

# COMPARING THE UTILITY AND USABILITY OF THE MICROSOFT KINECT AND LEAP MOTION SENSOR DEVICES IN THE CONTEXT OF THEIR APPLICATION FOR GESTURE CONTROL OF BIOMEDICAL IMAGES

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## **Abstract**

### BACKGROUND

The necessity to interact with medical images in the Operating Room (OR), along with the requirement to maintain asepsis, imposes certain restrictions on the scrubbed clinician when using traditional mouse and keyboard. Touch-free image control systems, based on Commercial off the Shelf (COTS) sensors such as the Microsoft Kinect and Leap Motion, could enable the clinician to assume direct control of the medical image navigation and manipulation while maintaining sterility.

### EVALUATION

Surgeons and radiologists, resident in a large academic teaching hospital, individually trialled two controllers, Leap Motion and Microsoft Kinect for Windows v2, as part of a pre-commercial Natural User Interface (NUI) system. In a user-task-system type evaluation, the usability and utility of the two COTS motion sensor input devices were compared. The system usability scale (SUS) was used to measure the usability of each of the input devices. Additional feedback was obtained on the perceived utility of both systems. The speed and accuracy of the two controllers for anatomical structure measurement were compared with those of a standard computer mouse.

### RESULTS

The results from the data analysis showed marginal to average acceptability of the two devices. Microsoft Kinect for Windows v2 was found to have better utility and usability, particularly for Surgeons and Interventional Radiologists. The accuracy of the Leap Motion sensor was established to be better and comparable with that of a computer mouse. Analysis of the internal consistency of the utility survey showed that having greater control in sterile settings is integral to the perception of usefulness.

Also, a link was found between the system usability and the perception of utility with better perceived usability translating into better perceived utility. The Kinect sensor was found potentially tiresome to use but with very good potential. The Leap Motion sensor was also seen as having good potential for use in the OR but its limited *field of view* was highlighted as a disadvantage.

## DISCUSSION

The system usability can be further enhanced by implementing design changes to improve its accuracy as well as its gesture vocabulary. The Kinect sensor can benefit from the implementation of voice commands. The deployment of the NUI system in the OR should be carefully assessed and planned, particularly with respect to the sensors placement and the choice of display. Integrating the input from several COTS sensors can improve the system consistency and reliability.

## CONCLUSION

Advanced, touch-free commercial NUI image control systems, based on low cost COTS sensors are available and prospectively useful for interacting with biomedical images in sterile clinical setting such as the Operating Room. Further research and development is required to establish the design specifications, installation guidelines and user training requirements that can ensure successful deployment in varying clinical areas.