

Teaching and Learning Conference- Second Draft

Development of Functional Models: 3D printed models for ultrasound-guided surgical training and an image to model conversion pipeline

3D printing techniques are increasingly used in engineering science, allowing the use of computer aided design (CAD) to rapidly and inexpensively create prototypes and components. There is also growing interest in the application of these techniques in a clinical context for the creation of anatomically accurate 3D printed models from medical images for therapeutic, research and teaching applications. The aim of the present work was to develop a pipeline for the conversion of medical imaging data to 3D printed models and produce functional prints as teaching examples.

Clinical partners identified a requirement for practical kidney and rib models for use in surgical teaching and planning of complex cases. Medical images were segmented to extract volumes of interest, which were refined and exported to 3D printing software. UCL 3D printing resources were used to build high quality, functional models for use as teaching and planning aids for ultrasound-guided surgical procedures.

The image processing techniques, software, and practical 3D printing training were then outlined in a set of online teaching materials designed to allow students to create 3D printed models from medical image data. The development of the rib and kidney models were included as worked examples.

These resources will be of use to anyone with little or no previous experience in medical image processing who have identified a potential application for 3D printing in a medical context, or those with a more general interest in the techniques discussed.

This work was funded by a UCL ChangeMakers grant.