Extended Reality (XR) Simulation for Healthcare Education

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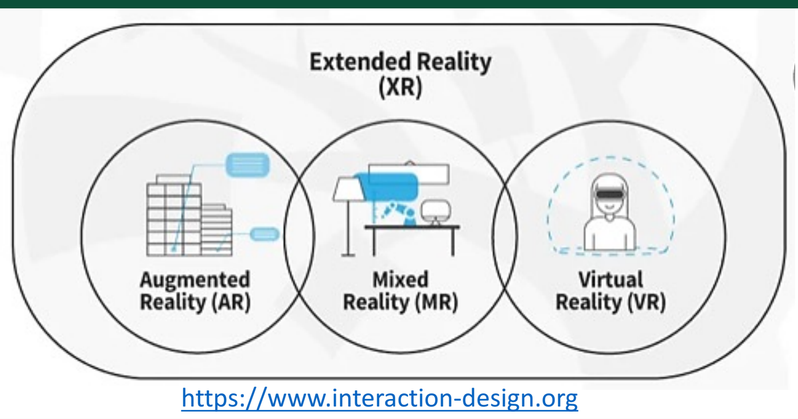
Introduction

Problem: Current healthcare education training for *students* and *medical professionals* requires many hours of theoretical study and clinical placements to master the appropriate skills needed. **Simulation** of healthcare and medical practices offers a way to teach students and professional alternative ways to learn these skills, but often the simulation technology are expensive, not adaptable, and not very portable. We aim to solve these problems by developing novel Virtual Reality (VR) and Augmented Reality (AR) (combined together aka **Extended Reality - XR**) software using portable head mounted displays to help improve simulation of healthcare education for students and medical professionals.



https://www.interaction-design.org

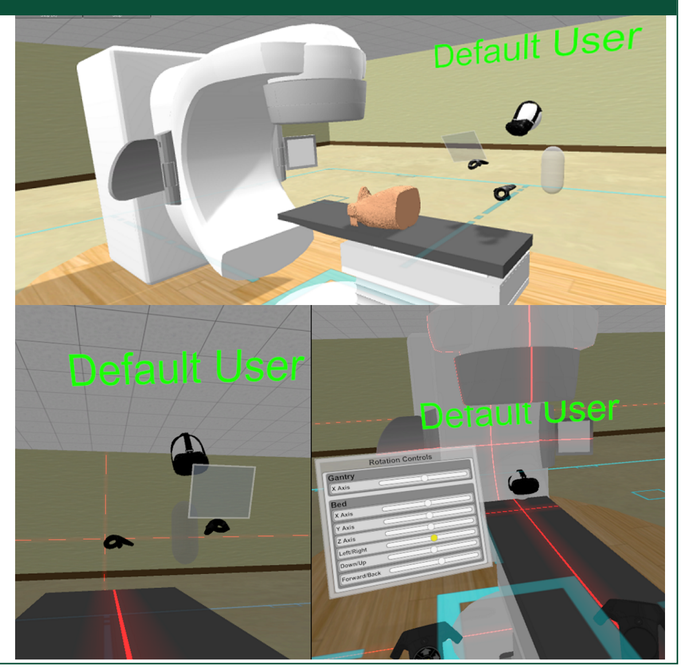
Solution:

- We have developed several simulation training XR solutions for r*adiation therapy*, *child birth*, and *electrophysiology*.
- We have conducted studies with students and medical professionals in NZ. Findings show that there is a great need for these kinds of solutions as they offer near real experiences and allow for training modules to be developed that offer fast feedback and support assessment.

Radiation Therapy

***LINACVR**:* interacting with a simulated LINAC and DICOM data.

Cancer is the cause of over 15% of deaths globally (~10 million people). Radiation therapy is a common form of cancer treatment but it is in high demand and requires highly trained radiation therapists. *in-situ* training of radiation therapy students is impacted by the increasing demand for radiation therapy along with efficiencies aimed at increasing treatment numbers. Simulation of radiation therapy can provide an effective training solution without requiring expensive and in demand equipment. We have developed ***LINACVR***, a VR radiation therapy simulation of a LINAC that provides an immersive training solution using DICOM data and supports a multi-user view so patients can experience the simulation with their therapists and oncologists. We evaluated LINACVR with 15 radiation therapy students and educators in NZ, and results indicated that it would be effective in radiation therapy training and was more effective than existing simulators (e.g. VERT).

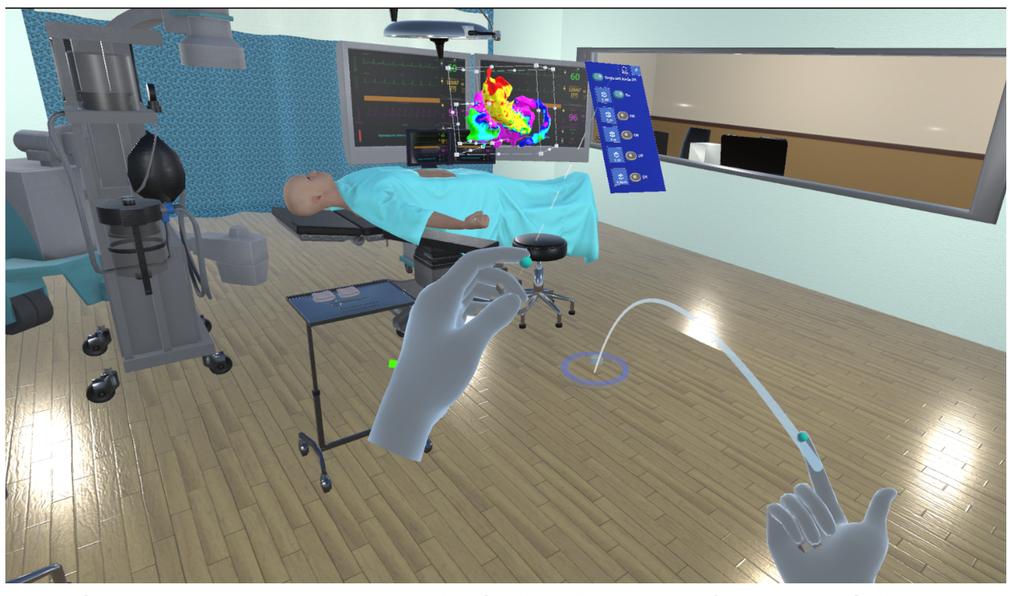


Child Birth

***ChildBirthVR**:* woman Zara and her partner Philip simulating a birth.

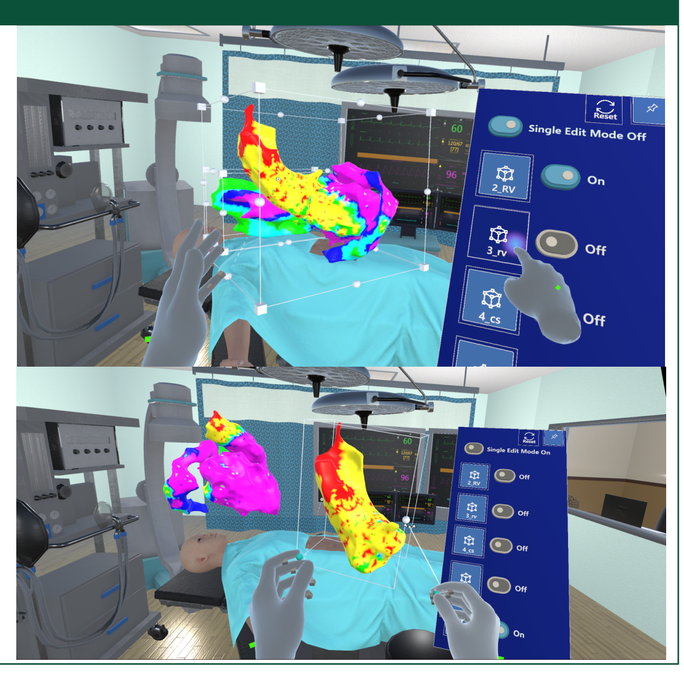
There is a need in NZ for more midwives. Training student midwives can be challenging and we use ***ChildBirthVR*** simulation from Virtual Medical Coaching. In the simulation student midwives interact with a birthing woman and her partner, using prompts and questions to guide the labour process. Students first enter the room and conduct an initial medical assessment asking: how strong are the contractions, how often are they coming, and have her waters broken. The simulation shows the woman experiencing more discomfort over time, and students can take observations such as heart rate, temperature, blood pressure, palpate to find out the position the baby is lying in and can listen to the fetal heart rate, and perform a vaginal examination to assess progress. Finally the simulation shows a virtual birth of a baby. The simulation helps remind students what questions to ask women and what assessments need to be done and when. Feedback from our students is that the simulation is realistic and engaging.

Electrophysiology



***CardiacEPX**:* interacting with Carto3D data performing ablation.

Cardiac arrhythmia refers to abnormalities of heart rhythm, and cardiac catheter ablation procedure provides the best therapeutic outcomes to cure this life-threatening pathology. An electrophysiologist clinically performs the procedure that involves navigating 'catheters' into the chambers of the heart through peripheral blood vessels, studying the cardiac electrophysiology and performing ablations. Two main scenarios have been identified to improve the effectiveness of the procedure: intraoperative guidance and procedure training. Our study aims to examine how XR technologies (AR/VR) can be used to improve the effectiveness of the cardiac catheter ablation procedure. We have interviewed 6 electrophysiologists in NZ and the findings have helped us to develop ***CardiacEPX*** to support simulation of procedure training utilizing Carto3D data. We are now conducting user studies of our tool with medical professionals.



Collaborators

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Capital & Coast District Health Board
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