How to Build A Customizable and Affordable Augmented Reality Platform

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Abstract Number:
Disclosures

Dr. Jang Yoon is the co-founder of MedCyclops
Introduction

- There has been a steady interest from the surgical community to adopt wearable head-up display (HUD) in assisting surgical procedures since its conception.
- With continual evolution of augmented reality (AR) technology, commercially available AR platforms can be easily modified to fit surgeons’ needs.
- AR-HUD use during surgical procedures can display information in the direction of your working view, leading to less distraction and more focus on the operative task.

Here, we share an incorporation approach for AR-HUD system with relative ease and low cost.
Methods

- A Moverio BT-35E Smart Glasses (Epson Inc, Suwa, Japan) AR-HUD, offers a light and comfortable frame, and bifocal image display.
- This AR-HUD system can be connected to existing standard operating room imaging platforms such as fluoroscopy, and 3D neuro-navigation such as Medtronic Stealth and Stryker Navigation.
- Our AR-HUD system is compatible with any imaging platform with a High-Definition Multimedia Interface (HDMI) outlet to transmit images onto its display.
Results

The AR-HUD system has been deployed for three patients undergoing spinal reconstruction.

1. 35 year-old male with right-sided C6-7 disc herniation underwent a single-level C6-7 arthroplasty.
2. 73 year-old female with prior L3-5 fusion complicated by adjacent level disease with 21 degree levoscoliosis with apex at L2-3 underwent L1-3 direct lateral lumbar interbody fusion and extension of fusion to T10.
3. 71 year-old male with prior T10-L4 fusion with a right L4-5 pars fracture underwent decompression and extension of fusion to pelvis with L5-S1 posterior lumbar interbody fusion.
Results

- The AR-HUD displayed intraoperative fluoroscopy images in the direction of the surgeon's hand, thus obviating the need for obtrusive monitors in the surgical theater.

- No delays in image transmission were noted.

- The AR-HUD was unobtrusive and was worn for the duration of the surgeries, including non-instrumentation portions.

Figure 3. Intraoperative use of the Moverio BT-35E AR-HUD system.
Discussion

- The Moverio BT-35E Smart Glasses offer an affordable and ergonomic means by which to view intraoperative imaging during neurosurgical procedures.

- Future work includes modification of AR-HUD to allow for image magnification and incorporation of holograms for navigation purposes.

- AR-HUD can be further developed to eventually incorporate both navigation and surgical microscope technology.
Summary

- AR-HUD is capable of displaying actionable information in the surgeon’s working view.

- Our Moverio BT-35E AR-HUD system was successfully utilized for three patients undergoing spinal reconstruction.

- AR-HUD eliminates unnecessary movements and increases ergonomics of surgical procedures.

- Customized AR-HUD systems are technologically and cost accessible.