Virtual reality human dissection lab simulator

Maaz Zuberi MD[1]*, Kavita Prakash[1]*, Nitin D'Souza[2], Prajnesh Amrit[3], Vance Powell PhD[1], Janine Ziermann PhD[1], Sulaman Rahmat PhD[1]

[1]Howard University Hospital, Washington D.C, USA [2]Birmingham City University, Birmingham, England, [3]Simon Fraser University, Burnaby, Canada, * co-first authors

Objective:

- The global pandemic has negatively effected medical training by limiting in person teaching and favoring online distanced education
- Anatomical education has suffered significantly due to loss of access to cadaver labs, and tangible anatomic models
- Although online resources for anatomy are available, they tend to be costly, institution specific and without an interactive active learning component as seen in true dissections
- To bridge this gap in education, we are building a photorealistic, intuitive and immersive Virtual Reality Anatomy Lab Simulator- a fully functional dissection lab in virtual reality, for personal use.

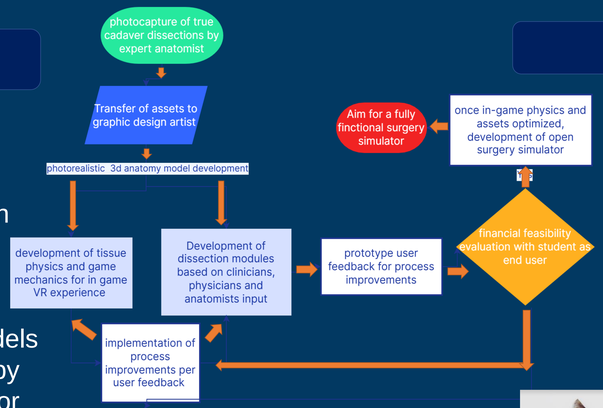
Description/Methods:

- Development of a 3D library of real photo-scanned cadaveric images with dissections completed by an anatomy professor, digitized using high resolution photogrammetry.
- Assets generated by graphics artist in open source software Blender.
- To simulate the dissection, final 3D models are processed into our physics engine by game designers using Unreal Editor 4 for realistic cutting capability with tools
- A virtual instructor and interactive menu to guide students through dissections
- Includes a haptic corrective component- controllers will vibrate when wrong incision made and not permit user to proceed until the correct one is made
- Simulator designed for the Oculus but will be compatible with other VR systems
- Handheld controllers allow students to build dexterity, appreciate tissue layers, textures, and complexity with haptic feedback

Future considerations:

- Complete dissection modules on the entire human body
- Collaborating with Meta to use prototype haptic gloves for greater precision
- Open surgery Surgical simulations for resident education

Process diagrams:



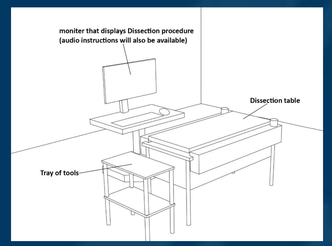


Diagram of asset placement



Photorealistic muscle

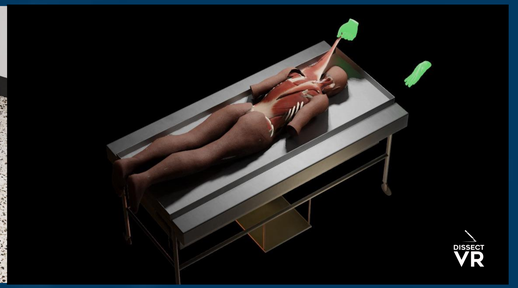


photorealistic anatomy hall in game

In- engine screen shots:



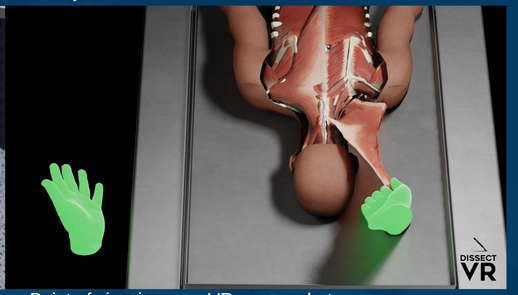
In game dissection cadaver with lab assets



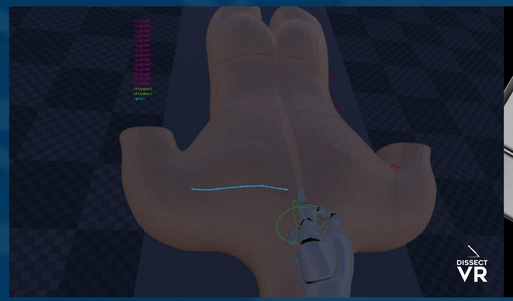
Bird eye view of VR environment



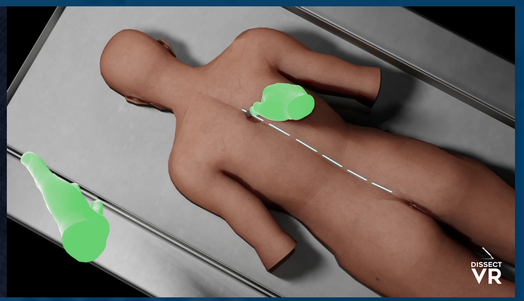
In game holographic instructor with muscle physics



Point of view in game VR screen shot



Unreal engine interface tool



Point of view in game VR screen shot