Virtual ACS 2021 Surgeons and Engineers: A Dialogue on Surgical Simulation Meeting

Promoting Technology and Collaboration

From Scans and Model Collections to Interactive Surgical Simulation

Jorg Peters; Jennifer Cremer; and Ruiliang Gao.

University of Florida, Gainesville, FL

Background: Creating variants of virtual anatomy suitable for interactive simulation with force-feedback has been a bottleneck for creating relevant and engaging laparoscopic surgical training. Such modeling, as well as reconstruction of patient-specific anatomy, currently requires close interaction between medical specialists (e.g. radiologists) and computer aided design specialists (engineers). At present, few surgeons aiming to prepare their residents for active duty in the operating room, or planning a complex surgical intervention can avail themselves of such an inter-disciplinary support team.

Technology **Overview:** The Toolkit for Illustration of Procedures in Surgery (TIPS) lowers the barriers to modeling and reconstruction especially of soft tissue. TIPS provides an interface for assembling simulation-ready pieces of anatomy (simlets) that a surgeon-educator can combine into a training scenario via a simple text-based editor; and a new external tool that leverages a VR environment to allow a surgeon to document their expert understanding of vascular connectivity by interactively generating valid, simulation-ready trees from patient-specific data that are too sparse for leveraging image processing tools.

Potential Application in Surgical Simulation and Education: Enabling surgeons to themselves design, adapt or customize anatomy for laparoscopic surgical training and surgical planning increases their involvement in driving and shaping the direction of surgical simulation and education. Assessment of impact on education and surgical planning are in progress.

Potential Opportunities to Collaborate: Prime partners for TIPS are surgical educators and surgeons planning anatomically complex interventions. Open source soft tissue simulation libraries, like SOFA and iMSTK, are natural collaborators who form the backbone of the actual simulation.