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A holographic pipeline for medical imaging: A demonstration using fetal micro-CT data

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The field of medical imaging stands to benefit significantly from advances in virtual reality (VR); being able to transform 2D image slices into patient-specific 3D-holographic models which can be interacted within their 3D anatomical context from different angles can significantly aid pre-surgical planning, professional education and diagnostic explanation to patients. The lack of competence in deployment of VR solutions among healthcare-professionals and the relative infancy of the technology calls for the development of a streamlined pipeline from medical image to holographic application, to ensure the benefits of VR are widely available. The pipeline developed here focuses on the required editing of 3D-segmentations for rendering in VR. A desktop application written in Java was developed which controls 3D modelling software in the background where professionals can upload their segmentations for processing. A new file format was also devised - 'Medical Holographic Interchange Format (.MHIF)' - which lays out a blueprint for holographic storage. As a demonstration of this pipeline, we used segmentations from fetal micro-CT scans, completed at Great Ormond Street Hospital. The processed holograms were used in an application for Microsoft's mixed-reality HoloLens device, which was created using Unity and Microsoft's Mixed-Reality-Tool-Kit, and includes all the necessary code to manipulate the holograms in an intuitive way. This research demonstrates how the current complexities of developing holographic imaging applications can be abstracted and streamlined for use by healthcare-professionals. It also demonstrates the visual power of VR, having created 3D interactive models over 60 times the scale of the scanned subject.

Biography

Caroline Smith qualified with MBBS from University of College London (UCL), UK in 2010 and has worked in general surgery and care of the elderly. She learned to code alongside with her medical work and is currently pursuing a Master's Degree in Computer Science at University College London, UK. She is interested in the augmentation of healthcare with technology, particularly machine learning and virtual reality.

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