ACS 2024 Surgeons and Engineers: A Dialogue on Surgical Simulation Meeting

P-D-02

Research-In-Progress

Cutting to the Chase: Is There a Relationship Between Mechanical Properties and Haptic Fidelity?

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Introduction: Current surgical simulation developers are in an arms race to create a simulation that closely replicates the haptic fidelity of human tissues. In order to achieve a simulation with high haptic fidelity, it is theorized that the synthetic material properties of the simulation should match the material properties of human tissues. The mechanical properties of human tissues, however, are very difficult to characterize, and there tends to be a range of values for a given mechanical property. The aim of this research is to explore the sensitivity of surgeons for given mechanical properties to determine how closely a simulator's mechanical properties need to emulate those of a patient.

Methods: Tissue mimics with varying elastic moduli and hardness were assessed by surgeons to determine a surgeon's sensitivity for each mechanical property.

Preliminary Results: A just-noticeable-difference value was calculated for elastic modulus and hardness to quantitatively assess sensitivity. Additionally, qualitative feedback from surgeons regarding the mimics was also collected.

Next Steps: Using the data from this experiment, a new iteration of a tissue mimic will be created. Future experiments will compare surgeon's quantitative and qualitative feedback of the newest tissue mimic with that of cadaveric tissues.