

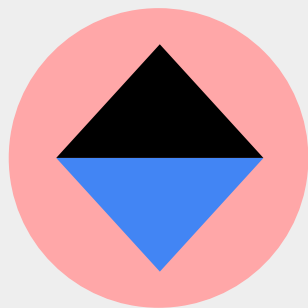
MURA

L

Advisors:

**Ivan Seskar, Jennifer Shane,
Wade Trappe**





Maëlle Mével



Heeun Kim

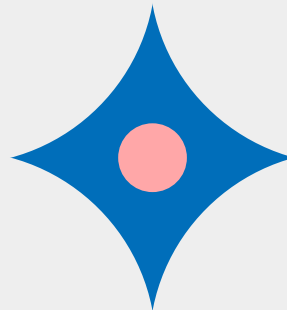


The Team

**Hans
Wassermann**



**Amithi
Pathak**

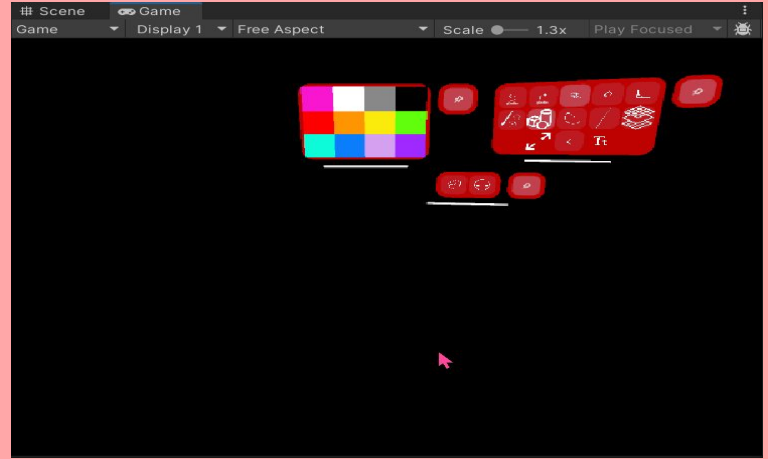


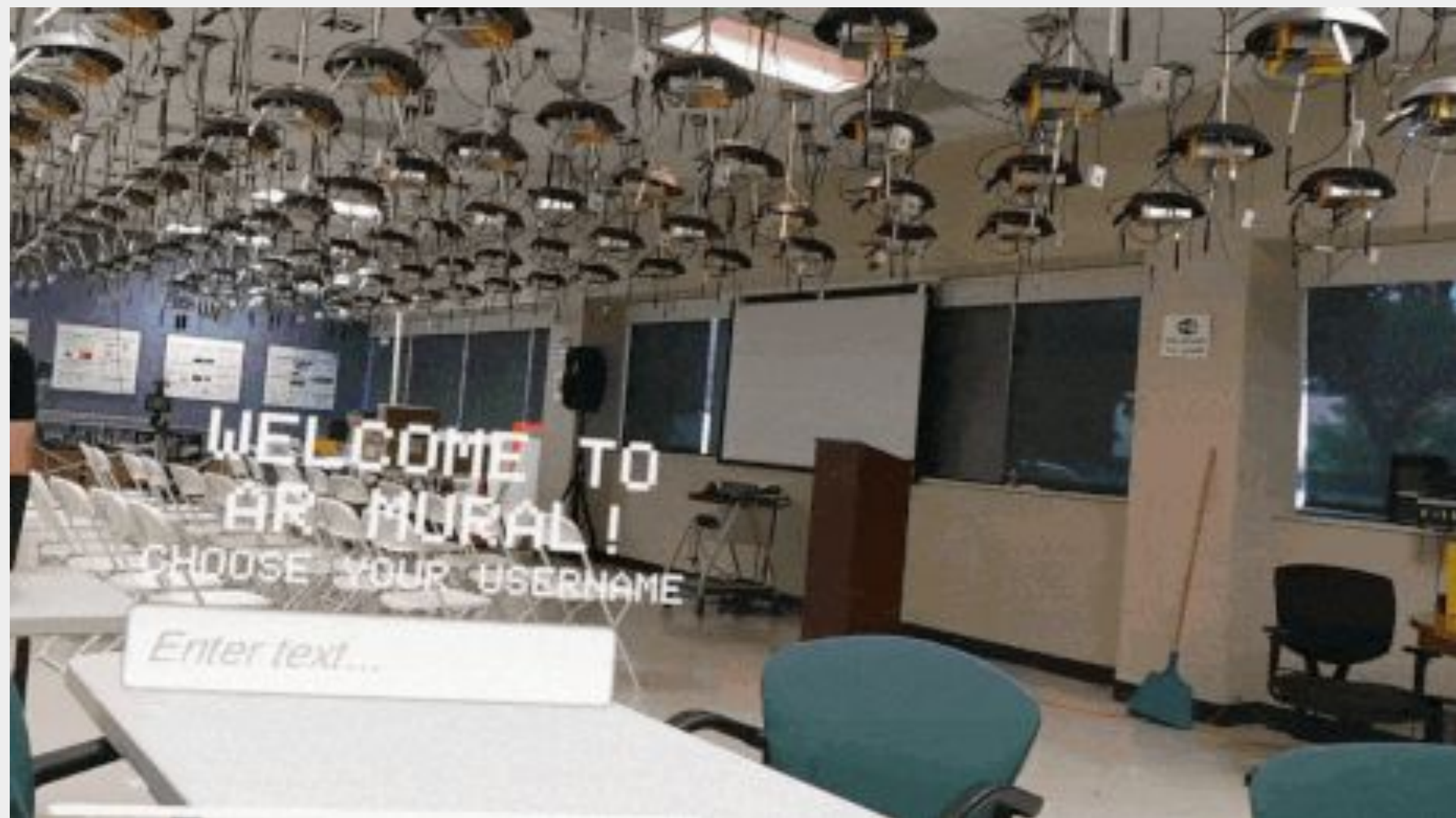
Bomie Jun



What is AR Mural?

A collaborative
drawing/sculpting
platform in
augmented reality





WELCOME TO
AR MURAL!
CHOOSE YOUR USERNAME

Enter text...

Background



Game development platform
for building and testing apps

Visual Studio



"Middle man" between Unity
and Hololens to deploy apps

Hololens 2



Microsoft augmented reality
headset

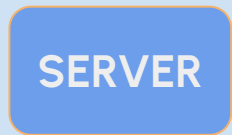
MQTT Server



Communication protocol used
for server to connect users

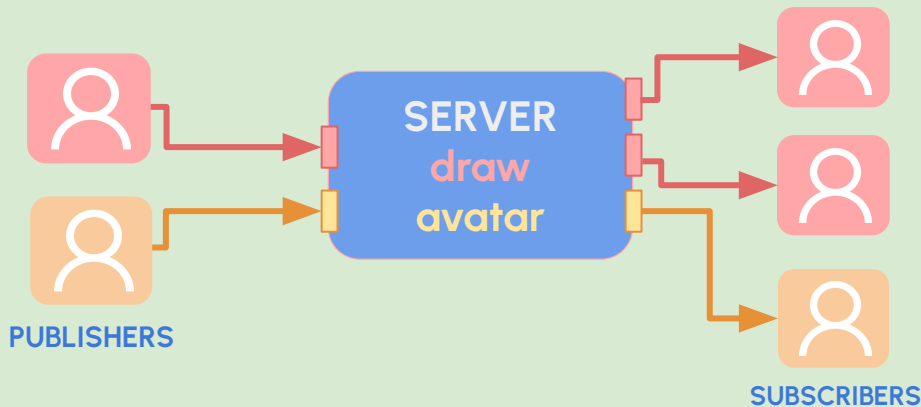
Background: MQTT

Standard Server



Client sends request
Server processes and
sends a response

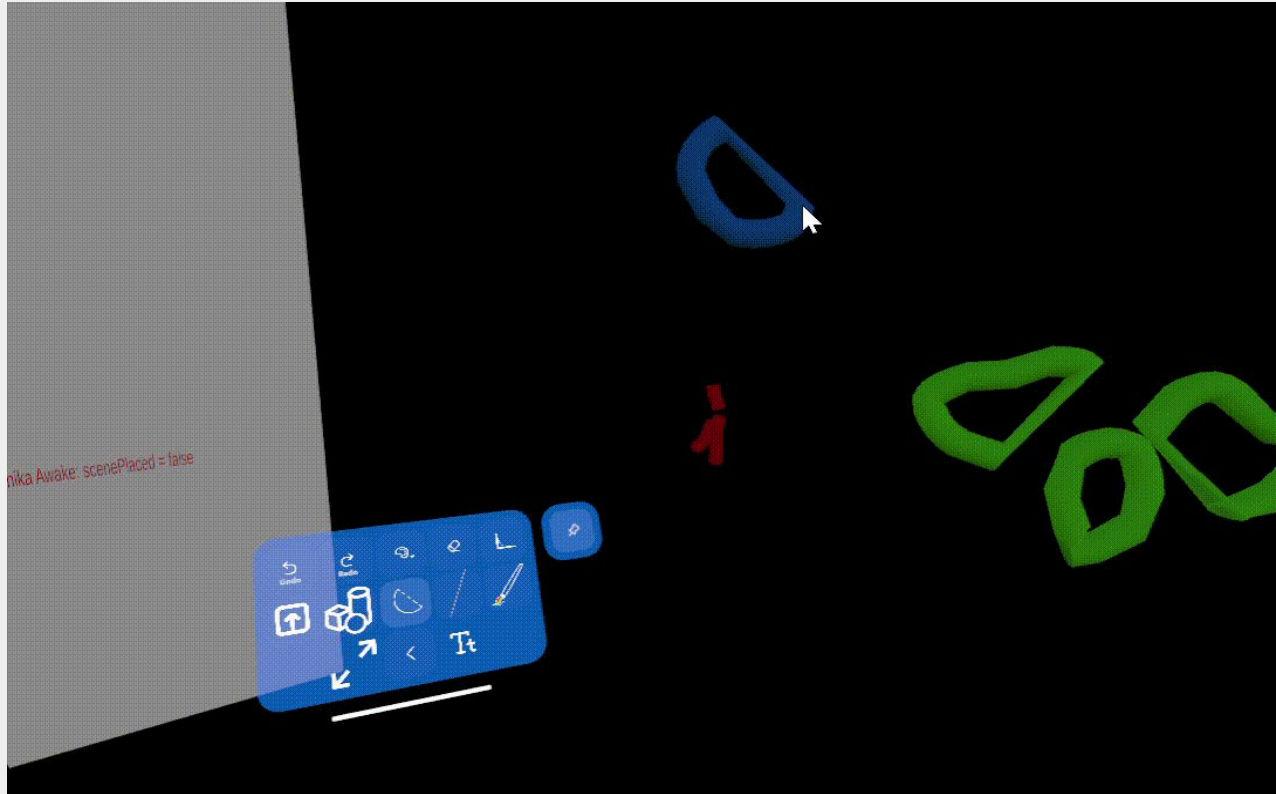
Message Query Telemetry Transport Server



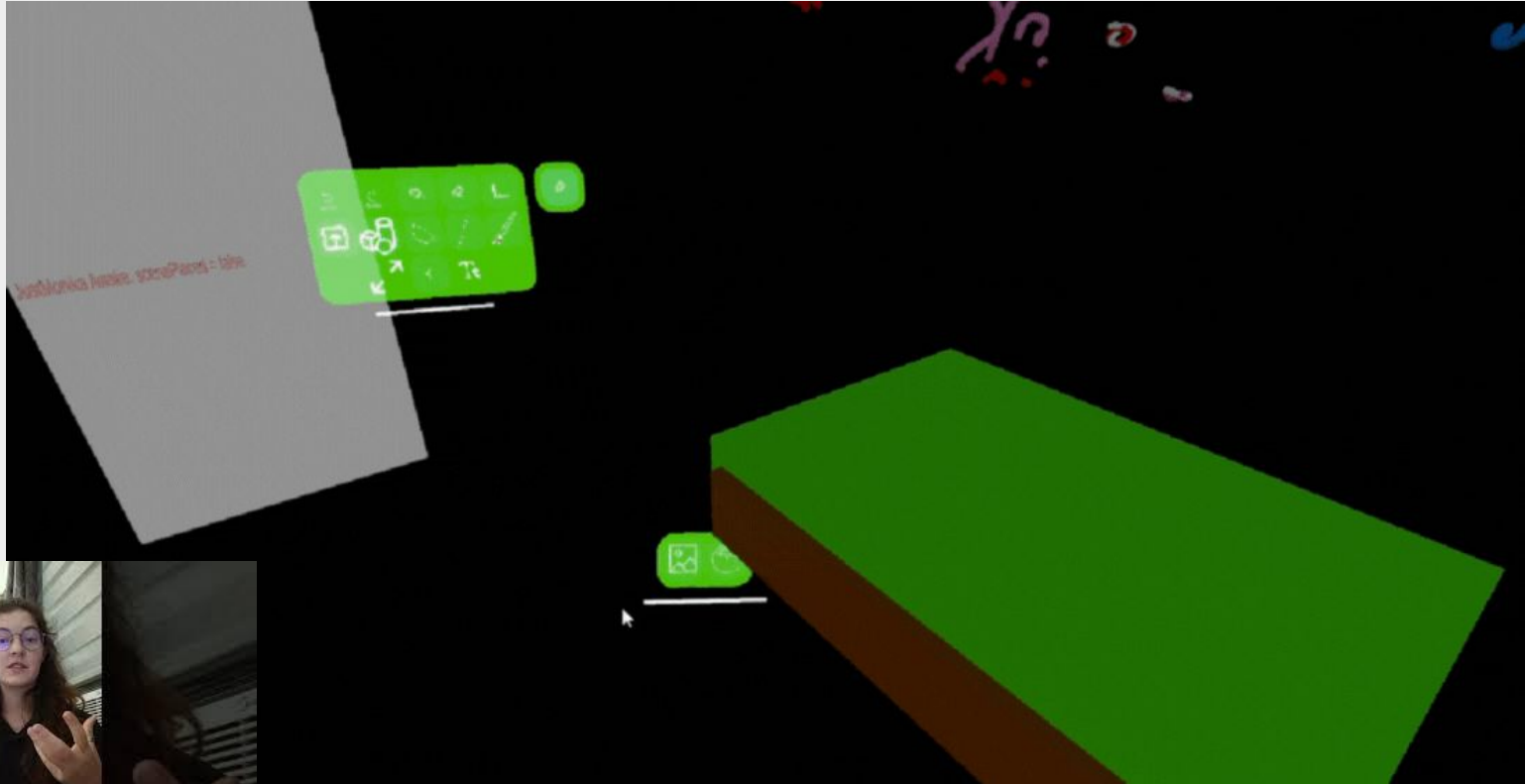
Publisher-subscriber model

Publisher sends message to topic
Clients subscribe to topic to receive
messages

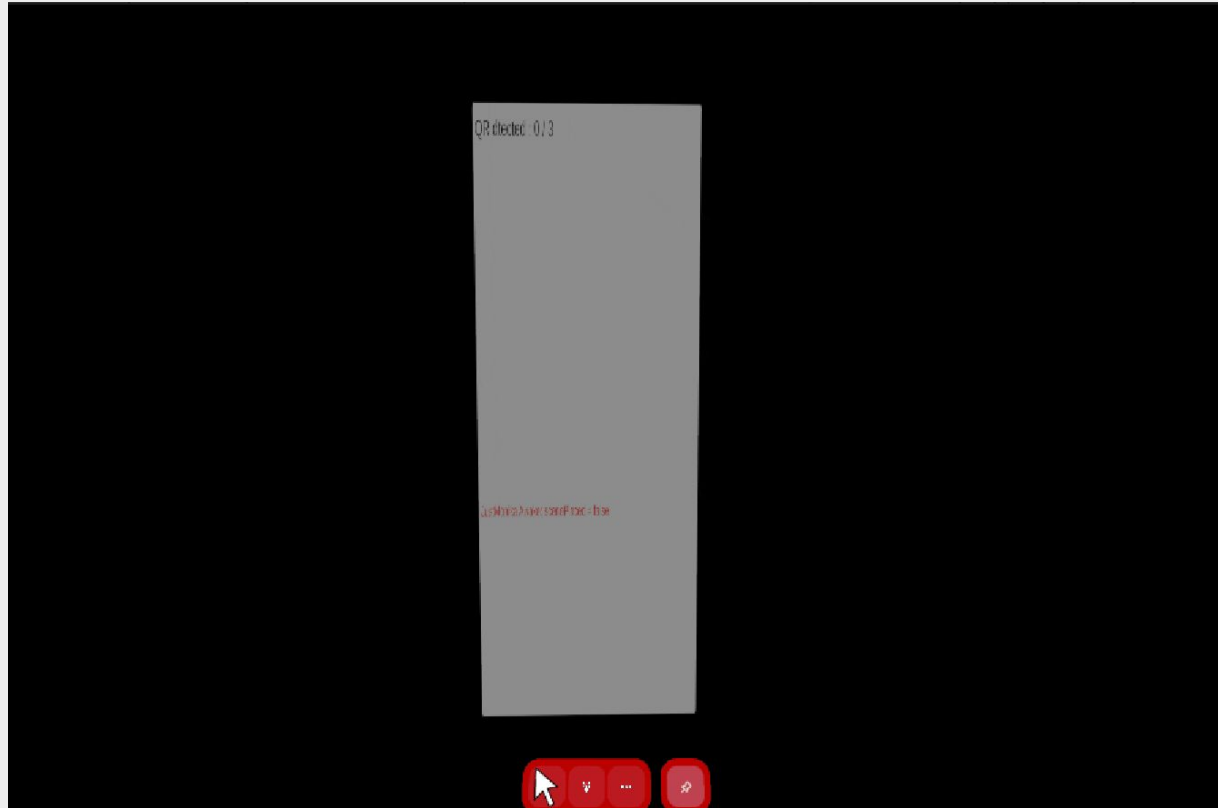
Tool: Undo/Redo



Tool: Object Tool



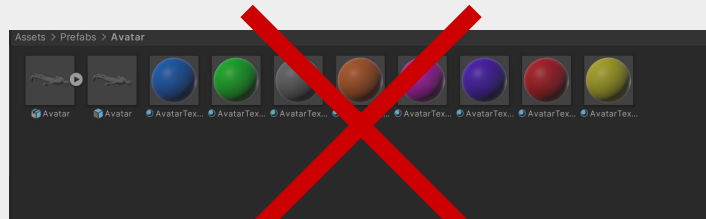
Feature: Avatars



Feature: Avatars

Avatar Selection

- Customization of avatar
 - Changing color of material attached to prefab in AvatarManager



```
Color parsedColor;
if (renderer != null && ColorUtility.TryParseHtmlString("#" + userColorHex, out parsedColor))
{
    renderer.material.color = parsedColor;
}
else
{
    renderer.material.color = Color.red;
}

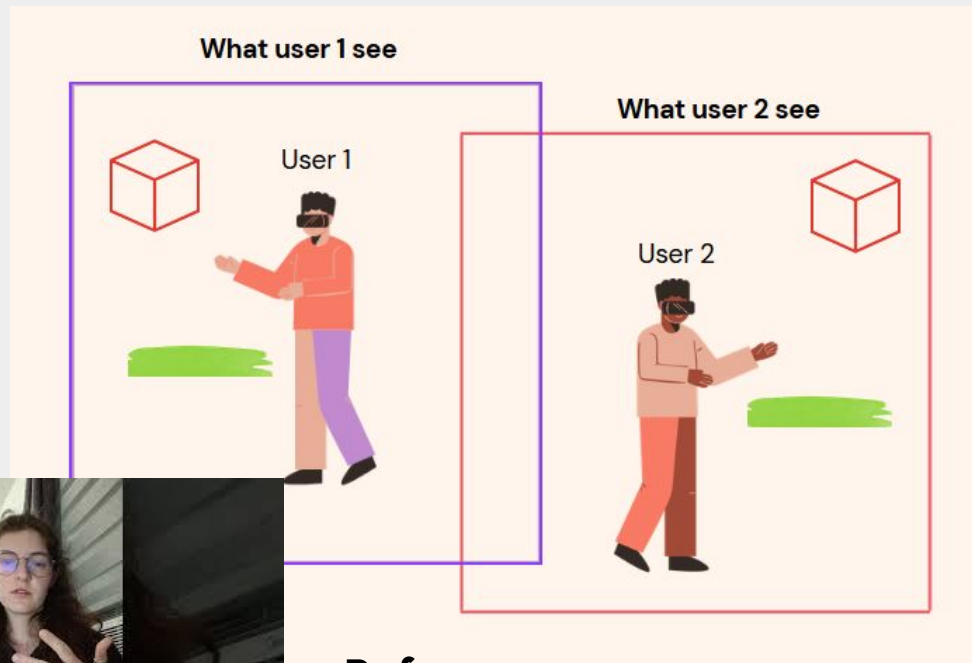
// Store reference
remoteAvatars[clientId] = newAvatar;

Debug.Log($"[AvatarManager] Created new avatar for {clientId} at {position} with rotation {rotation}");
Debug.Log($"[AvatarManager] Total remote avatars: {remoteAvatars.Count}");
```

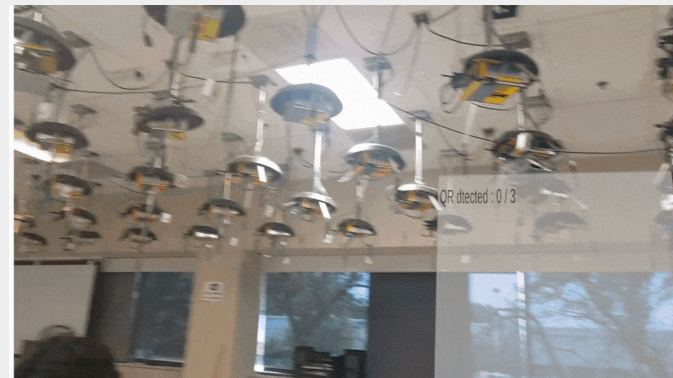
```
avatarList = new List<string> { "Red", "Orange", "Yellow", "Green", "Blue", "Purple", "Grey" };
avatarHexColors = new string[] { "FF0000FF", "FF8C00FF", "FCFC2DFF", "20F535", "2D79FCFF", "AA2DFCFF", "8A8A8AFF" };
```

Feature: QRCode Initialisation

Object position



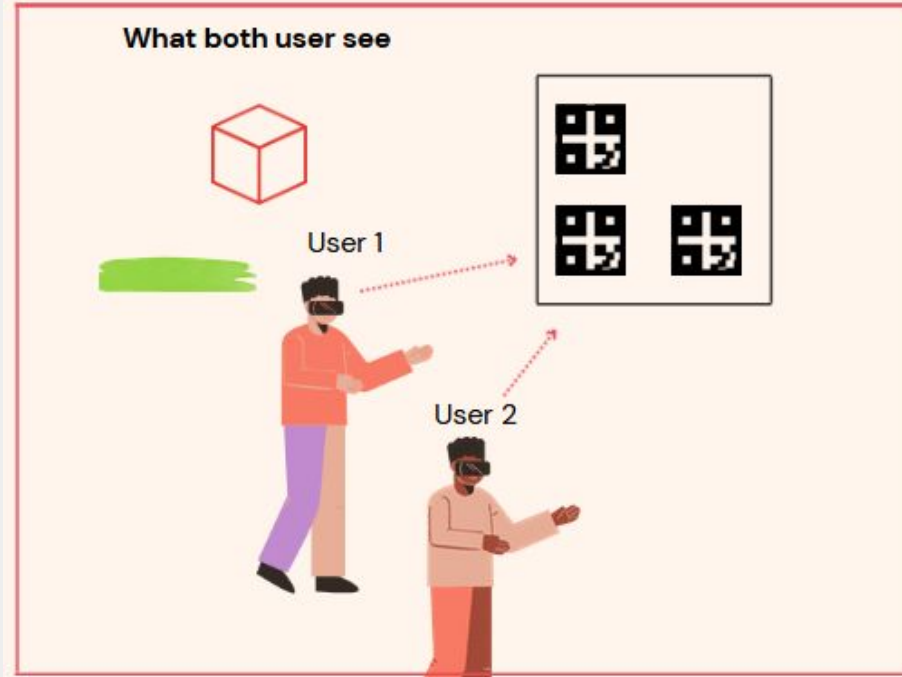
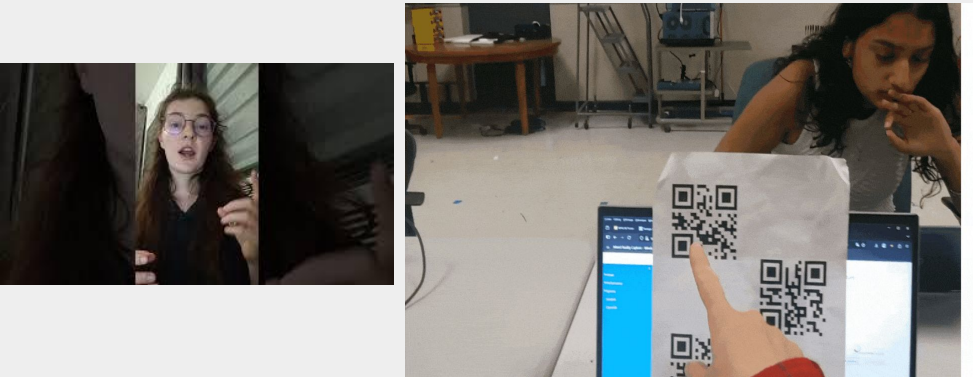
Before



Feature: QRCode Initialisation

Avatar position

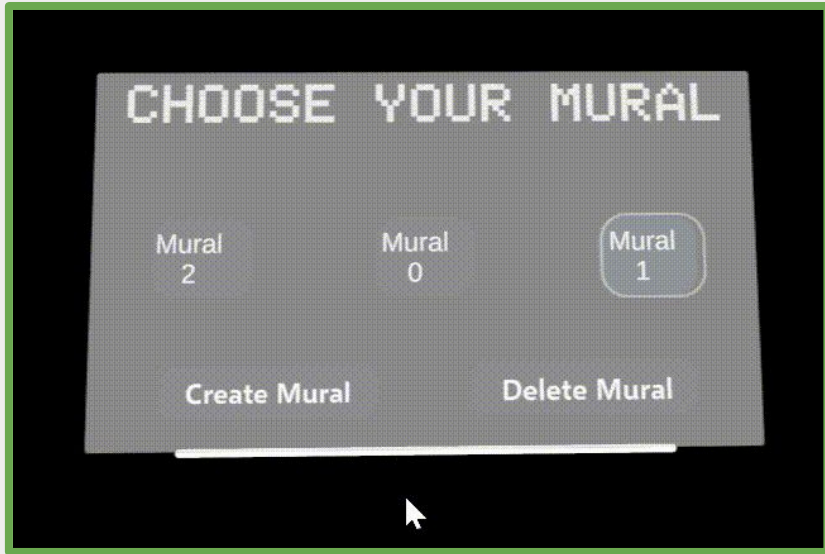
- When using the hololens each avatar is displayed according to their real position in space



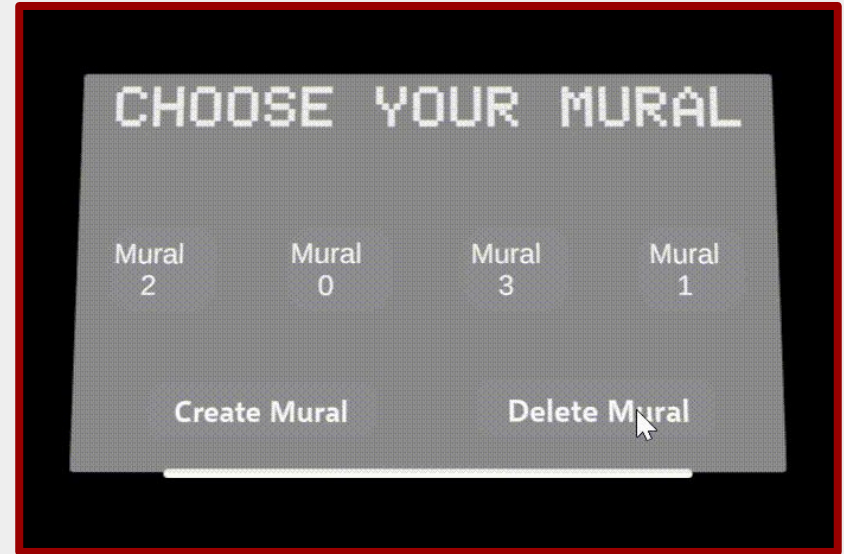
After

Feature: Multiple Murals

CREATING NEW MURALS

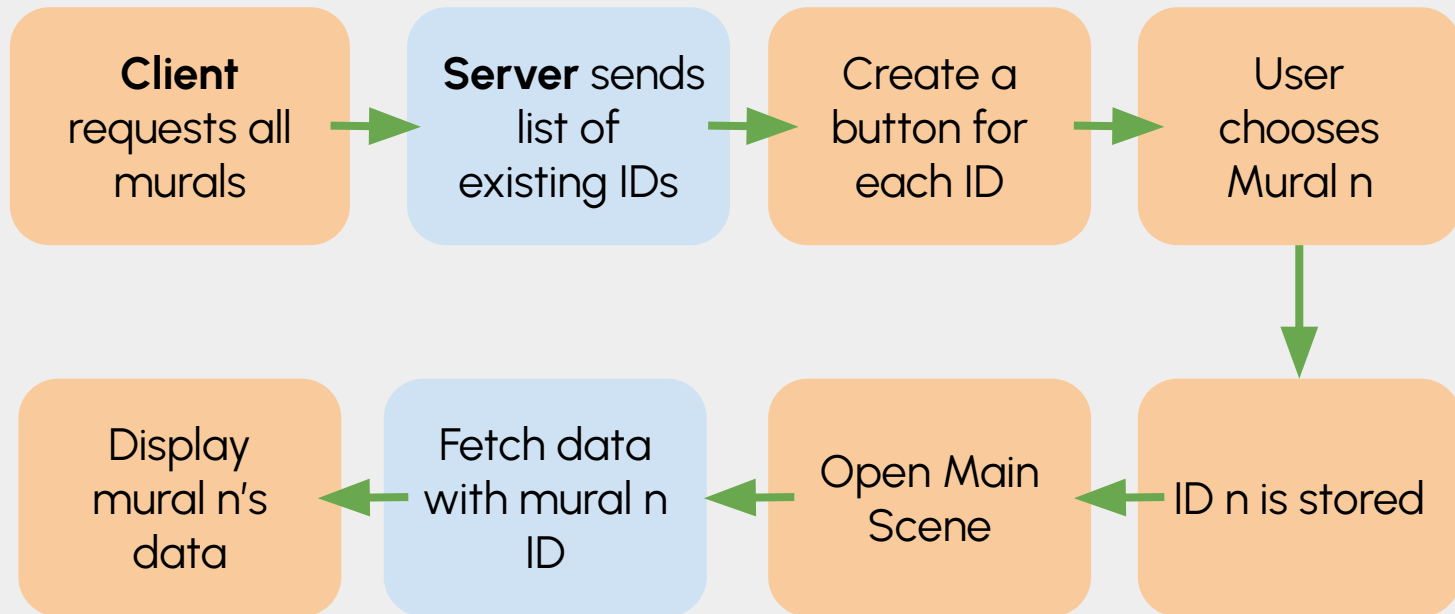


DELETING MURALS



Feature: Multiple Murals

BEHIND THE SCENES: Client Interaction



Challenge: LevelDB

MULTIMURAL LIMITATIONS

- Initial plan →
 - Have multiple databases, one for each mural
- **Problem:** Multiple LevelDB instances cannot be open at the same time
- Currently: one DB for multiple murals
 - Inefficient to query/store



Future Work

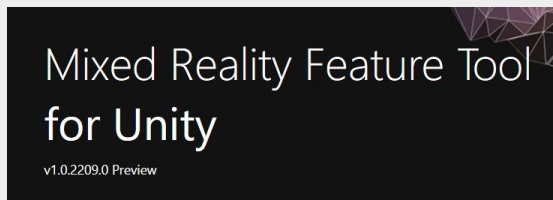
- Research + find a **database alternative** that
 - Handles multiple open databases
 - Has fast key/data lookup
 - Is scalable



Challenge: Documentation

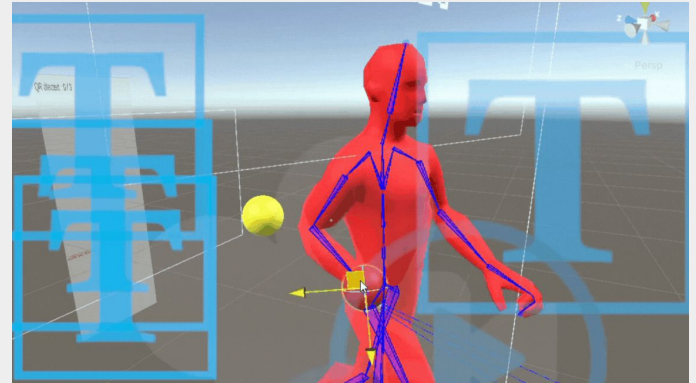
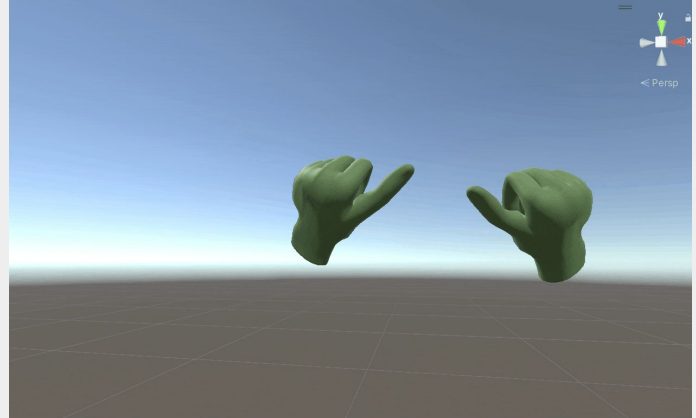
DOCUMENTATION SCARCITY FOR:

- Setting up
 - Mixed Reality ToolKit
 - Unity builds
 - Hololens Deployment
- MQTT Server
- AR Mural



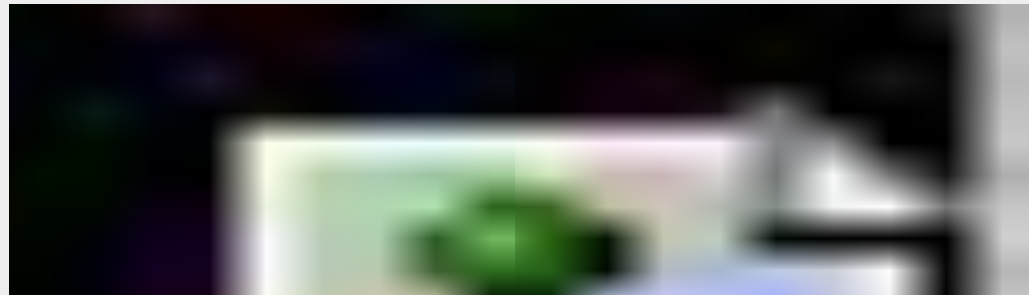
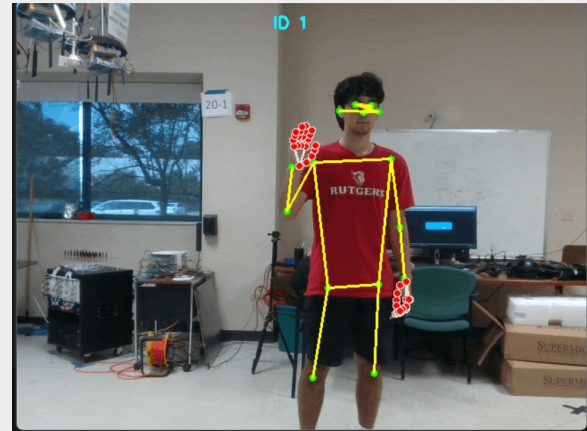
Challenge: Humanization

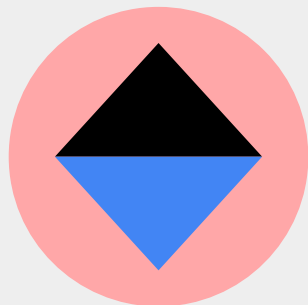
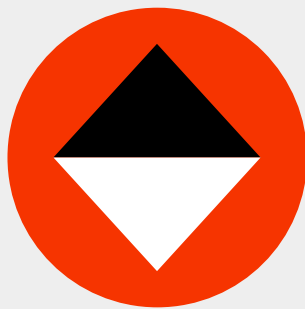
- Hand visualization for users similar to avatar generation using Hololens camera
- Body animation based on headset movements
- Slower and tedious testing on Hololens



Future Work

- Continue humanization development with external camera to mimic body movements
 - Machine learning body detection algorithm
 - Depth camera





THANK YOU!

