Laparoscopic Surgery Executive Summary

Laparoscopic surgery is a minimally invasive surgical procedure that uses an imaging device (laparoscope) to view the inside of the abdominal cavity. A team of surgeons performs the entire operation with the assistance of video portrayed on a monitor screen. Surgeons currently rely on verbal commands to direct partners to specific details on the image, which can often be misunderstood within the complex surgical environment.

To solve this problem, we developed a Digital-video-pointer. This device will allow ease of communication between surgeons, assist in decision-making, and prevent possible surgical error. The Digital-video-pointer contains a microcontroller that intercepts the video signal from the camera and superimposes a cursor over the surgical image. This final signal will be sent to monitors for surgeons to view. The surgeons can control the imposed pointer by a trackball mounted to the camera. As a result, the device will allow the surgeon operating the camera to point objects out without moving the camera itself.

Our prototype uses the Beagleboard XM, which is a single board computer with integrated USB and DVI-I hardware ports. The video signal is inputted through a video capture device, and the pointer information from a trackball enters via USB. The signals are combined using the Beagleboard XM, and the final signal is outputted through the DVI-I port.

The closest alternatives to the proposed solution are a variety of commercially available analog units. These devices are not feasible since our client requires a device that processes digital video standard in most operating rooms.

Our device is patentable because of its uniqueness as well as the lack of digital video streaming technology currently available. WARF has searched for similar patents to our proposed system and found none. This confirms that the Digital-video-pointer is a unique idea and design. Furthermore, this intellectual property can be implemented as a stand-alone device (like our design) or directly integrated within the camera.

There exists a wide range of commercial opportunities in multiple markets for our screen pointer device. Hospitals searching to improve surgeons' experiences and performances during cutting-edge surgery are likely to invest in the device. Preliminary research has shown that surgeons have a desire to see such a system be made available to them. Other viable markets include applications in military robotics, surveillance, and counterintelligence. Our proposed final unit cost is $5,000-$7,000, and a market price between $10,000 and $15,000.

Our prototype fulfills our client's requirement to integrate a cursor with streaming video. Our prototype is in the process of implementing the design discussed above.