ETH Master thesis proposal (any discipline)

Pilots have been using simulators for years in order to get practical experience in a safe and repeatable way. Doctors have begun using simulators as well in order to practice on computer-based simulators instead of on patients.

You will use Human Factors, System Design, and Statistics to test and verify the effect of haptic illusions for use in these surgical simulators, specifically with audio-tactile feedback. You will setup and run user tests, analyze the resulting psychophysical functions, and propose concrete solutions and applications for the use in commercial surgical simulators. This work is used to increase the acceptance and realism of simulators, to make them better training tools for surgeons.

Keywords: haptics, illusions, human factors, psychophysics, perception

- Description

  The Topic

  Surgical simulators often rely on plastic and rubber models for training medical procedures. While these models look like real body parts, they don't cover the variety of situations that doctors face in the operating room. As part of a research project looking into applying non-visual feedback in commercial surgical simulators, this thesis focuses on the application of repeated use of haptic illusions in a training setting.

  Haptic illusions allow for different senses to influence the sense of touch, specifically using sound and/or vibration to make the material properties of the rubber models feel different than they are. Previous research has shown that these illusions are possible to create, but the long-term use of these effects hasn't been tested yet. This project would play an active role in the direction of non-feedback implementation is surgical simulation training.

The Thesis

You will update and expand an existing setup for testing the effect of the audio-tactile feedback on material properties. You will recruit subjects and run studies collecting data, according to ETH and international ethical guidelines. Afterwards, you will analyze the results with statistical tools, like R and SPSS, along with Excel. You will then analyze how these results can be best implemented in a commercial simulator product line. As this is a novel area of research in haptics and perception, you have the chance to become a co-author of a scientific paper in a conference or journal.

You are

You are • interested in learning about human perception • interested in knowledge about experiment design and statistical analysis (like linear regression and ANOVA) • ideally experienced with statistical tools • interested in helping improve medical training • capable of reading scientific articles • motivated to participate in current research

Goal

Your work will make surgical training better for doctors by helping define how haptic illusions can be applied in a practical way for commercial systems.

- Contact Details
  Carolyn Mattes-O'Brien ETH Zürich, D-HEST Lengghalde 5 8092 Zürich
  Carolyn.obrien@hest.ethz.ch in cooperation with RELab, Human Factors Engineering Lab, and VirtaMed AG

- Location
  VirtaMed AG, Schlieren & Human Factors Engineering Lab, SEC ETH Zurich

Calendar

Earliest start	2019-03-01
Latest end	2019-10-01