



# AR Mural

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# Team Members

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# Overview and Goal

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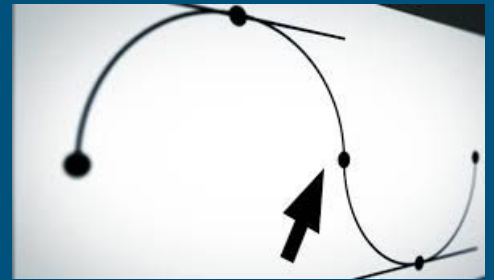


- Augmented Reality: Users interact with computer graphics that are superimposed onto a real world environment
- HoloLens: Head mounted display running the Windows mixed reality platform, that can run AR programs
- Create an **augmented reality art creation** application for the **hololens** in **Unity**.
- Use OpenAR Cloud infrastructure to create a distributed augmented reality canvas which will **allow collaboration** between **artists** in **multiple locations**.

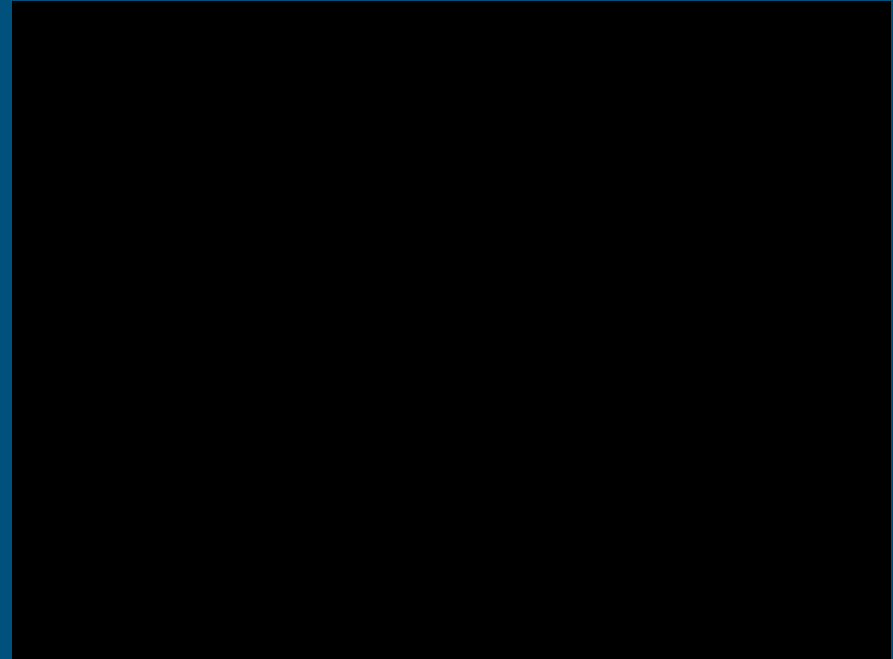
# Painting code

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- Painting program was coded with C# in visual studio and Unity Engine
- Allows users to create strokes by generating vertices at designated positions and create a bezier curve/spline
- Strokes can have their color and width altered
- The stroke's vertices, color, and width are saved in a dictionary for future retrieval and alterations

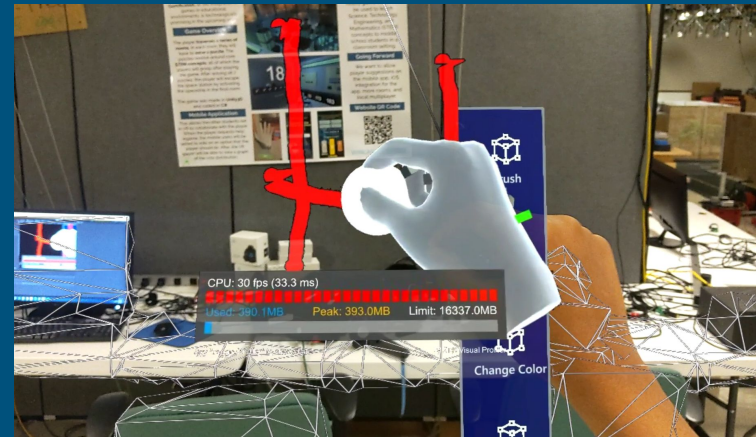


Spline



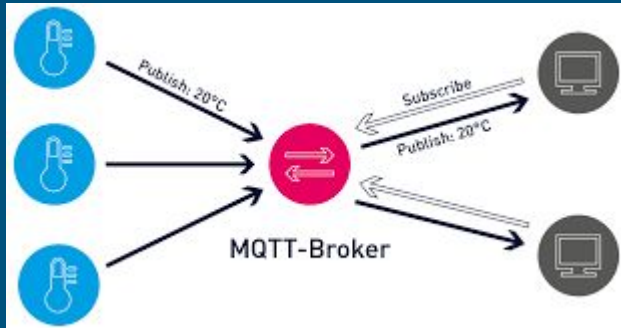
# Implementing in Hololens

- Unity engine's Mixed Reality Toolkit was used to create a program for the Hololens
- MRTK generates an AR camera, hands for user input, and has a gesture recognition features
- Program was projected onto the hololens from the unity window



# Networking

- Used MQTT protocol
- M2MQTT - specific MQTT client built for C# and Unity usage
- Allow each stroke Game Object to be sent and received to and from the broker



```
Connected to broker on test.mosquitto.org
Received: {sensors: [{ 'name': 'nls v. verzé slepice kokodak UUID: 58007B000C50305498343520 @M1:1.M2:0:A:31',
  'T_K': 298.54 [K], 'T': 25.39 [C], 'T_F': 77.71 [F]},{ 'name': 'Ultrasonic flowmeter v. 1.0.0.1 (d217ca0) DIRTY
  @M1:3.M2:0:A:10', 'Beer volume': 93.00 [ml], 'Water volume': 0.00 [ml], 'Sponge count': 0.00 [sponges], 'Colorfulness':
  3196.00 [I]},{ 'name': 'Cooler - upper temperature sensor v. N/A @M1:6.M2:1:A:76', 'Temperature': 24.00 [C]},{ 'name':
  'Compressor output - temperature sensor v. N/A @M1:6.M2:3:A:78', 'Temperature': 24.00 [C]},{ 'name': 'Compressor input
  - temperature sensor v. N/A @M1:6.M2:6:A:72', 'Temperature': 26.00 [C]},{ 'name': 'Temperature and humidity sensor v.
  N/A @M1:6.M2:8:A:64', 'Temperature': 26.20 [C], 'Humidity': 69.00 [%]},{ 'name': 'virtual sensor v. N/A
  @M1:10.M2:0:A:0', 'Uptime': 1251617.00 [s], 'Primary_socket_connected': 1.00 [I], 'Secondary_socket_connected':
  1.00 [I], 'LTE_RSSI': -67.00 [db], 'WiFi_RSSI': -62.00 [db], 'Free_heap': 27060.00 [b]}]}
Disconnected.
```

Broker Address	<input type="checkbox"/> Encrypted	Port	
test.mosquitto.org		1883	
<input type="button" value="Connect"/>	<input type="button" value="Disconnect"/>	<input type="button" value="Test Publish"/>	<input type="button" value="Clear"/>

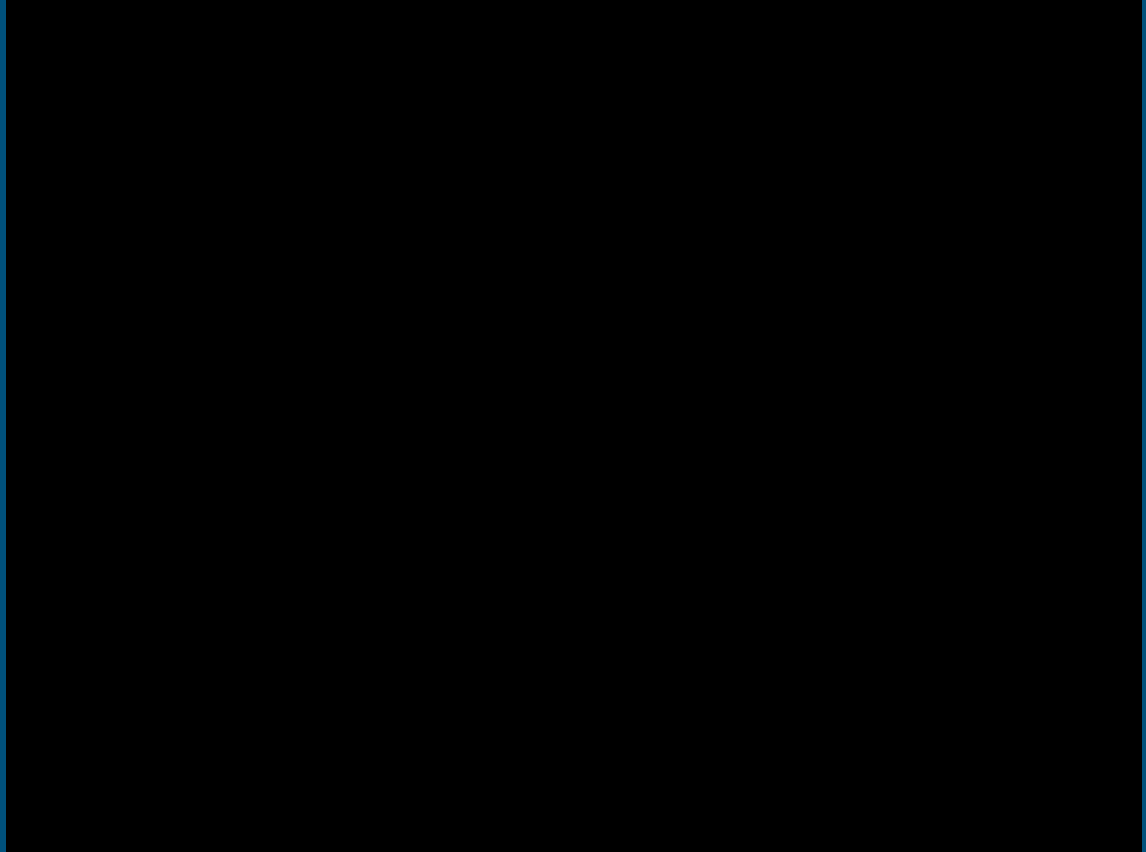
20.6

```
[17:54:16] Event Fired. The message, from Object Controller 1 is = 20.4
UnityEngine.Debug.Log (object)
[17:54:16] Received: 20.4
UnityEngine.Debug.Log (object)
[17:54:19] Received: 20.4
UnityEngine.Debug.Log (object)
[17:54:22] Received: 20.4
UnityEngine.Debug.Log (object)
```

# Results

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- The user can paint by pinching their fingers to draw, and by letting go to stop.
- UI (user interface) tracks head movements, so user can use painting features
- Users collaborating will see each other's strokes



# Future Work

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Future features for painting:

- Proper erasing functionality
- Adding more features in the Hololens
- Improved UI (user interface) for a smoother user experience
- Ability to move strokes
- Allow collaboration through CloudAR or networking





Any Questions?