Augmented Reality for Improved Situational Awareness in Minimally Invasive Surgery

Researchers at the University of South Florida have developed an augmented reality method for improved situational awareness in minimally invasive surgery (MIS).

MIS generally refers to the use of laparoscopy in addition to other techniques that reduce trauma by limiting the size of the operative incision. Laparoscopy can be hindered by several limitations. The most obvious of these drawbacks is that tactile feedback of the internal anatomy is nearly eliminated when the surgeon cannot place a hand in the body cavity. This limits the identification of structures that are not visible within the peritoneal cavity, such as those that lie within the retro peritoneum and pelvis, which may have been otherwise recognized by feel.

In addition, although the magnified view provided by laparoscopy offers excellent inspection of objects to the front of the camera it drastically limits the field of view and does not allow visualization of the areas outside the forward optical axis. When vital anatomical structures are not found, or perhaps worse when they are misidentified, serious and even life threatening injury may ensue.

USF inventors have created an augmented reality system that provides accurate and precisely aligned overlay images of anatomic tissues, which may be difficult to identify due to anatomical location, aberrancy or distortion. This system will help guide surgeons to recognize structures of key interest and better avoid injury in MIS.

This technology will allow mapping and identification of hidden surgical anatomy during MIS through a visual overlay of rendered pre-operative CT data that is registered to the surgical video using 3D surface anatomy. Ultimately this technology may be used to provide image-guided surgery, map vascular anatomy and avoid injury to deep structures such as those located in the retro peritoneum when operating in the abdomen and pelvis.
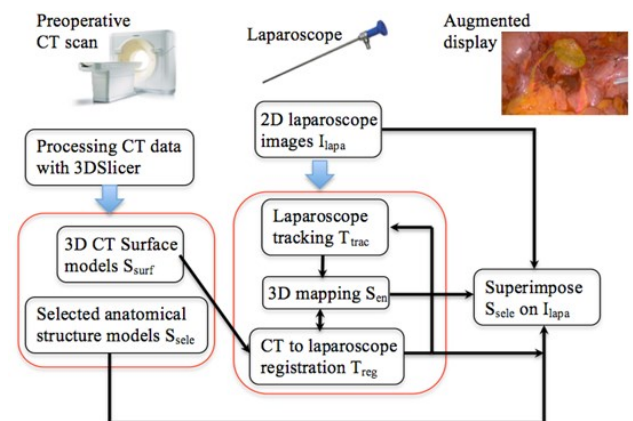
ADVANTAGES:

- **Mapping and identification of hidden surgical anatomy**
- **Map vascular anatomy**
- **Help avoid injury**

Improved Situational Awareness

Workflow Chart of the Proposed Augmentation System

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