

Leap Motion Gesture Control With OsiriX in the Operating Room to Control Imaging: First Experiences During Live Surgery

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Dear Editor,

We would like to present our first experiences with the use of an innovative system to control the imaging in the operation room, the Leap Motion gesture control and OsiriX. Touch-free systems are useful where the contact between the surgeon and computer is disadvantageous; in the operating room a touch-less system is an ideal solution.

These solutions reduce surgery time, minimize the risk of infections (in some hospitals, PC monitors are located on the wall and the surgeon must leave the operating table to go there).

During surgery, changing gloves each time the computer system has to be operated interrupts the workflow and can result in longer surgery times with higher risk for the patient and higher costs. A Swiss group presented a good prototype: they use Orisix and Microsoft Kinect to perform the touch-free control in the operation room and during autopsy.¹

This solution, in our opinion, can neither be placed on the market nor in operation rooms. The vocal control had several limitations, the Kinect is quite expensive, intraoperative 3-dimensional (3D) imaging was difficult to control, and the working distance of ~1.2 m required a screen of appropriate size. They concluded by suggesting that using more advanced methods, such as recognition of finger gestures, could solve these problems.

The Test

Leap Motion (Leap Motion, Inc, San Francisco, CA) Gesture Control² is a new device released in 2012-2013. A wave of a hand or lift of a finger can be used to operate computers in a new way. The Leap Motion controller senses how we move our hands, the way we naturally move them. So we can point, wave, reach, and grab. For the gesture control, we chose a gesture control app, obtained from the Leap Motion online store: GameWave

(GameWave App, v 1.5.2, www.uwyn.com, Manage, Belgium). For our test, we used the freely available OsiriX (OsiriX Foundation, Geneva, Switzerland) as PACS (picture archiving and communication system) and medical image data viewer with OS X 10.8.2, Apple, Cupertino, CA) We easily configured GameWave with OsiriX keyboard shortcuts (scroll, zoom, and 3D rotation) to control and move magnetic resonance imaging, computed tomography scan with MultiPlanar Reconstruction and Volume 3D Reconstruction during live surgery. The test group consisted of 8 medical professionals: 2 general surgeons, 1 urologist, 3 orthopedic surgeons (one is an expert on pelvis fractures), and 2 hand surgeons of University of Verona, Italy. Leap Motion was situated near the operation site on a sterile sheet connected with a USB cable to the computer and monitors situated over or around the surgeon (Figure 1).

Results

It was easy to familiarize with the system and the 3 gestures, with an average training time of approximately 5 minutes. Familiarity with OsiriX did not play an important role. The working distance between Leap Motion and monitor was not a problem thanks to a USB extension cord. Surgeons reported excellent opinion of this system. An interesting feature was the use of Leap Motion to move the 3D reconstruction of the pelvic fractures and the articular fractures in orthopedic and hand surgery. The presented system does not require

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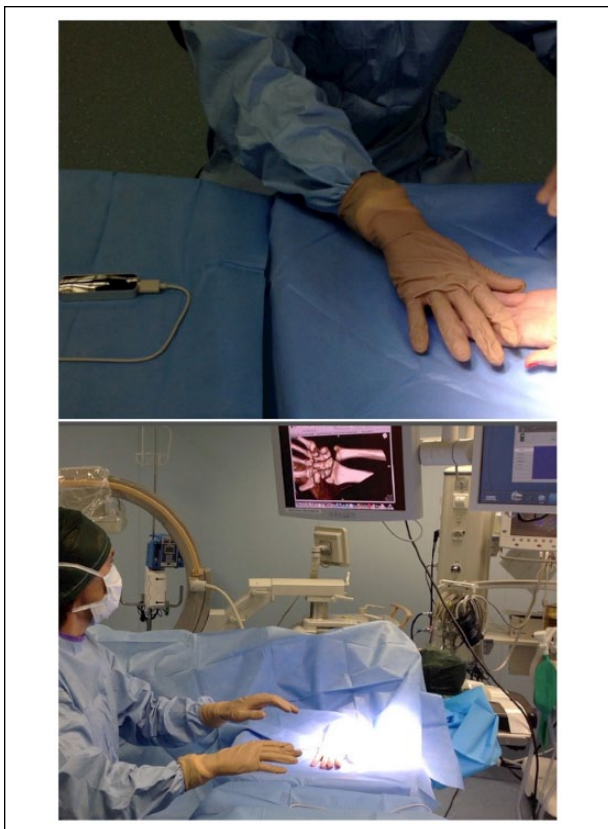


Figure 1. Leap Motion situated near the operation site on a sterile sheet connected with USB cable to the computer situated over the surgeon.

difficult calibration and can be operated by any user immediately, after configuration of the OsiriX keyboard shortcuts.

The system is very cost-effective (Leap Motion \$106 and GameWave \$4.87). A simple video of our test is available at <http://youtu.be/vth2pSrgAR0>

Conclusions

For the first time in the literature, Leap Motion, a touch-less finger gesture control was tested to control imaging such as computed tomography scan and magnetic resonance imaging during live surgery.

The idea was shown to be very efficient, low-cost, and helped control the risk of infections in the operating room. In the future, new app for other Dicom Viewer or specific OsiriX plug-in could improve this system and the gesture and the image controls, opening an avenue for potential applications in many other areas, such as data visualization, augmented reality, accessibility, and robotics.

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