Mixed Reality Surgical Team Training

• Develop initial steps toward a Mixed Reality simulator for training a robotic surgery team
• Simulator will use real da Vinci robot with simulated patient
• Generate synthetic endoscope video that combines real instruments (robotic and hand-held) with simulated anatomy
• Reconstruct point clouds from multiple cameras installed inside an abdominal phantom (in addition to endoscope). This handles occlusion of real instruments by simulated anatomy.

What Students Will Do: (1) Physical setup for a motion capture system inside the abdominal phantom. (2) Real-time reconstruction of 3D point clouds from the motion capture cameras (and endoscope)

Deliverables:
- Abdominal phantom with embedded cameras
- Algorithms for camera calibration and 3D reconstruction
- Experiments to quantify 3D reconstruction accuracy
- Mixed reality visualization of instruments moving around simulated anatomy (no interaction with anatomy)

Size group: 2-3 students

Skills:
- Proficiency in C++ and/or Python
- Computer Vision & Computer Graphics

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