

C.S. MOTT CHILDREN'S HOSPITAL

Augmented Reality in Pediatric Minimally Invasive Surgery

Student Team:

Fernando Espino Casas – Master of Business Administration

Matthew Shannon – EGL (BSE Computer Engineering & MSE Electrical & Computer Engineering)

Project Sponsors:

Dr. David Chesney – Professor, Computer Science & Engineering

Dr. Ronald Hirschl – Pediatric Surgeon

Dr. Marcus Jarboe – Pediatric Surgeon

Faculty Advisors:

Amy Cohn – College of Engineering

Stephen Leider – Ross School of Business

C.S. Mott Children's Hospital at Michigan Medicine is nationally recognized as one of the leading pediatric health care centers in the United States. Established in 1903, Mott provides comprehensive primary and specialty healthcare for children, including numerous surgical procedures.

Minimally invasive surgical (MIS) operations, performed at Mott Children's Hospital and other hospitals nationwide, involve the use of expensive, ergonomically unfavorable booms and monitors that are not under the surgeons' direct control because the surgeon is sterile. This current setup inhibits the visibility of real-time video from surgical cameras (surgeons and equipment on the other side of the OR table impede visibility) and requires others in the room to adjust monitors, resulting not just in surgeon frustration, but in ergonomic concerns that feed into long-term chronic disability and impact the ability to optimally perform MIS procedures. In addition, by having to be sterile, the surgeon is isolated from what would otherwise be easy access to other crucial information such as imaging, vital signs, procedural videos, and the medical literature. The impact cascades outside the operating room as well, with case delays resulting in suboptimal use of OR time and inefficient cost-management of the OR.

To address these issues, the Tauber team worked to fully integrate the newest HoloLens 2 augmented reality (AR) headset for use in operating rooms at Mott. First, the team conducted secondary research to familiarize itself with both the clinical environment and the capabilities of the HoloLens 2. The team proceeded to map key datastreams that exist in the OR and analyze what critical steps were required to integrate them into the headset, while simultaneously conducting surgeon interviews to identify factors that would impact their adoption of the technology. Based on this work, the Tauber team provided detailed recommendations to integrate real-time video from the surgical camera, patient vitals, and images into the HoloLens 2; in addition, the team provided a comprehensive business case, outlining the key benefits of integrating AR technology at Mott and other hospitals. Finally, to ensure a smooth transfer and roadmap for surgeon adoption of the technology, the Tauber team developed a surgeon acceptance and implementation plan.

After finalizing and successfully integrating the HoloLens 2 into each operating room, Mott can expect qualitative and quantitative benefits. With greater agency, surgeons will minimize delays from frustrating processes, improving short-term case completion and long-term operative careers. Moreover, administratively, Mott can expect to save 2,500 annual overtime hours and cut at least an estimated \$500,000 in annual OR operating expenses, with the possibility to extend elsewhere in other Michigan Medicine operating rooms.