Report on Virtual Reality: Student choice presentation

Applying Multi-User Virtual Reality to Collaborative Medical Training

Overview:

It aims at providing novel training tools for paramedics that enhances current learning methods.

The hardware setup consists of a two-user full-scale VR environment with head-mounted displays for two interactive trainees and one additional desktop pc for one trainer participant.

The software provides a connected multi-user environment, showcasing a paramedic emergency simulation with focus on anaphylactic shock.

The prototype offers hands-on experience on multi-user VR in an applied scenario, and it concerns four important research areas:

1. user navigation,
2. interaction
3. level of visual abstraction
4. level of task abstraction.

Emergencies in pre-hospital care are characterized by a particularly high complexity.

Factors contributing to this complexity include:

1. time pressure
2. limited patient information
3. low tolerance to errors,
4. varying team constellations
5. the rare exposure of critical emergencies such as the severe anaphylactic reaction.

Multi-user Virtual Reality may prove helpful in training for such complex collaborative tasks, especially if training in real situations is not possible.

How does it work?

A multi-disciplinary project association develops a practicing system for paramedical vocational training that aims at combining serious game technology with virtual reality in concert with curricular modeling and implementation at paramedic services.

VR Standards in training?

The setup provides a realistic proving ground for virtual reality in a vocational training scenario. They have used HTC VIVE lighthouse technology for tracking users' heads, hands, and other body parts. The software is based on the Unity game engine and TriCAT Spaces remote meeting software and runs on VR-enabled windows-PCs.

Our main research questions are:

Navigation:

It helps us to know:

- How can we visualize users effectively?
- How can we keep users from running into each other in real-life when one user virtually leaves the shared virtual space but stays in the shared real volume?
- How can we re-arrange virtual volumes to match real volumes?
- How can we invite/move users to perform certain navigational tasks to support storytelling events?

Interactivity:

In a multi-user environment, the body pose is so different using larger controllers so that co-workers cannot recognize easily that such an item is currently in use. We additionally created other item menu systems such as belts to cope with challenges of user/context awareness.

Level of visual abstraction:

They chose a realistic scenario with a reasonably simplified model.

The virtual patient model provides dynamic symptoms such as skin color, bumps, breath animation frequency, or sweat using procedural shaders.

Level of task abstraction:

We need to choose which tasks will be performed with realistic precision and which not. For example, we found using controller vibration helpful for measuring patient pulse. At the same time, controlling the pulse for two controllers from different users in sync was challenging across network, when two users choose to measure pulse together. One important aspect is how time moves on during gameplay.

The EPICSAVE prototype setup

It shows two VR users in a shared volume playing as paramedic trainees while a third user playing as trainer adjusts health and symptoms of a virtual patient. The setup uses two VIVE Lighthouse emitters. A projector shows current views on a wall for spectators.

The collaborative training software.

Upper left: a user applies blood pressure measurement.

Upper right: two users exchange tools in a cooperative situation.

Lower left: cutting open the patient's clothes is performed using an abstract interface showing real time delay.

Lower right: the trainer view allows a third user to change patient health and symptoms in real-time.

Limitations and Future work:

Need standards in important areas of interaction design such as navigation, interactivity, and level of abstraction.

Experiencing the prototype helps researchers and industry stakeholders to discuss future work towards developing VR training standards, and in general.