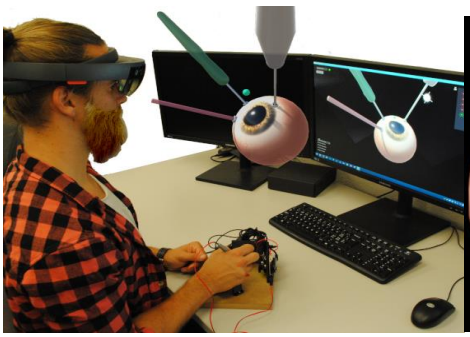
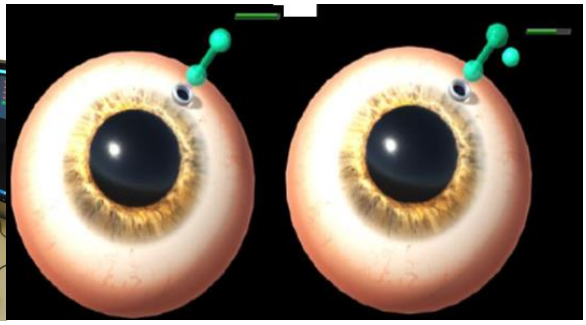
Bachelor's/Master's thesis or other student works at the group of Human Factors Engineering, Chair of Consumer Behavior (D-HEST)

Optimal Flow for microsurgery training in augmented reality

We have built a simulator in augmented reality for training microsurgical interventions (Fig. 1, left). The simulator enables to display virtual structures, such as organs, and it tracks the location of the microsurgical device while the surgeon performs manipulation tasks on the virtual structures. The surgeon's performance is continuously monitored. Performance is fed back to the trainee using a health bar (Fig 1, right). Performance is used to continuously customize the training task. Customization includes an adjustment of the difficulty level to the actual skills of the surgeon. The difficulty level is computed by a function scoring the severity of manipulation errors.
In order to achieve a state of effortless attention, a so called "Flow", challenges, which are controlled by the scoring function, should be in balance with the skills of the trainee. In the state of Flow, training efficiency is optimal.





https://www.ethz.ch/de/news-und-veranstaltungen/eth-news/news/2019/03/augmented-reality.html

Figure 1, left: Simulator for training ophthalmic (eye) microsurgery. The Microsoft's HoloLens is used as display technology. Continuous tracking and evaluation of micro-manipulations by means of an optical IR system. **Figure 1, right** (MSc thesis, Jana Köfler): Feedback of actual microsurgical performance by means of a green "health bar" shown on the top right corner. Long, green health bar (left eye) indicates a good performance.

Tasks

The aim of this student work is optimize Flow in the simulator for microsurgical training by means of a user study. Your tasks are:

- Familiarize with the device and with previous master thesis on the topic
- Familiarize with the concept of Flow
- Design the user study aiming to optimize Flow
- Run the user study
- Report findings in a written report and in an oral presentation

Requirements

- Motivated to work with augmented reality
- Organizational skills
- Have basic skills in statistics or willing to learn such skills

Support and contacts

The Human Factors Engineering group can provide a broad interdisciplinary technical and scientific support and has a solid experience in the many disciplines required to run the project.
For further information please contact: mmenozzi@ethz.ch or rosandro@ethz.ch
or call: 044 632 39 81 (M. Menozzi). Earliest start date is May,1st, 2019. No latest start date.