

WEEKLY UPDATE 1

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1. Weekly Progress

1.1. What is Haptics?

Haptic communication Haptic communication recreates the sense of touch by applying forces, vibrations, or motions to the user.

- Can be used to assist in creation of virtual objects in a computer simulation
- Can be used to control such virtual objects
- Can enhance the remote control of machines and devices
- Some example applications in medicine:
 - Mandibular reconstruction planning with the haptics-assisted surgery planning system
 - Robotic arm for surgery
 - Tactile imaging

1.2. Literature Review on Haptics Devices in the Medical Field

- REVIEW: *Haptics - touchfeedback technology widening the horizon of medicine* (Kapoor, et. al)
 - Haptics, A Key to Medical Interventions:
 - Tactile knowledge** Haptics provides immediate and intuitive tactile feedback of relevant information to the users.
 - Intuitive Alerts** These assist users in prioritization of important information, multisensory experience, that helps in increasing proficiency and decreasing errors.
 - Haptics in Laproscopic and Endoscopic Surgeries
 - * Haptic feedback in surgery, as an intraoperative, non-invasive real-time diagnostic tool

- * Can provide artificial tactile feedback
 - * May be used in any surgical situation
 - * Foreign body recognition, including shape and dimensions
 - * Detection of pulsation
- Haptics for Neurosurgery Simulation
 - * Opportunity for neurosurgeon residents to practice with realistic simulations
- Robotic Arm
 - * Can lift heavier objects
 - * Use has external limbs of a surgeon during complex retinal or heart surgeries
 - * Robot assisted surgery
- Needle Simulations
- Haptic Suturing Simulator
- Challenges:
 - * Haptic interface hardware design
 - * Tissue and organ model development
 - * real-time graphical and haptic rendering
- *Citation:* Kapoor, Shalini et al. Haptics - Touchfeedback Technology Widening the Horizon of Medicine. Journal of Clinical and Diagnostic Research?: JCDR 8.3 (2014): 294?299. PMC. Web. 3 Oct. 2017.
- *STUDY: Trust in haptic assistance: weighing visual and haptic cues based on error history* (Gibo, et. al)
 - Methods:
 - * Subjects: Ten, age 21-31
 - * Experimental setup:
 - Target-hitting task, handle position and force measured, visual cues were recorded
 - * Data analysis:
 - Weight that each subject placed on the visual cue relative to the haptic cue
 - This was compared to accuracy
 - * Results:
 - With both cues, subjects were able to find the target with equal or better performance
 - Show that the brain can learn to reweigh augmented cues

2. To-Do

- ☐ Find applications that intersect networking and BME
- ☐ Read papers (look at references)
- ☐ Send list of grad school advisors to Dr. Esposito