WEARABLE STEREOSCOPIC AUGMENTED REALITY SYSTEM FOR MEDICAL PROCEDURES

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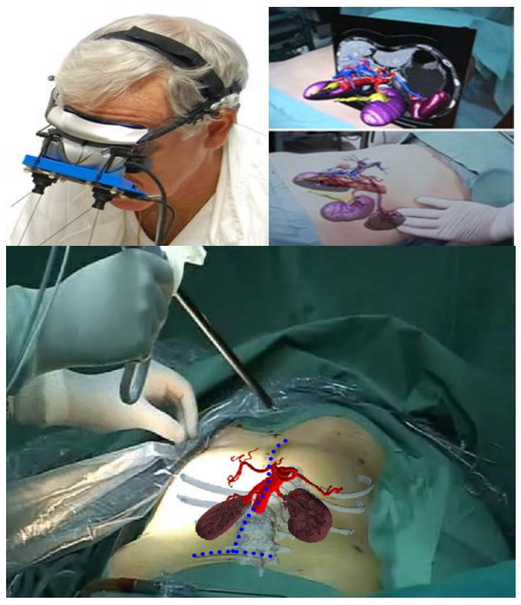
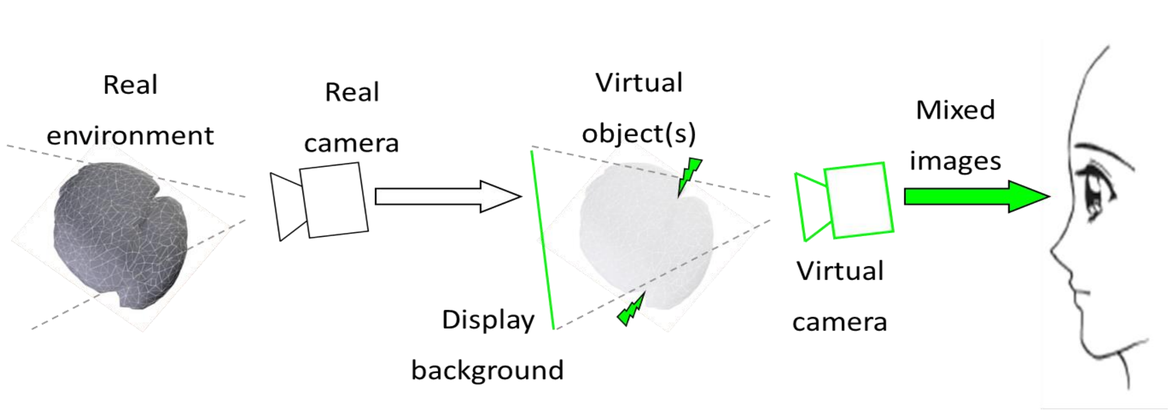
ABSTRACT: Aim of my research project is to optimize and validate a newly designed, localiser-free, stereoscopic head-mounted system featuring augmented reality (AR) as an aid to several surgical procedures. AR may provide physicians with a direct perception of where virtual anatomies are located within an actual scene and may constitute a functional and ergonomic integration between navigational surgery and virtual planning. In a preliminary study we demonstrated the potential utility of the proposed system for the freehand external guidance of endovascular magnetic carriers.

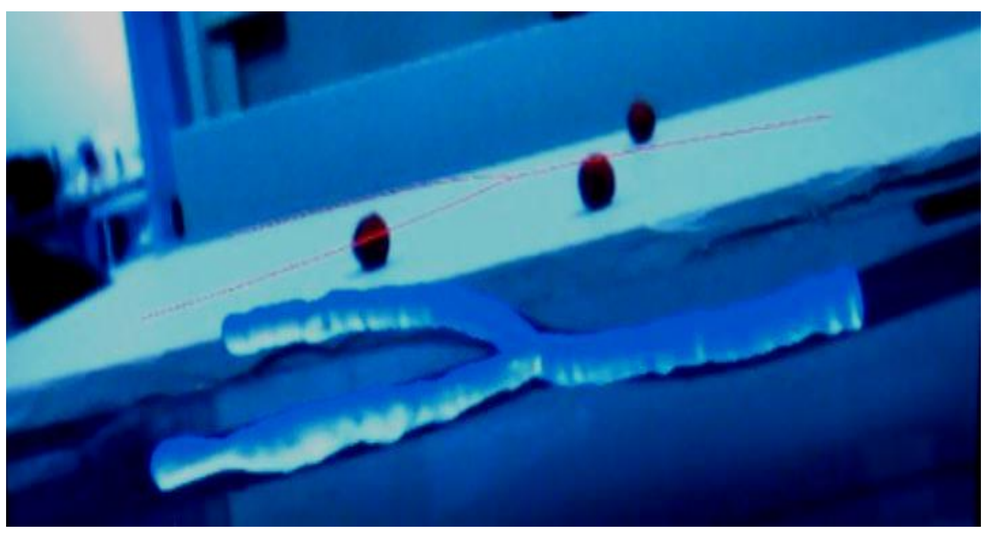


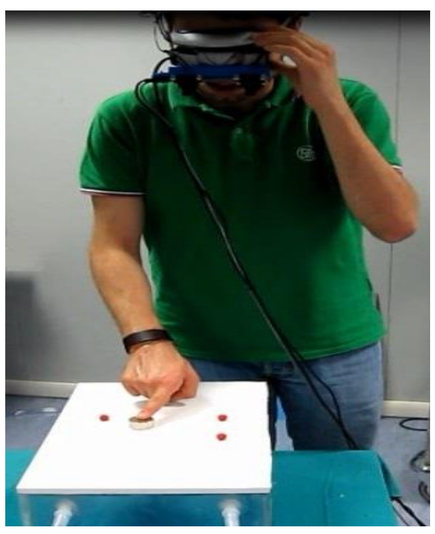
Augmented Reality (AR) in medicine allows merger of real views of the patient with virtual information generally consisting in patient specific 3D models of the anatomy extracted from medical dataset. AR is intended to provide physicians with a direct perception of where virtual anatomies are located within an actual scene and may constitute a functional and ergonomic integration between navigational surgery and virtual planning. Aim of my work is to optimize and validate a newly designed, localiser-free, stereoscopic head-mounted system featuring AR as an aid to several surgical procedures. The video see-through system comprises a commercial stereoscopic visor equipped with two external video cameras mounted in correspondence of the eyes so to emulate with a sufficiently wide field-of-view the user's sight.

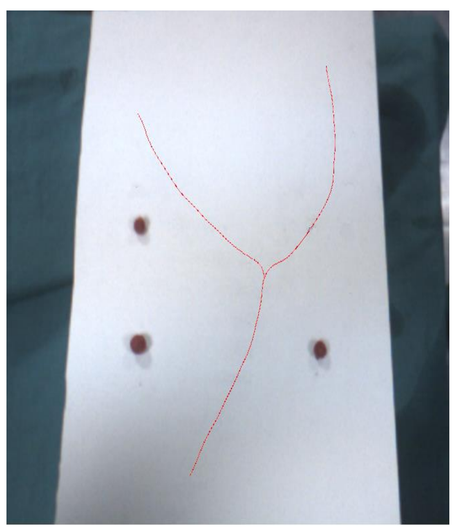


AR SYSTEM FOR FREEHAND GUIDE OF MAGNETIC ENDOVASCULAR DEVICES

In a preliminary study we demonstrated the potential utility of the proposed AR system for the freehand external guidance of endovascular magnetic carriers. Our methodology was designed to simplify the current state-of-art systems for the guide of magnetic carriers as targeted drug delivering agents which generally rely on robotic arms or MRI scanner. Visual features of the stereoscopic AR system were chosen so to assure ergonomics of the device and to provide the display modality entailing the smallest perceived parallax error.







During the experimental session every operator was asked to manually move the external magnet under AR guidance. Guiding trajectories reproduced the projection of the vessels centerline over the plane on which the magnet had to be slid. Consistent alignment between virtual trajectory and real scene was obtained via a marker-based rigid registration procedure based on the real-time localization of three monochromatic markers.