
# AR-Tho

*Immersive Multi-Sensory Training for Educating Surgeons*

## Problem

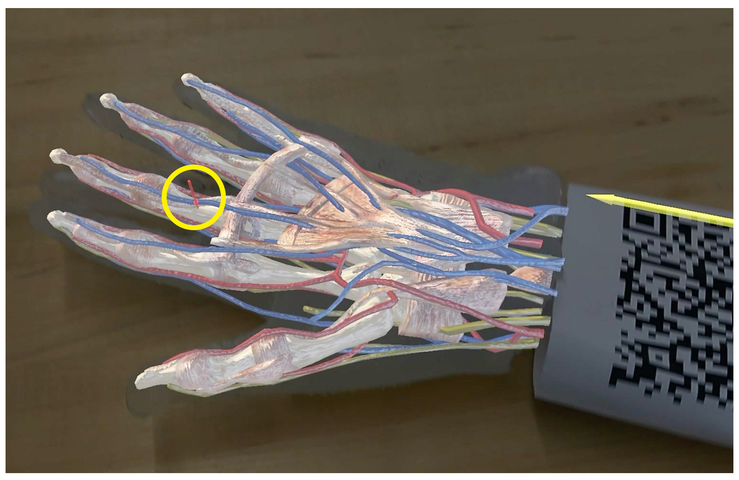
In surgery, high proficiency in medical knowledge and surgical technique is necessary for successful patient outcome. However, instructor surgeons and residents are facing increasingly limited time for feedback and training due to increasing patient cases and complex procedures. This has created a gap in medical knowledge and technique.

Outside of cases with live patients, residents use various forms of simulation training which are resource intensive and don't offer immersive, multi-sensory learning. Coupled with the recent pandemic, residents are increasingly limited in realistic practice opportunities.

## Solution

An augmented reality training platform that overlays virtual anatomy onto physical silicone and 3D printed models and allows doctors to practice procedures repeatedly in an immersive and low-risk environment.

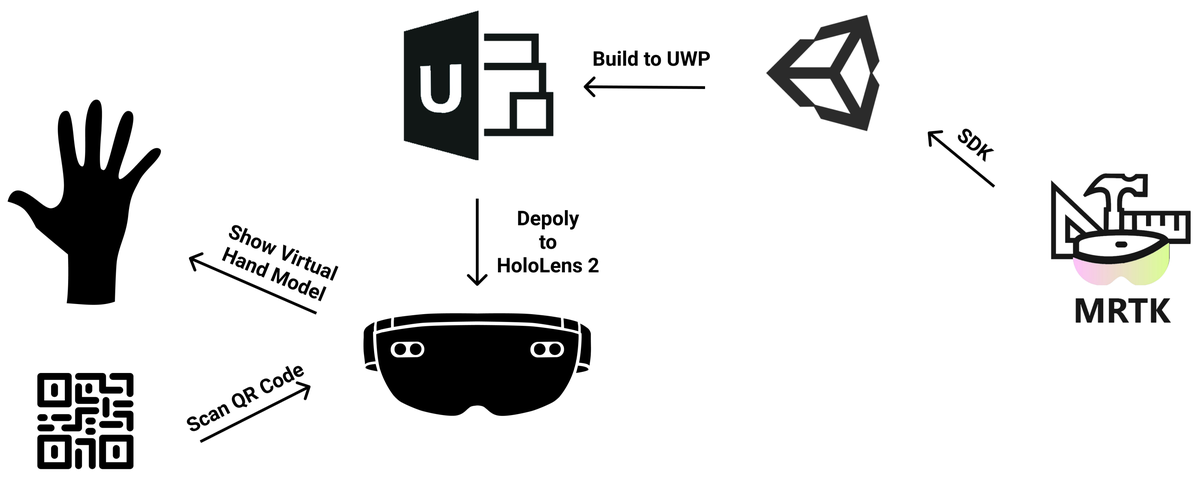
Users practice a digital block, or localized anesthesia, to the middle finger as a proof of concept to demonstrate how our immersive system. They can navigate a button menu to activate various anatomical layers, such as muscles, nerves, or skin.  Users can also rotate and move the virtual hand either in the virtual environment or by using the physical hand. These features allow users to adjust the training difficulty level, from learning basic anatomy in 3D to a realistic simulation of the procedure.



*X-ray-like virtual layers provide residents vital anotomically-correct information about the physical model.*

*User practicing injecting anesthetic (i.e. a digital block) into a 3D printed hand model encased in silicon. AR-Tho helps train users to avoid damaging soft tissues and veins during similar procedures.*

## Software & Hardware Systems Architecture




*AR-Tho is developed in Unity using MRTK SDK, built to UWP, and deployed to the HoloLens 2. A QR code directs the virtual hand model to be displayed.*

*Resident using AR-Tho's ability to switch between anotomical layers to learn 2D to 3D spacial awareness.*

## Process

### Expert Interviews & Observation

12 expert interviews with orthopaedic surgeons, residents, and AR experts

15 hours of observations

### Ideation

Scoped idea to specific anatomy and procedure

Identified top needs in resident learning

### Design & Usability Study

Created prototype using MRTK models in Unity

9 rounds usability studies across end users and stakeholders

### Implementation

Implemented user feedback into HoloLens 2 app

Created physical models to provide tactile feedback

GLOBAL **INNOVATION** EXCHANGE

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