Mixed Reality with Microsoft HoloLens

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Roadmap

Mixed Reality

Hardware

Demo

Use Cases

Developer Story
The Evolution of Device I/O

How do we get computer understand the world?
Between Realities
Mixed Reality
PHYSICAL REALITY
The state of things as they “actually exist” through our human senses without any technology.

VIRTUAL REALITY
Artificially created sensory experiences of people, environments and objects, which can include sight, touch, hearing, and smell.
MIXED REALITY

VIRTUAL REALITY

PHYSICAL REALITY

MIXED REALITY

The blending of physical and virtual worlds
Virtual Reality

VR places the User in another location entirely. It entirely occludes the user’s natural surroundings.

Wired Magazine
Augmented Reality

In a augmented reality the visual natural world is overlaid with a layer of digital content.

Wired Magazine
Mixed Reality

Virtual objects are integrated into – and responsive to – the natural world

Wired Magazine
What is a Hologram?

A hologram is an object like any other object in the real world, with only one difference: instead of being made of physical matter, a hologram is made entirely of light.

Holographic objects can be viewed from different angles and distances, just like physical objects.

Holograms do not offer any physical resistance when touched or pushed because they don’t have any mass.
# Microsoft HoloLens spans realities

<table>
<thead>
<tr>
<th>Feature</th>
<th>Augmented Reality</th>
<th>Mixed Reality</th>
<th>Virtual Reality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Augments the real world with helpful information</td>
<td>✓</td>
<td>✓</td>
<td></td>
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<tr>
<td>Blends holograms with your real world</td>
<td></td>
<td>✓</td>
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<tr>
<td>Can transport you to a virtual world</td>
<td></td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Replaces the real world</td>
<td></td>
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Microsoft HoloLens

The Device
Self-contained computer

Containing more computing power than the average laptop, Microsoft HoloLens doesn’t need external wires, markers, or cameras, nor a connection to a phone or PC, so you can move freely and untethered.
Advanced sensors

Microsoft HoloLens has advanced sensors to capture information about what you’re doing and the environment you’re in.
Transparent lenses

See-through holographic lenses use an advanced optical projection system, so you can see holograms in your world.
Holographic Processing Unit

The HPU is custom silicon that processes a large amount of data per second from the sensors, enabling Microsoft HoloLens to understand gestures, where you look, and map the world around you, all in real time.
Spatial sound

Microsoft HoloLens synthesizes sound so that you can hear holograms from anywhere in the room. It’s immersive, yet won’t block out the real world.
A new way to interact

Gaze

Gesture

Voice commands
Mixed Reality + Virtual Reality

Spatial Mapping

Fully unthered

Runs Windows 10

Interaction using gaze, gestures and voice
Use Cases
Developing for Mixed Reality
App view options

Holographic View

2D View
App view options

**Holographic View**

- Creates holograms
- No other app can draw at the same time
- Can render world-locked holograms
- Shell does not render at the same time
- App is responsible to handle all user input.

**2D View**

- Renders on a slate
- Slates are world-locked and can be adjusted in size and position by the user
- Apps resolution stays fixed
- Apps have to switch into 2D view for keyboard entry
- All desktop UWP apps can run in 2D view without modifications

Image: Microsoft
Development Options

Unity
- Best productivity
- Built-in HoloLens support
- Great support from Microsoft and the community
- Free for personal use

Direct3D
- DirectX 11
- C++
- or
- C# with SharpDX

UrhoSharp
- Cross-platform 3D-Engine by Xamarin

HoloJS
- Javascript
- WebGL

Pure UWP
- XAML
  - C#/VB/C++
  - Or
  - WinJS

Holographic View

Universal Windows Platform (UWP)

91%

https://twitter.com/unity3d/status/859110422833762305
Tooling

Visual Studio 2017 or Visual Studio 2015, Update 3
Free Community Edition

HoloLens Emulator

Unity 5.5
Free Personal Edition

Holographic Toolkit
https://github.com/Microsoft/HoloToolkit-Unity

Vuforia (optional)

Development Workflow

1. Unity
2. Visual Studio
3. HoloLens Emulator
Development Workflow optimized

Holographic Emulation introduced with Unity 5.5 allows to directly run a Holographic App from Unity in the Editor (Simulation) or on a HoloLens device (Remoting).

Development Workflow optimized

Holographic Simulation in Editor
10 Learnings from our projects
Learnings 1/10

HoloLens is a mobile device

http://kodierer.blogspot.com/2016/04/top-10-hololens-development.html
Learnings 2/10

Don’t forget to anchor your holograms

Learnings 3/10
Use existing tools & patterns

https://github.com/Microsoft/HoloToolkit-Unity
Learnings 4/10
Leverage Spatial Audio
Learnings 5/10
Choose the right input mode for your audience
Learnings 6/10
Choose Master Build Configuration when distributing the app for testing
Learnings 7/10
Lights matter for Holograms
Learnings 8/10
Use UWP part of your app for data access
Learnings 9/10
Choose the right build type for your app
Learnings 10/10
Test early in your target environment
Spectator View
The big Picture
Windows Mixed Reality
Windows Mixed Reality

Platform for Mixed Reality, built right into Windows. Shipping with Creators Update.
https://aka.ms/windows-mixed-reality

Relatively low hardware requirements
https://developer.microsoft.com/en-us/windows/mixed-reality/Install_the_tools.html#system_requirements

Choice of inexpensive immersive headsets with inside-out tracking from various OEMs including Acer, ASUS, Dell, HP and Lenovo starting at $299 coming later 2017.

Input support for Gamepad, Mouse, Keyboard and Voice
Enterprise Features
Available only with the Commercial Suite

- **Windows Store for business**
  Your IT department can also set up an enterprise private store, containing only your company's apps for your specific Hololens usage. Securely distribute your enterprise software to selected group of enterprise users.

- **Mobile Device Management (MDM) for Hololens**
  Your IT department can manage multiple Hololens devices simultaneously using solutions like Microsoft InTune. You will be able to manage settings, select apps to install and set security configurations tailored to your organization's need.

- **Kiosk mode**
  With Hololens kiosk mode, you can limit which apps to run to enable demo or showcase experiences.

- **Windows Update for Business**
  Controlled operating system updates to devices and support for long term servicing branch.

- **Identity**
  Azure Active Directory and next generation credentials with PIN unlock.

- **Data security**
  BitLocker data encryption and secure boot is enabled on Hololens to provide the same level of security protection as any other Windows device.

- **Work access**
  Anyone in your organization can remotely connect to the corporate network through a virtual private network on a Hololens. Hololens can also access Wi-Fi networks that require credentials.
Where to start

1. Grab the tools
2. Attend the free Holographic Academy online
3. Deep dive into the Holographic App Development documentation
4. Check you open source Galaxy Explorer app on GitHub
   https://github.com/Microsoft/GalaxyExplorer
5. Submit your first app to the Windows Store
6. Showcase your app using Spectator View
Questions?
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Thank you!