual content to the real world. Medical augmented reality (AR) applications require accurate alignment, for example to visualize a brain MRI rendering on a patient's head, or a bone on his/her real leg. Currently, most alignment methods rely on tracking the real-world object, transformation of the real-world pose into the virtual object space and then rendering of the virtual object at the transformed location. But this process is subject to variations among AR operators and often leads to imperfect alignments, making the overlay inadequate for medical AR and other applications that require precision. The new method is based on the placement of virtual 'fiducials' around a real-world object. Placing the fiducials exactly at the positions where the user perceives certain real-world locations can correct any misalignments with the content on the AR display.

Stage of Development
The new tool has been deployed at the Stanford School of Medicine for AR neuro-navigation in Transcranial Magnetic Stimulation (a type of non-invasive brain stimulation used to treat depression, for example). The method has shown accuracies of within 5mm for locating areas of interest in the brain using an AR display.

Applications

- Medical AR
    - Transcranial magnetic stimulation (TMS)
    - Motor threshold estimation
    - Stroke/aphasia rehabilitation

    - Registration of a body avatar or volumetric medical imaging data to a real-world body for surgical planning and navigation
- Non-medical applications such as registration of equipment during assembly/maintenance tasks

Advantages

- Highly accurate
- Elegant solution

Publications

- S. Sathyanarayana, C. Leuze, B. Hargreaves, B. Daniel, G. Wetzstein, A. Etkin, M.T. Bhata, J.A. McNab Comparison-of-head-pose-tracking-methods-for-mixed-reality-neuronavigation for transcranial magnetic stimulation Proceedings SPIE Medical Imaging 2020.

Patents

- Published Application: 20200342675
- Issued: 11,024,096 (USA)

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