Immersive Virtual Reality for Surgical Simulation Training

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Background

Human factors training in medicine has shown to lead to better clinical outcomes for patients and increase morale in the workplace. At the Hospital of the University of Pennsylvania, this training currently occurs in the operating room. However, it is costly both from a monetary and organizational standpoint. Developing a remote means of providing this training would be extremely valuable to the health system. Immersive virtuality provides the means of making this a reality.

Objectives

- Perform a scoping literature review of immersive virtual reality in medical education and simulation to understand how this technology is currently being utilized

- Create a virtual reality environment in Spatial.io for human factors training

- Develop a pilot simulation for virtual reality that corresponds to current in-person simulation that goes on at the Hospital of the University of Pennsylvania

    Post-operative bleed after thyroidectomy selected

- Create training videos on how to use the Spatial.io and the other technologies so that laypeople may easily utilize the technology

- Run pilot scenario with medical professionals

Methods

Using a 3D modeling software known as Blender, objects were be designed and textured for virtual reality. Alternatively, objects or whole rooms were be scanned for import into virtual reality using a LiDAR scanner. These objects were then imported into a virtual meeting space software known as Spatial.io. Multiple users then used an immersive virtual reality headset (Oculus Quest 2) to interact with one another and engage in human factors training remotely.
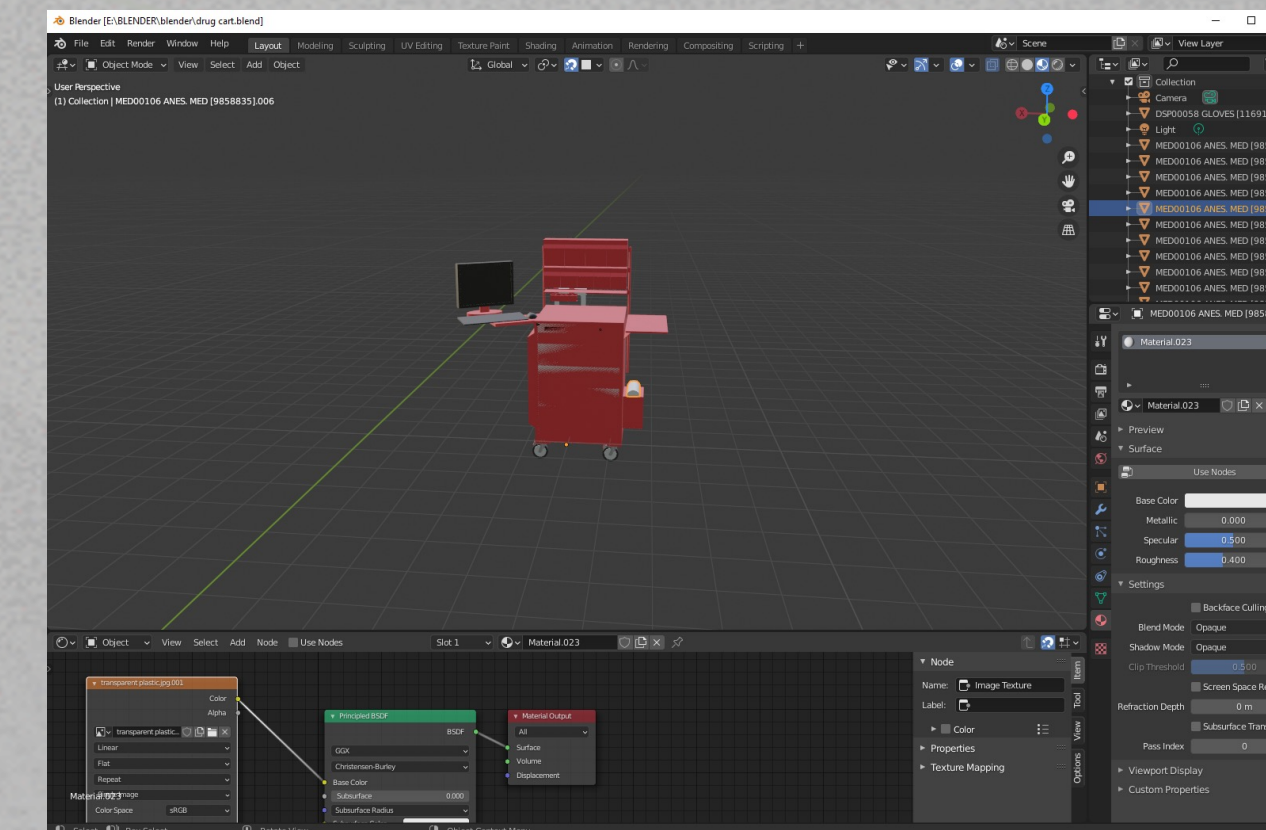
3D modeling software (Blender)

LiDAR scanned object

Oculus Quest 2 headset being used in a completed immersive virtual reality simulation

Results

- Scoping literature review performed and used to generate ideas on how best to utilize immersive virtual reality for human factors training

- Virtual reality space and objects created for medical simulation

- Pilot scenario "Post-operative bleed after thyroidectomy in virtual reality" designed

- Pilot scenario to be run with medical professionals in the coming weeks

Discussion

We were able to gain an in-depth knowledge of immersive virtual reality and its utilization in medical education through this project. Using this knowledge we were able to successfully create a novel immersive virtual reality environment and simulation for use in medical human factors training.
Once the pilot scenario is tested, we plan to evaluate the educational value of immersive virtual reality training against in-person training. Additionally, we plan to create a suite of simulation scenarios for utilization in the hospital as well as in other settings such as clinic or even non-clinical environments.
The success of our project will not only make the delivery of the educational content smoother from a logistics perspective, but also save the hospital systems thousands of dollars on a yearly basis.

Acknowledgements