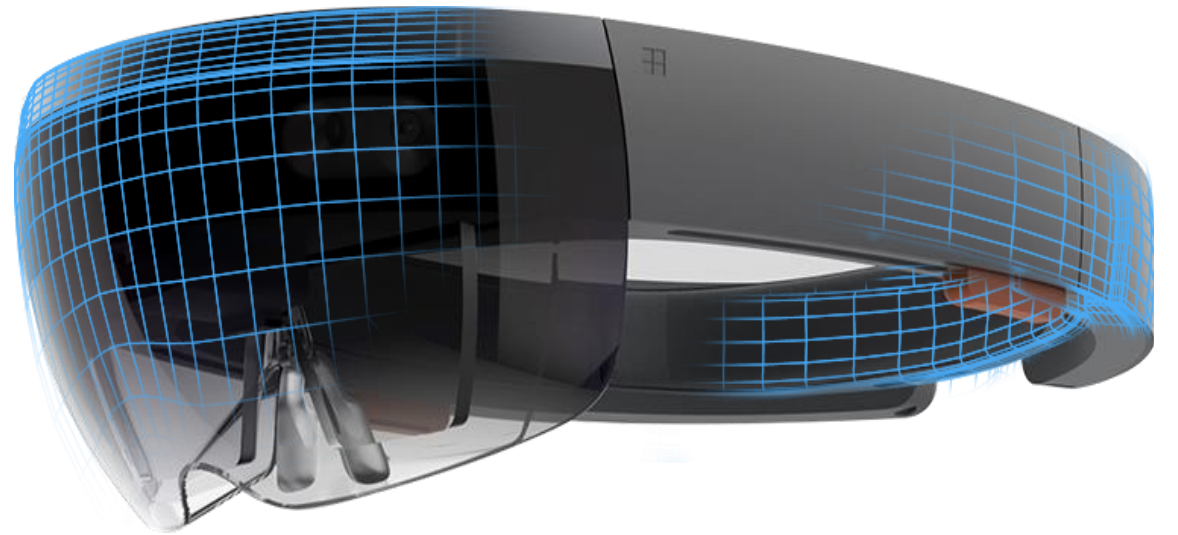


Digital Reality Spectrums and Deep Dive into Mixed Reality Development

Abhijit Jana

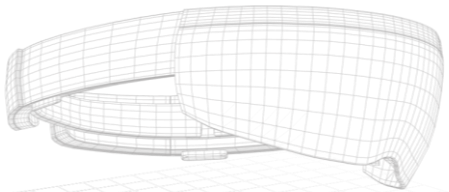
Consultant | Microsoft

Blog : <http://abhijitjana.net> | Twitter: [@abhijitjana](https://twitter.com/abhijitjana)



Objective

- ✓ Understand Digital reality spectrums
- ✓ Virtual Reality(VR) /Augmented Reality(AR) / Mixed Reality(MR)
- ✓ Windows Mixed Reality & Microsoft HoloLens
- ✓ Building a Mixed Reality application with HoloLens
- ✓ Building connected scenarios with HoloLens
- ✓ References for further learning



User Interaction Models Over Times



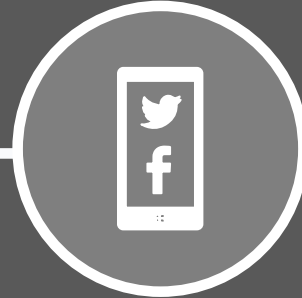
1980s: **PC**

- Desktop



1990s: **Internet**

- Search
- User "visits" websites



2000s: **Mobile**

- Social
- User download apps from App Stores

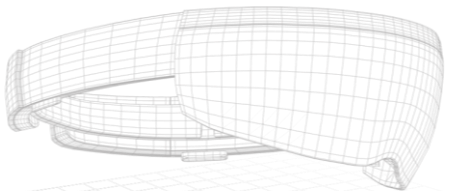
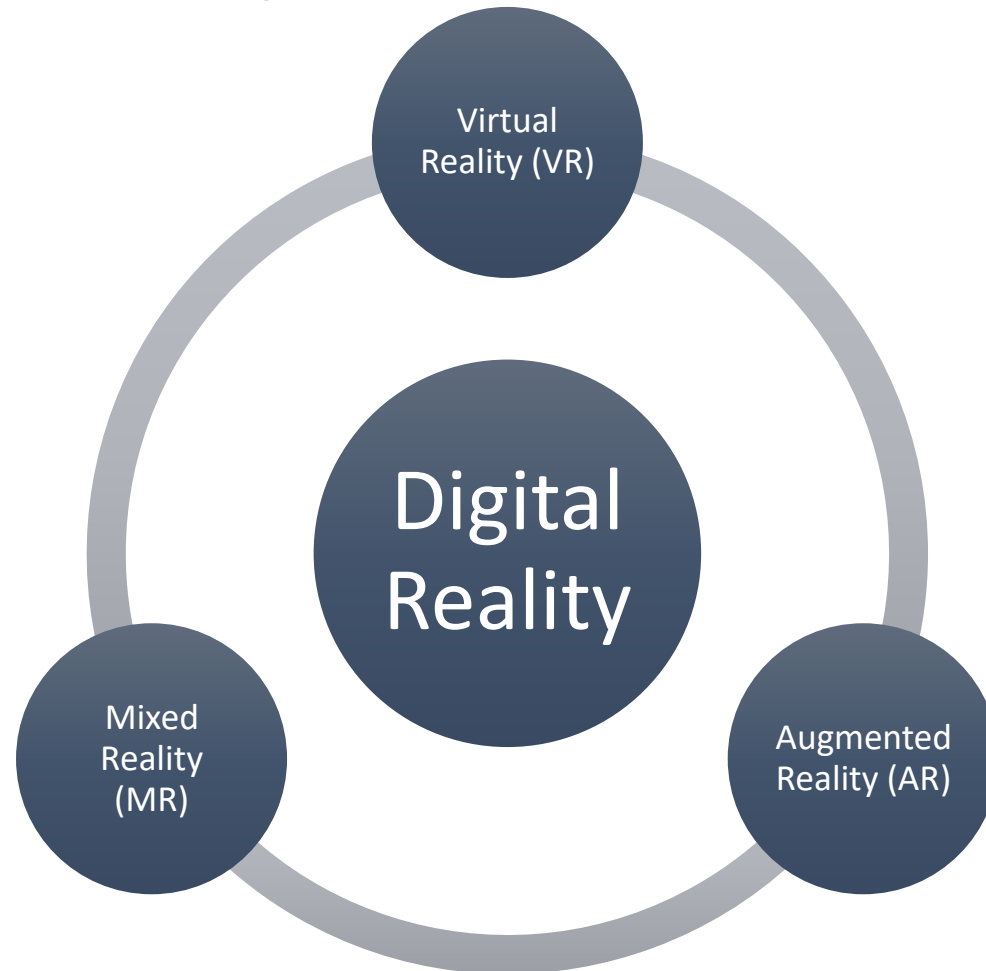


The future: **Immersive Computing**

- Natural language and interactions between people and technology
- Conversational canvas
- Bots
- Digital Realty

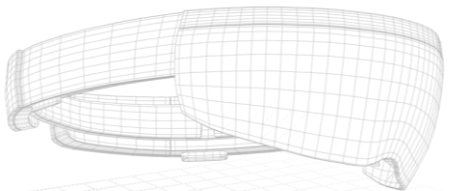
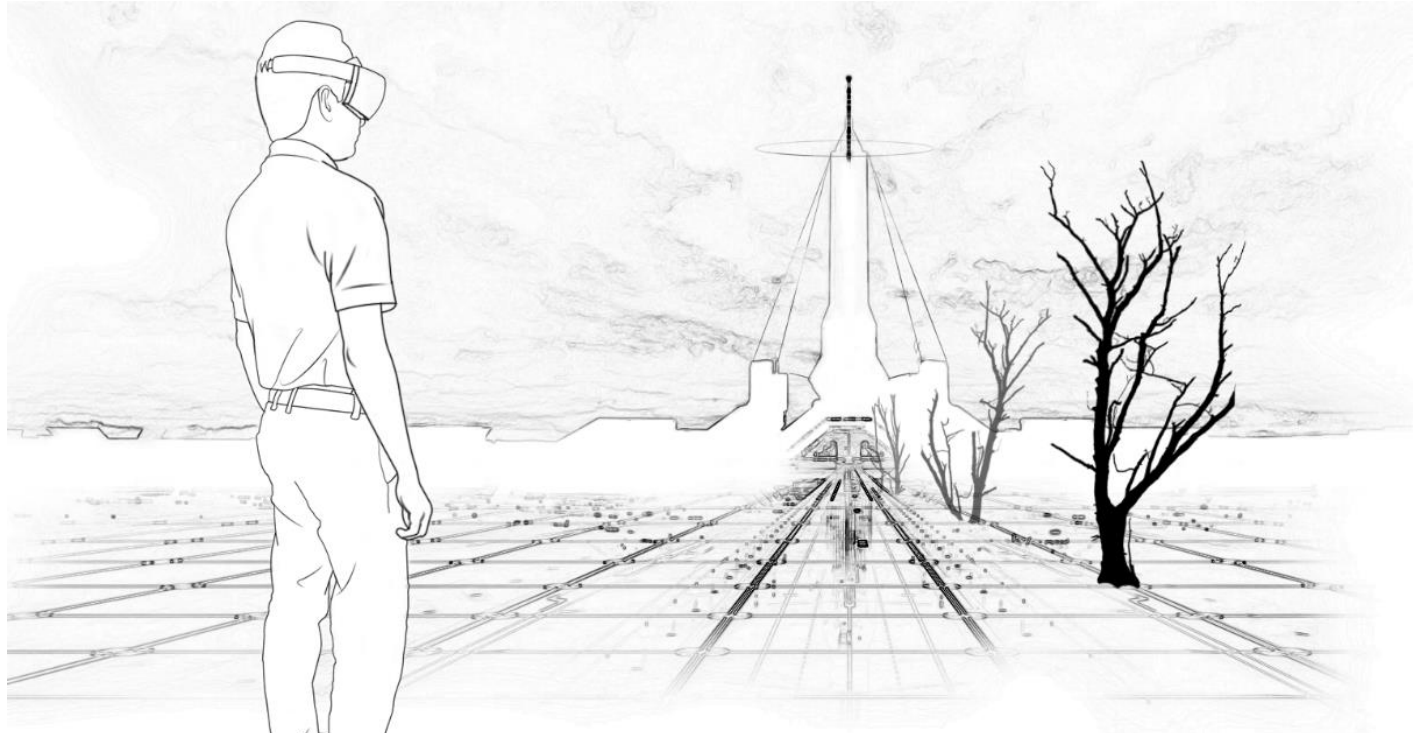
Digital Reality Spectrums

- ❑ Digital Reality brings the immersive experience
 - Perception of being **present** in a **non-physical world** or being **present** in both physical and non-physical.



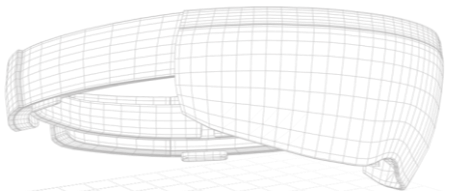
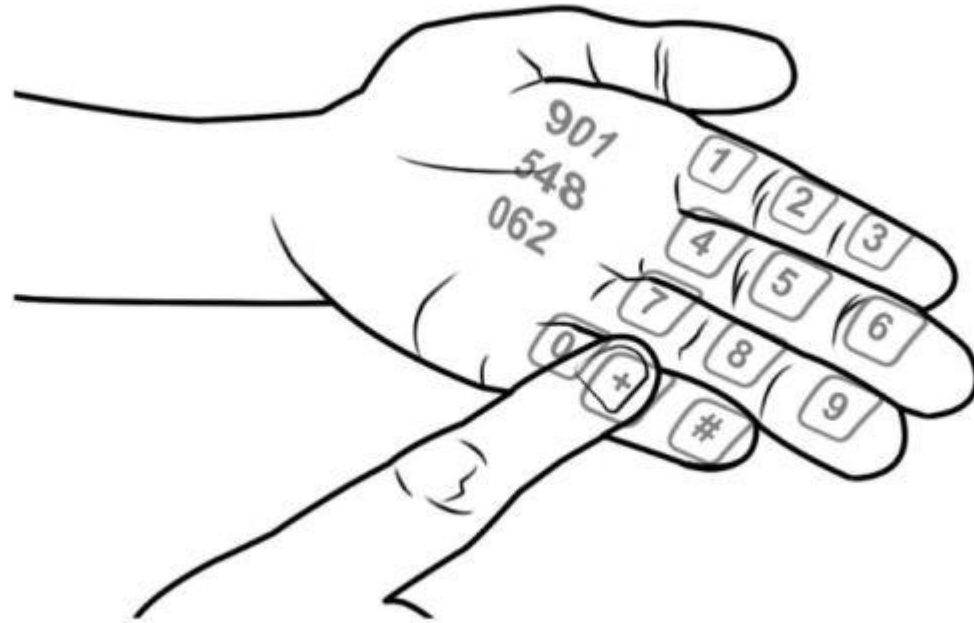
Virtual Reality (VR)

- ❑ It replaces the whole view with the simulated environment and totally disconnects you from the real world.



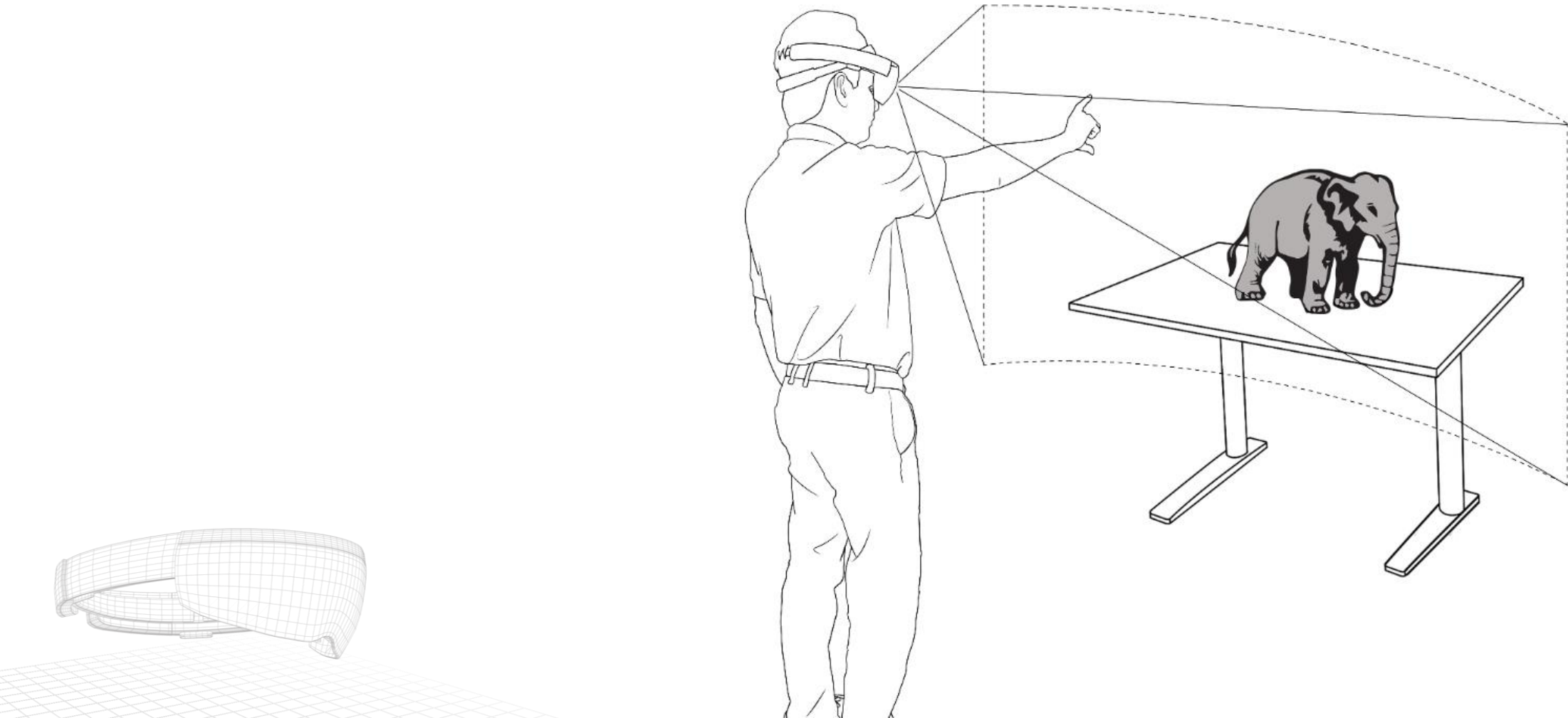
Augmented Reality (AR)

- ❑ It enhances the real environments with digital objects. Digital content such as text, 3d objects or other graphical information's are overlaid over the original surface.

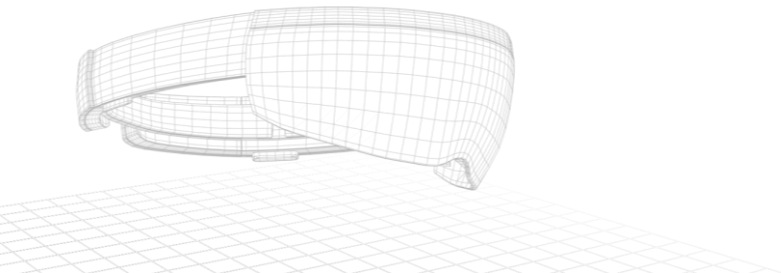
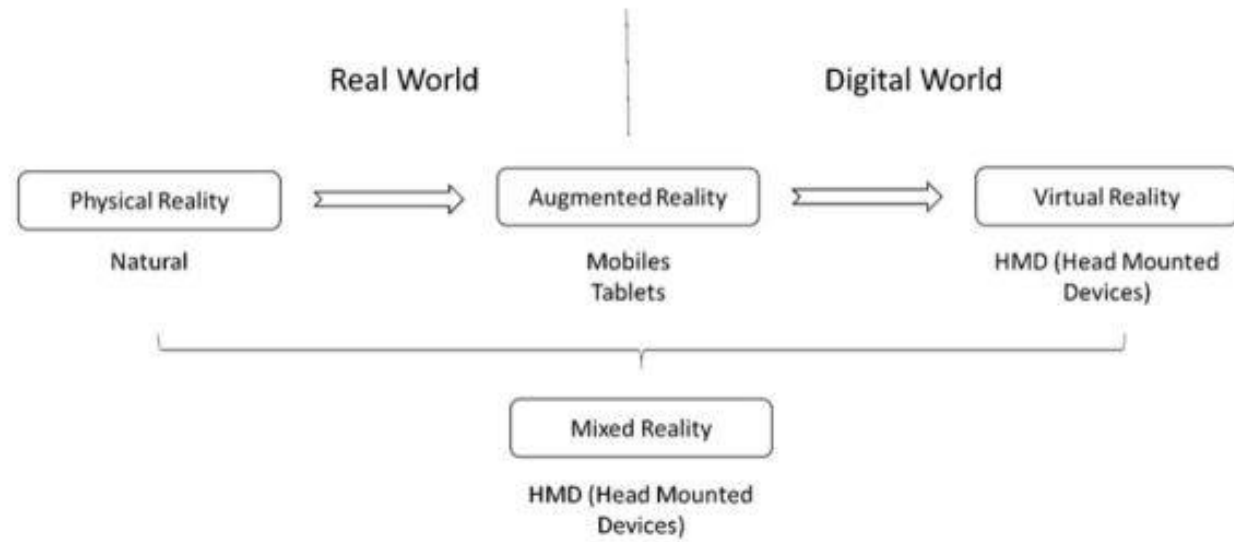


Mixed Reality (MR)

- ❑ It's like blending digital objects and physical object, and you can interact with both.



VR / AR / MR



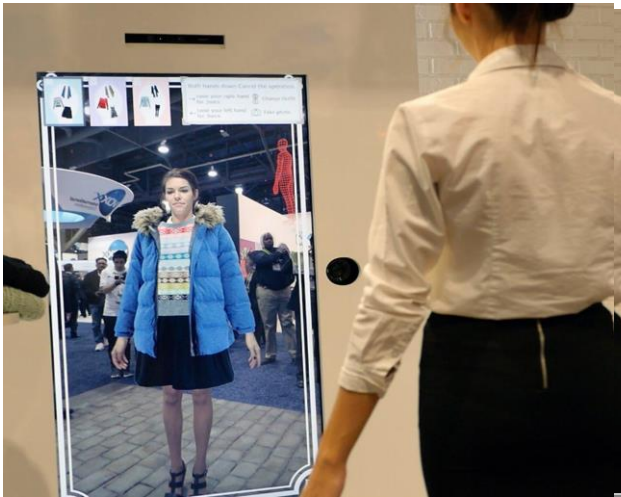
Revolutionizing industries with Digital Reality



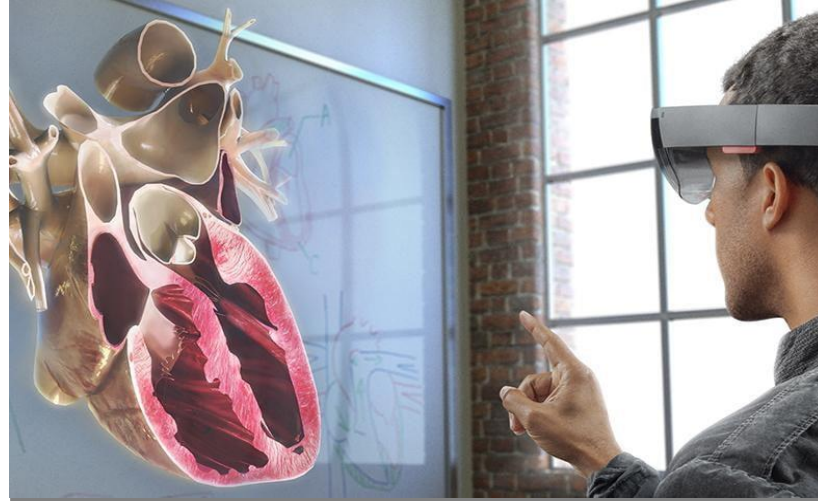
Education



Manufacturing



Retail



Healthcare



Training

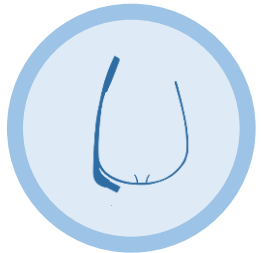
Virtual Reality

Complete Immersive experiences that replaces the real world



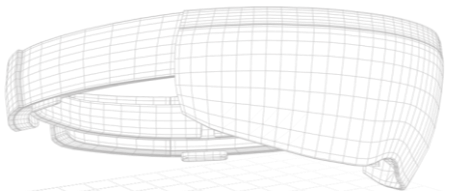
Augmented Reality

Overlay the digital information into the physical world around us.



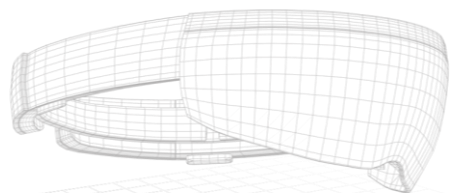
Mixed Reality

Mixed 2D and 3D Virtual objects in to real space and interact with them

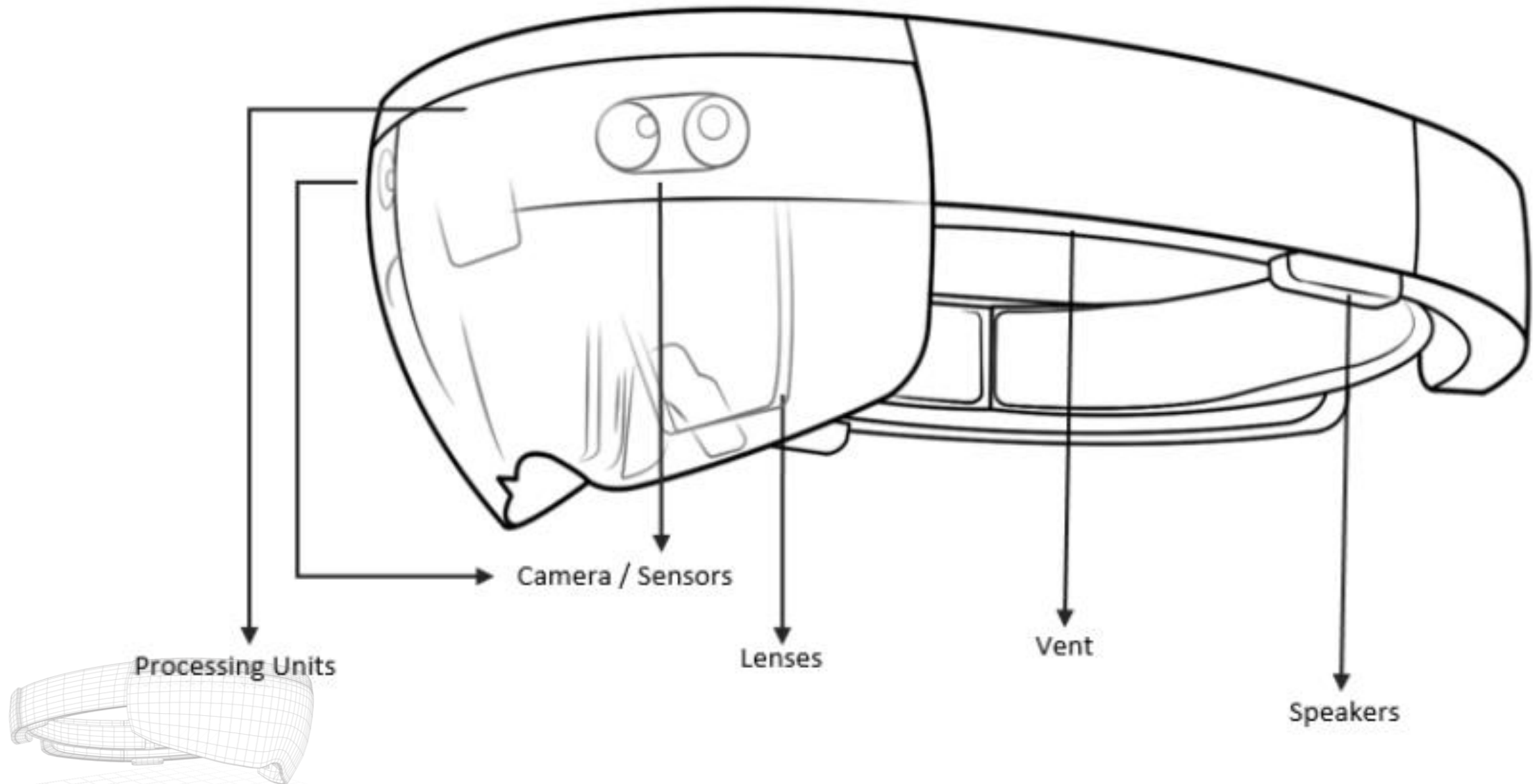




Windows Mixed Reality & Microsoft HoloLens



What's Inside the device



HoloLens Interaction Model

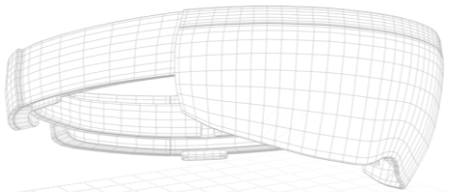
Gaze

Gesture

Voice
Recognition

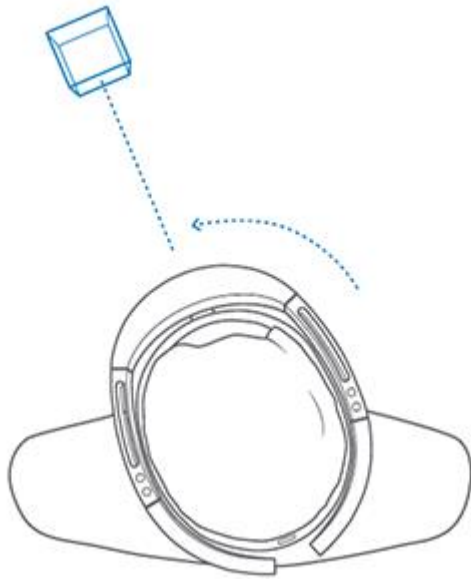
Spatial
Audio

Spatial
Mapping

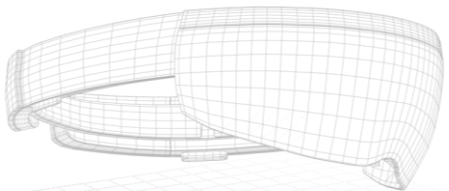


HoloLens Interaction Model

Gaze

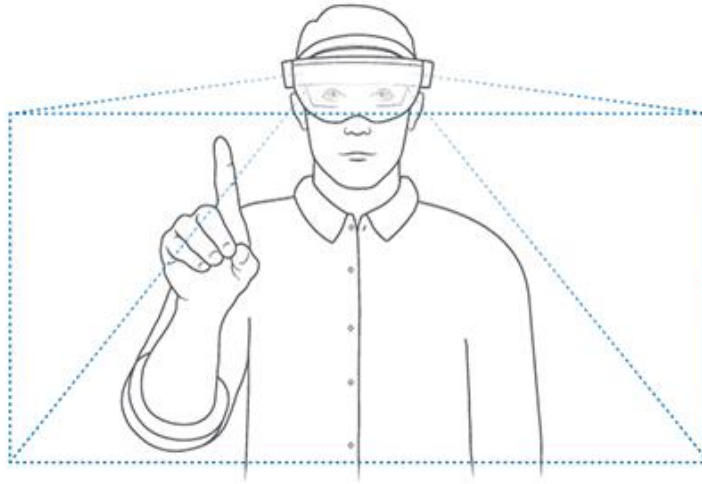


- ✓ Cursor Indicates the Gaze Direction.
- ✓ Raycast determines point of attention.
- ✓ Cursor can hug surfaces it intersects.
- ✓ Cursor can be temporarily hidden.



HoloLens Interaction Model

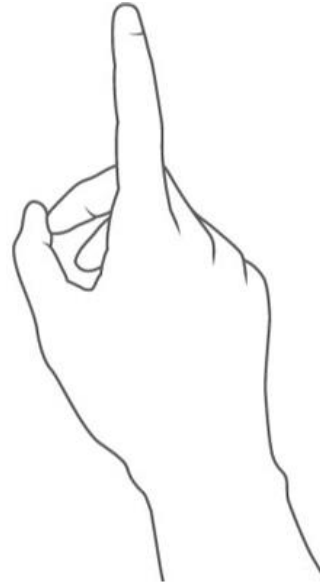
Gesture



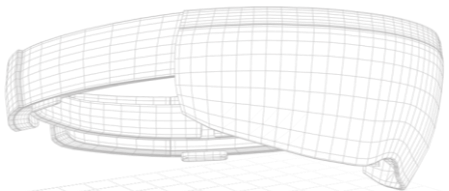
Bloom



Air Tap



Tap / Hold



HoloLens Interaction Model

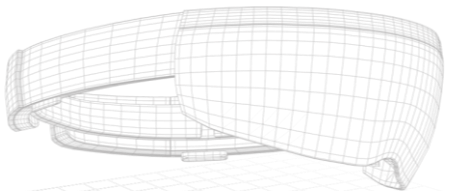
- ✓ Use your voice to do many of the same things you do with gestures on HoloLens
- ✓ Use default commands (like "Select" and "Place")

Voice
Recognition



Hey Cortana

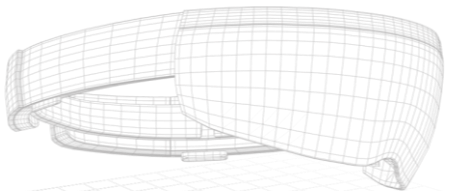
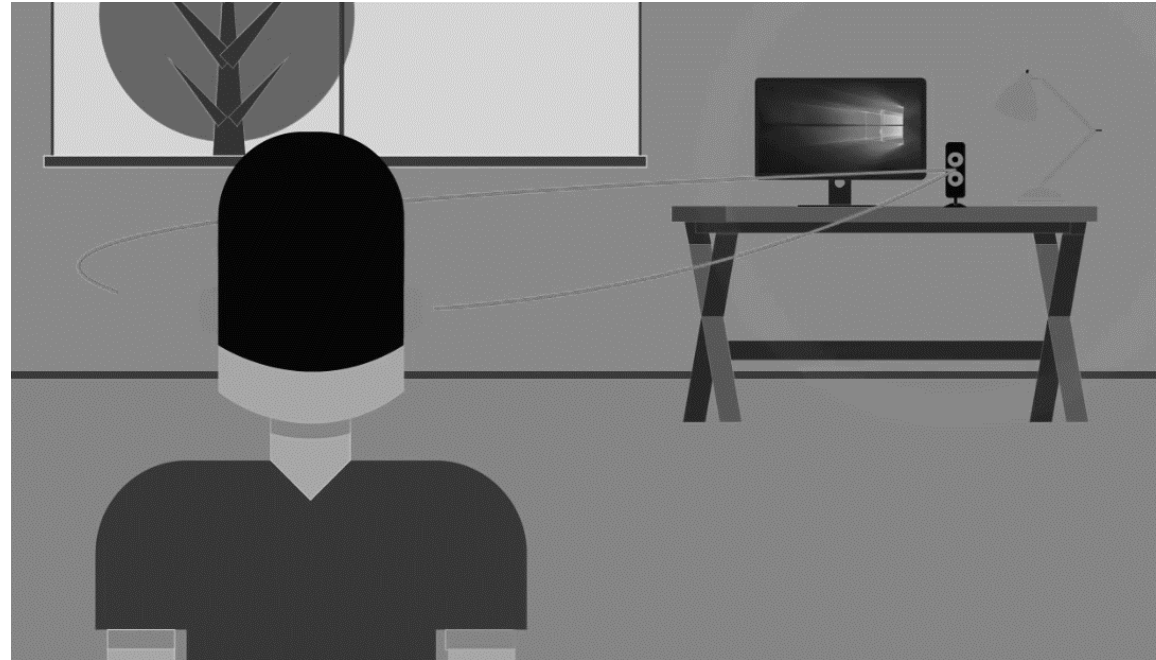
- ✓ Increase the volume.
- ✓ Decrease the brightness.
- ✓ Shut down.
- ✓ Restart.
- ✓ Go to sleep.
- ✓ Mute.
- ✓ Launch <app name>.



HoloLens Interaction Model

- ✓ We use Spatial audio to expand the mix reality experience beyond our visual senses
- ✓ Speakers in HoloLens uses HRTF(Head related transfer function) to simulate 3D sound using direction, distance, and environmental simulations.

Spatial
Audio



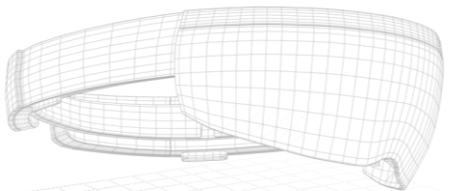
HoloLens Interaction Model

- ✓ Spatial mapping provides a detailed representation of real-world surfaces in the environment around HoloLens.
- ✓ This allows developers to mix holograms into the world around you.

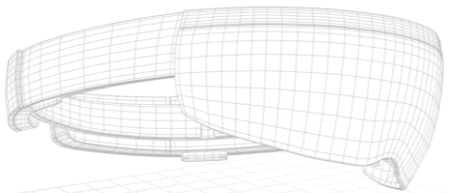
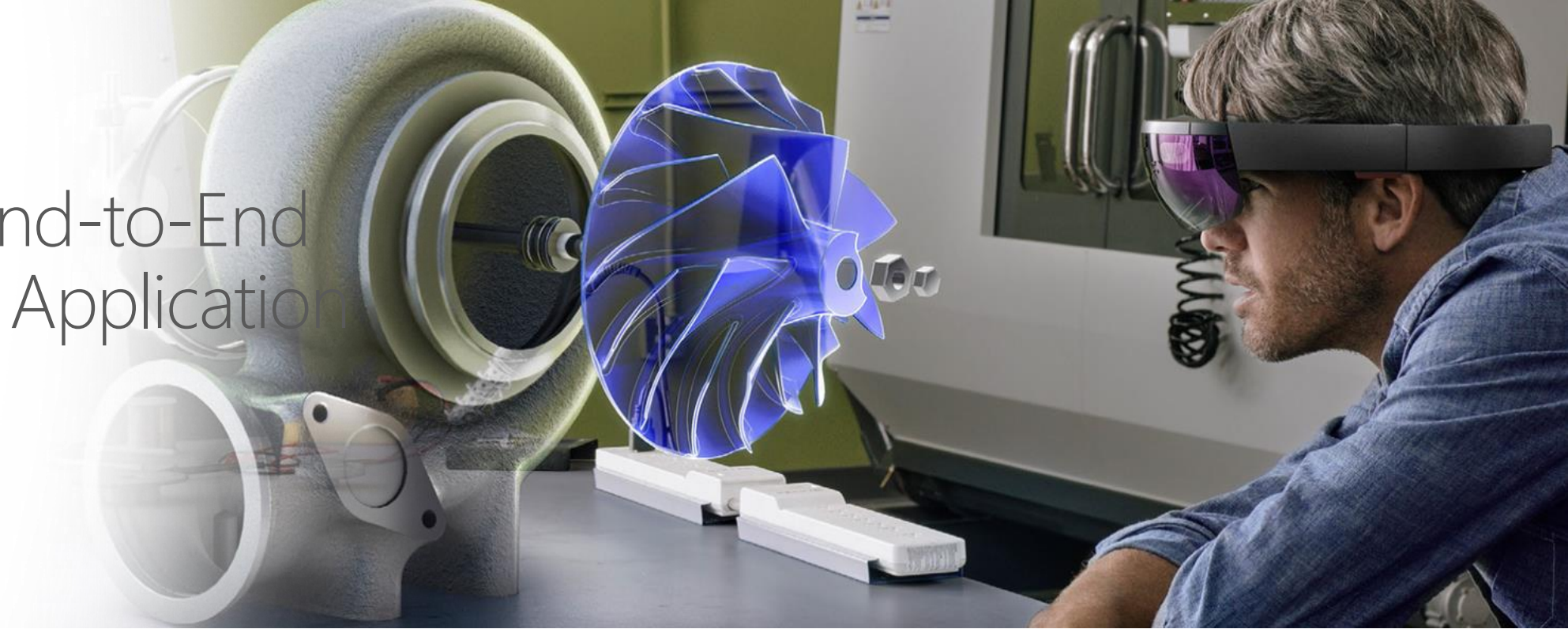
Spatial Mapping

We use Spatial Mapping for following purposes

- ✓ Navigation
- ✓ Occlusion
- ✓ Physics
- ✓ Placement
- ✓ Visualization



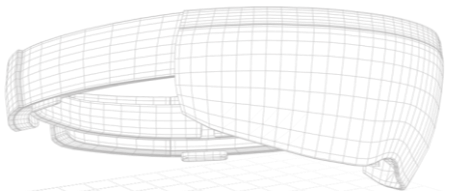
Develop an End-to-End Mixed Reality Application



Developer Skill Sets

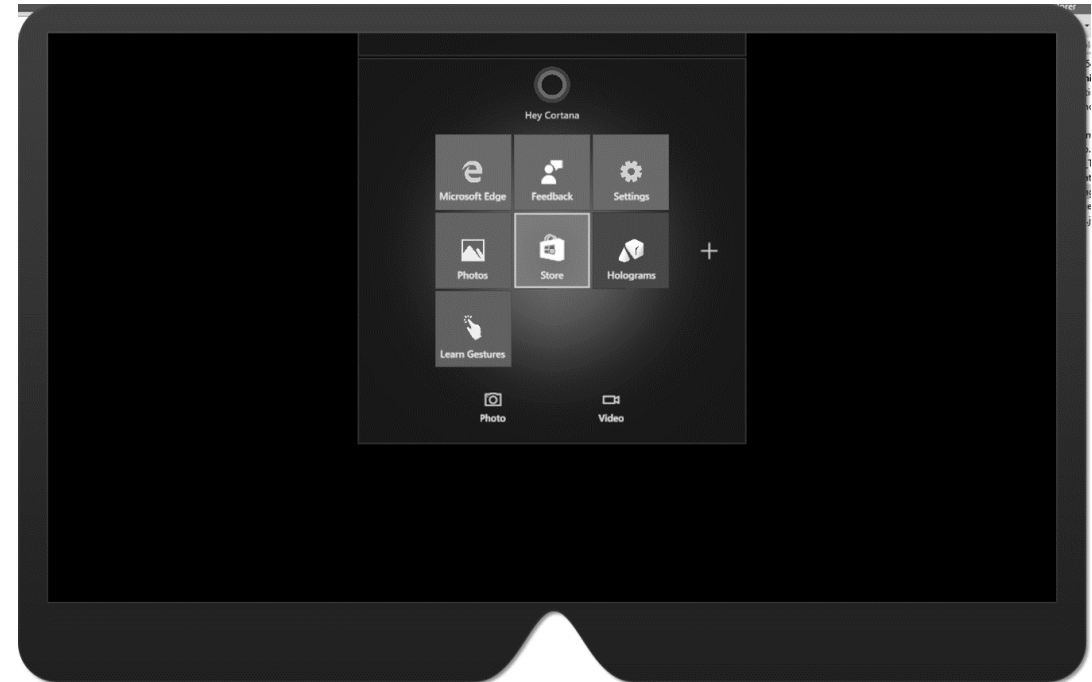
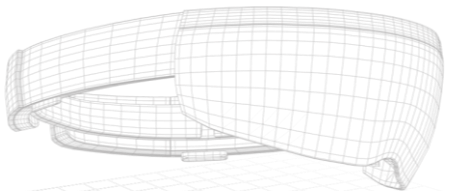
What do I need to know as a developer ?

- .NET
- Visual Studio 2015/2017
- Universal Windows Platforms (UWP)
- App development / C# and XAML
- *Unity 3D / 3D Modeling*
- *Building Games with Unity 3D*
- *Writing C# Script for Unity*

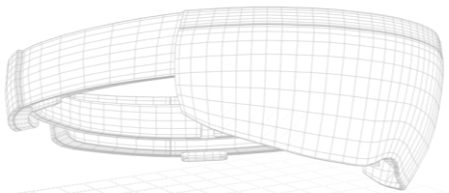


Setting up Development Environment

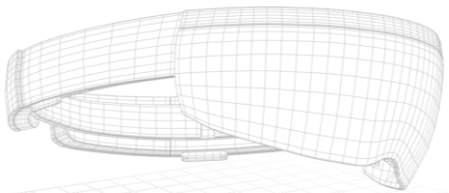
- [Install Visual Studio 2015/2017](#)
- [HoloLens Emulator](#)
- [Unity3D](#)
- HoloLens Device



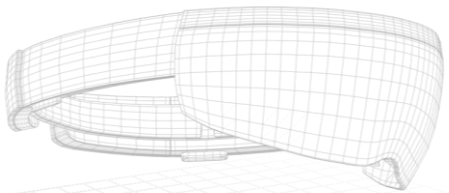
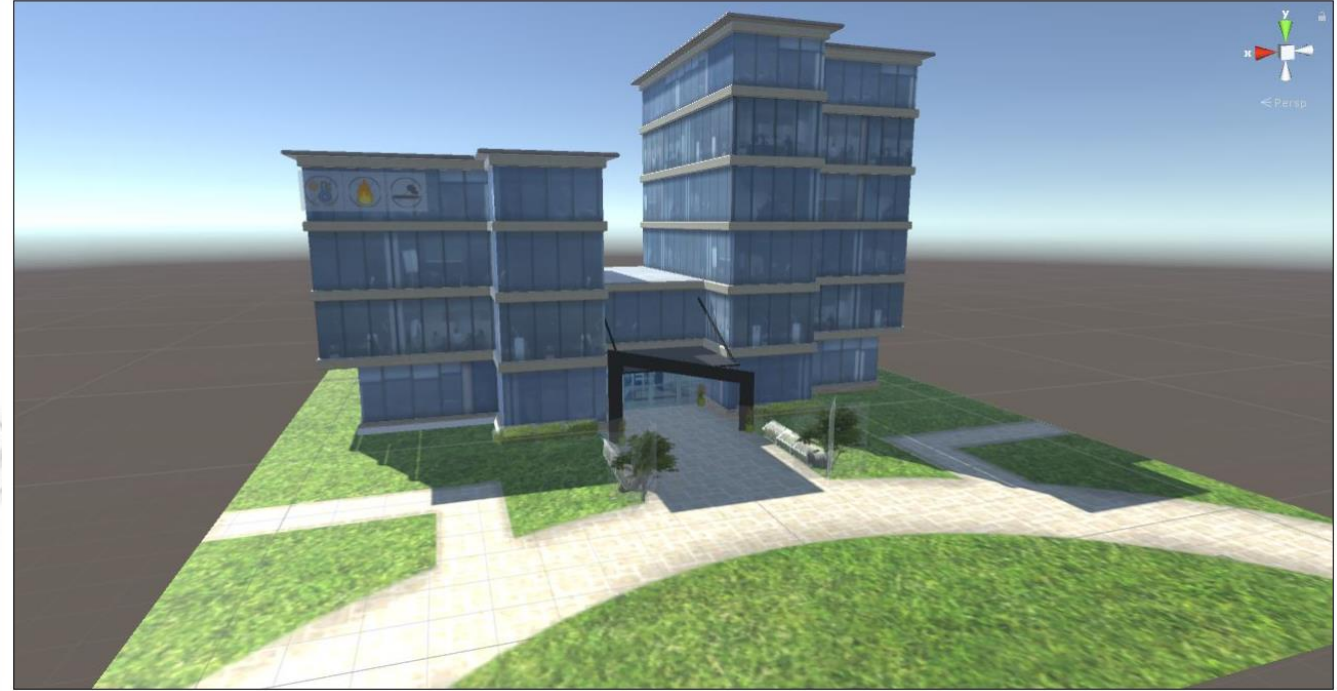
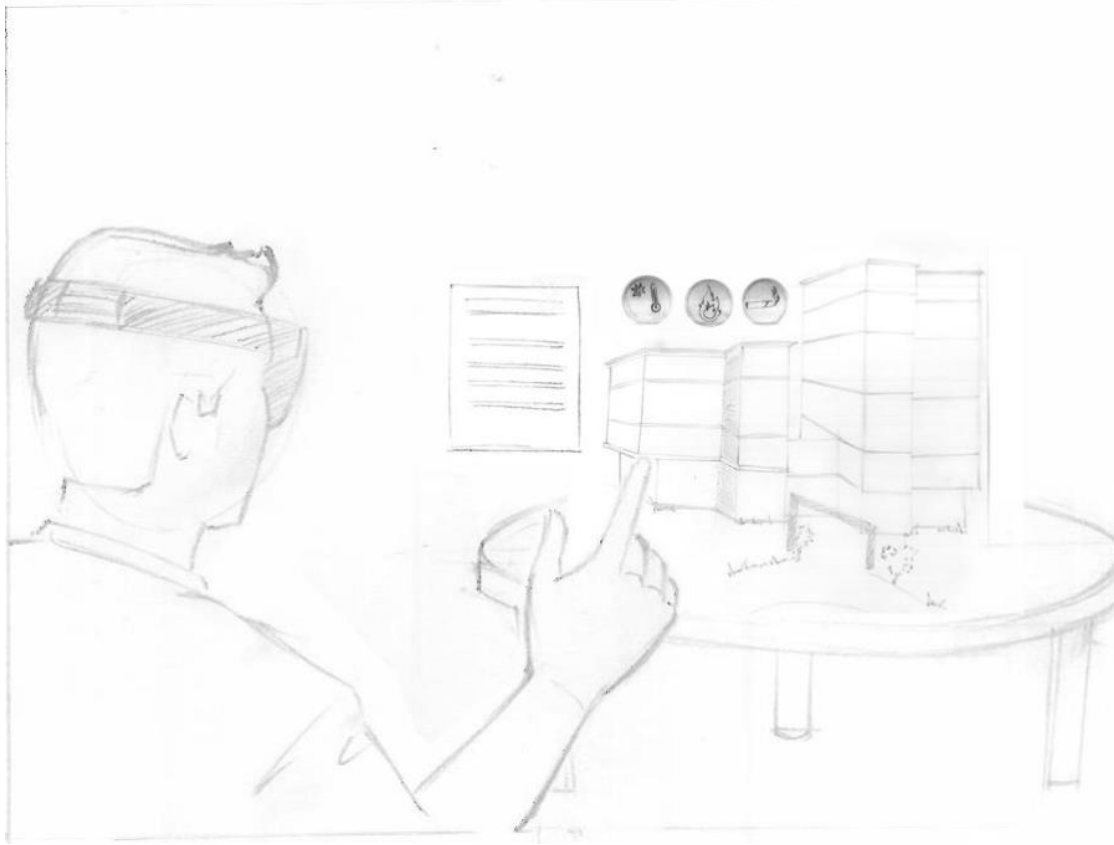
Demo : Building your first Mixed Reality Application – Step by Step



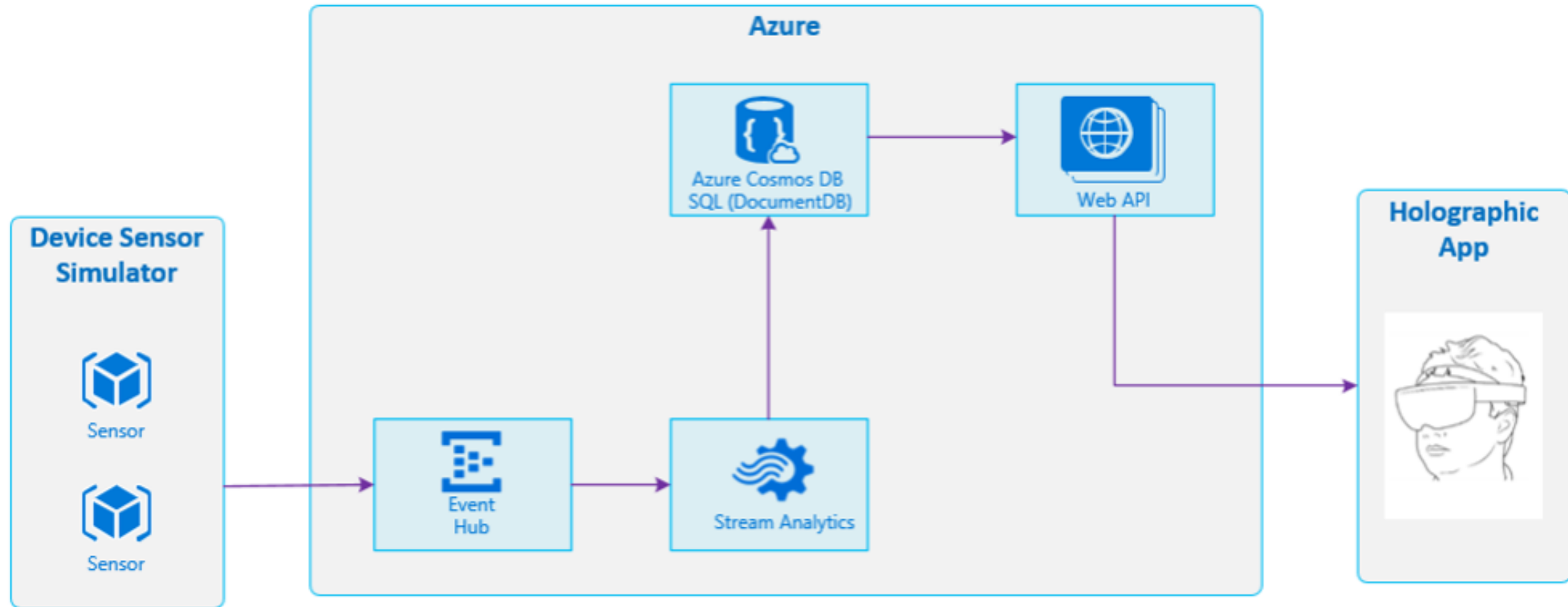
Demo : Connecting your Mixed Reality App with Azure



Mixed Reality & Enterprise Scenarios – Smart Building

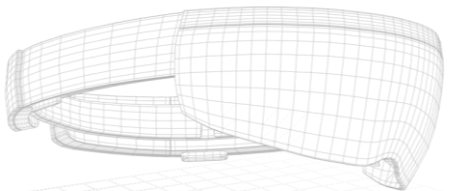


Mixed Reality Smart Building – Architecture



Add-on Demos..

- ✓ Windows Mixed Reality Viewer
- ✓ Creating 3D Model using Paint 3D and using it in Mixed Reality



References and Further Study

<https://developer.microsoft.com/en-us/windows/mixed-reality/academy>

Holographic App Development Using Microsoft HoloLens

Tutorials



Holograms 100: Getting started with Unity

We will walk you through creating a basic holographic app built with Unity. This project can then serve as a starting template for any holographic app you might want to build in Unity.



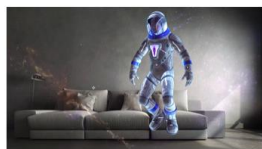
Holograms 101E: Introduction with Emulator

We will walk you through a complete project that introduces core Windows Holographic features including: gaze, gesture, voice, spatial sound and spatial mapping using the HoloLens emulator.



Holograms 101: Introduction with Device

We will walk you through a complete project that introduces core Windows Holographic features including: gaze, gesture, voice, spatial sound and spatial mapping.



Holograms 210: Gaze

Gaze is the first form of input, and reveals the user's intent and awareness. You will add contextual awareness to your cursor and holograms, taking full advantage of what your app knows about the user's gaze.



Holograms 211: Gesture

Gestures turn user intention into action. With gestures, users can interact with holograms. In this course, you will learn to track the user's hands, respond to user input, and give feedback



Holograms 212: Voice

Voice allows us to interact with our holograms in an easy and natural way. In this course, you will learn to make users aware of available voice commands, give feedback that a voice command was heard, and your app will use dictation to



Mixed Reality 213: Motion controllers

This course will explore ways of visualizing the motion controllers, handling input events, and attaching custom UI elements to the controllers.



Holograms 220: Spatial sound

Spatial sound breathes life into holograms and gives them presence. In this course, you will learn to use spatial sound to ground holograms in the real world, give feedback during interactions, and use audio to find your holograms.

[v/en-us/windows/mixed-reality/holograms_100](https://en-us/windows/mixed-reality/holograms_100)

Windows Dev CenterMixed realityAcademyDevelopmentDesignCommunity and SupportDashboard

Design

Learn the fundamentals of designing mixed reality experiences.

Get started with design

Read our high-level thoughts and understand the principles we follow.

- Mixed reality
- About this design guidance
- My first year on the HoloLens design team
- AfterNow's process - envisioning, prototyping, building
- The pursuit of more personal computing

Interaction design

Learn about input, commanding, navigation, and other interaction basics.

- Interaction fundamentals
- Comfort
- Gaze targeting
- Gestures
- Voice design
- Holograms

Style

Make your app delightful by using color, typography, and motion.

- Color, light and materials
- Spatial sound design
- Typography
- Scale

App patterns

Learn how apps can span scenarios across immersive and real world environments.

- Types of mixed reality apps
- Room scan visualization
- Cursors
- Billboarding and tag-along

Controls

Use controls and patterns as building blocks to create your own app experience.

- Text in Unity
- Interactive object
- Object collection
- Progress
- App bar and bounding box

Sample apps

Build great experiences from samples designed and created by our team.

- Periodic Table of the Elements
- Lunar Module
- Galaxy Explorer

Design tools and resources

Jump-start your project with design templates and tools.

- HoloSketch
- Inclusive design at Microsoft
- Fluent Design System
- UWP app design and UI
- 3D design tools from Simulvaon

Sample apps

Explore and experiment with sample app experiences created for developers by the Windows Mixed Reality team. These apps showcase our approach to designing great experiences and highlight the opportunities in UI, interaction, and integrated services.

Periodic Table of the Elements

Learn how to lay out an array of objects in 3D space with various surface types using an Object collection.

Lunar Module

Learn how to extend HoloLens' base gestures with two-handed tracking and Xbox controller input.

Galaxy Explorer

The Galaxy Explorer Project is ready. You shared your ideas with the community, chose an app, watched a team build it, and can now get the source code.

Case study - Scaling Datascape across devices with different performance

Datascape is a Windows Mixed Reality application developed internally at Microsoft where we focused on displaying weather data on top of terrain data.

Thank You!

Abhijit Jana

<http://abhijitjana.net>

<http://dailydotnettips.com>

Twitter: [@abhijitjana](https://twitter.com/abhijitjana)

