RUTGERS
WINLAB | Wireless Information Network Laboratory

AR Mural

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Overview

A collaborative drawing platform in augmented reality which allows users to create virtual murals using the Unity Game Engine and Microsoft Hololens.

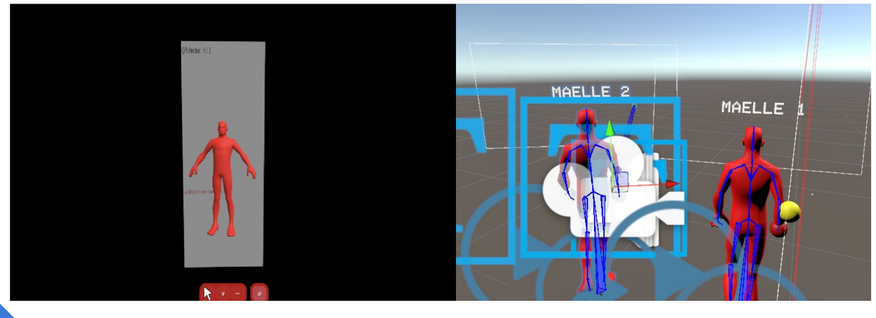
Added Tools

- Undo/Redo tool for brushstrokes
- Object tool
  - Import a wide range of 3D assets into mural

Avatar Generation

Creates an Avatar within the virtual space, allowing users to see other users.

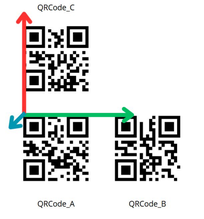
- Uses the MQTT server to update the avatar's position
  1. Every avatar sends a "hearbeat" of their coordinates to the server which is broadcast to other clients
  2. Other clients then recreate the avatar on their side
     a. Users won't see their own avatar, only others
  3. If a user hasn't sent a heartbeat in the past 3 seconds, their avatar is destroyed

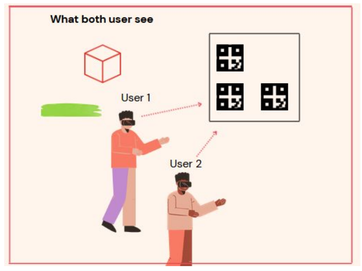


QR Code Initialization

Need to scan 3 QRCodes in order to create a 3D frame that is being use to place objects and avatars.

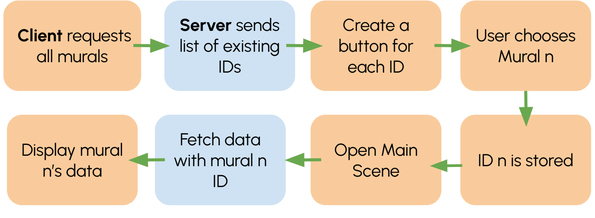
- Only need to scan once
- Multiple users in the same room will have accurate avatars and their objects appear at the same place
- People from other location can share the same space if they scan the same QRCodes





Multiple Murals

- Restructure of existing LevelDB:
  - Addition of mural_id to database Key for mural filtering
  - New Key: "mural_id: x, y"
- Each mural is associated with its own group of MQTT topics.
  - Ex: mural_id/cmd, mural_id/qry
- Creation and deletion of murals
  - Create button creates new set of chunk keys for each mural.
  - Delete button enables/disables "delete mode" in which user chooses mural to delete, presses delete button again.

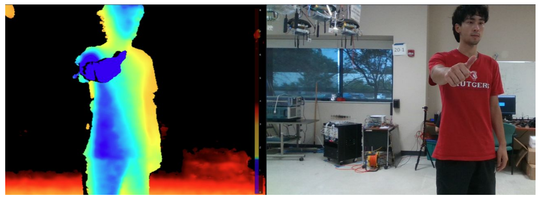


Challenges

1. We experimented with different ways of humanizing the avatar that proved to be difficult:
   - Using a live hand tracking package to recreate hand data (like how avatars are created)
   - Interpreting changes in the headset position and orientation as body movements
2. LevelDB's limited capabilities for handling multiple murals:
   - Inability to open multiple databases simultaneously

Conclusion/Future Work

- Continue humanization develop with YOLO and RealSense depth camera
- Add recently updated screenshot to world information in mural menu
- Determine optimal database alternative to LevelDB



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