

ACS 2022 Surgeons and Engineers: A Dialogue on Surgical Simulation Meeting

Research In-Progress

TIPSLite: interactive laparoscopy training wherever there is sufficient internet connectivity

Jorg Peters, PhD; Krista Terracina; and Ruiliang Gao

University of Florida, Gainesville, FL

Introduction: The pandemic has reduced access to training, a familiar problem for rural, underserved locations. In response, SurfLab prototyped TIPSLite, a physical and software interactive laparoscopy training interface that can be used wherever there is sufficient internet connectivity. Reactions from surgeons are "TIPSLite is truly innovative", "responsive to the time and location constraints of medical students and physicians", and "a solution for remote, pandemic, international and continuing education outreach".

Methods: Requirements for deploying TIPSLite are a thin client (laptop) for display from the remote simulation server and an affixed upright cell phone pen providing a trocar pivot point that stays in contact to a flipped smartphone acting as a surgical instrument. Users download a thin client and a phone app (Android play or Apple store). The upright-clamped cell phone pen tip acts as a fulcrum point (trocar) and the down-flipped phone allows the full range of motion of laparoscopic surgery tools: three rotational degrees-of-freedom (up-down, left-right, axial rotation) and insertion-retraction. Disconnecting from the fulcrum by lifting the phone resets and allows switching the tool. Vibration and sound provide collision and cauterizing feedback. A computer mouse is typically used to retract tissue with the non-dominant hand. The remote server runs the Toolkit for Illustration of Procedures in Surgery (TIPS).

Preliminary Results: In a design-analysis cycle, SurfLab tested numerous prototype app and remote server options both under Apple testflight and Android. To date, 14 users have been debriefed. TIPSLite has been used at home, at work, and in a cafeteria experiencing negligible latency at 50Mb/sec.

Next Steps: Early accolades must be rigorously tested, after assuring optimal ease-of-use. Specifically, the goal is to test the hypothesis that the key benefits of TIPS training, hands-on experience of complex surgical sequences, can be experienced using TIPSLite freeing learners from difficult-to-deploy-and-maintain haptic devices and software.



TIPS^{lite}

phone-based 4-dof haptic interface (mouse for weak hand) © J.Peters.