

Shattering the Barrier

BETWEEN REAL AND VIRTUAL



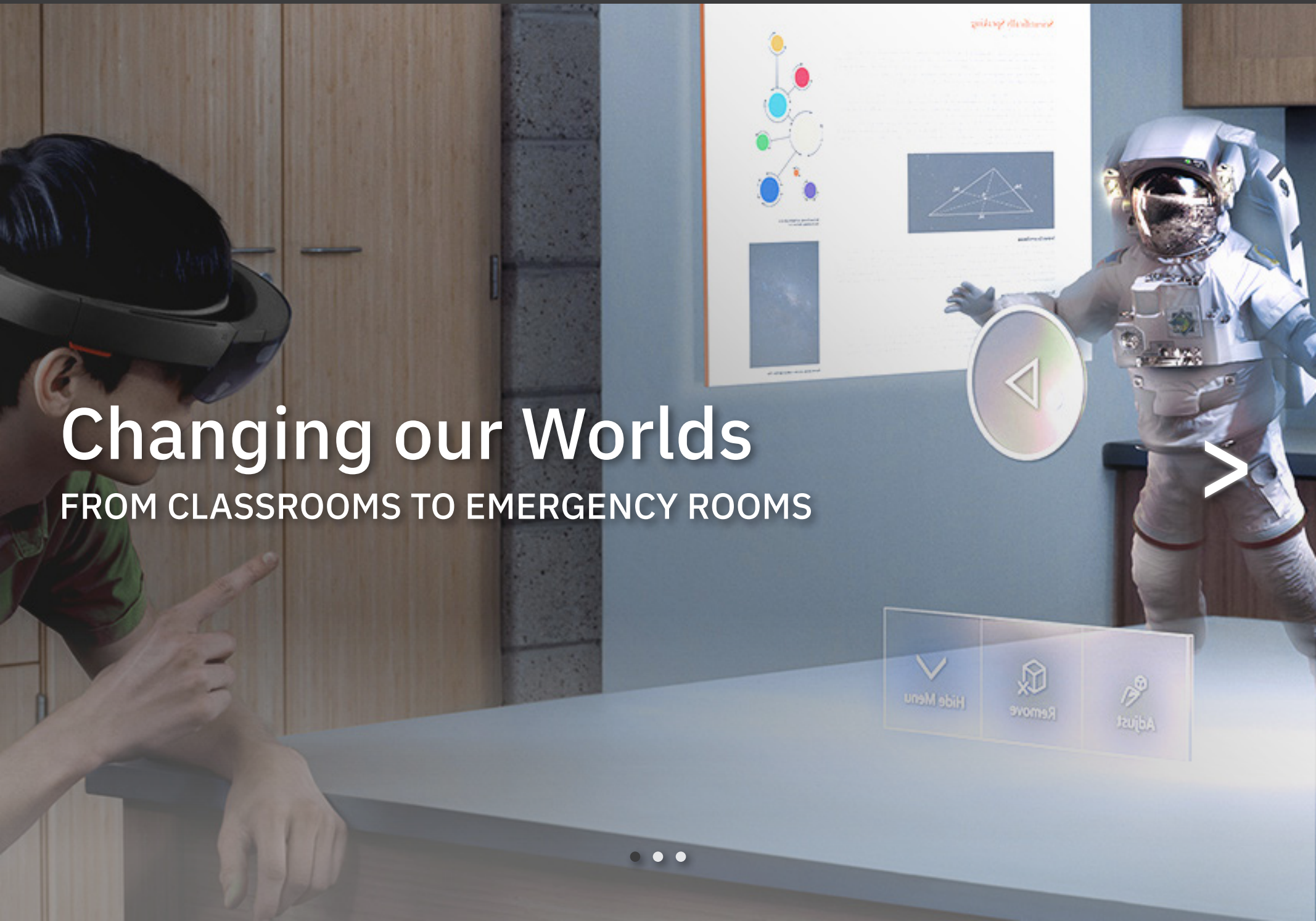
Building a Future

WITH GROUNDBREAKING TECHNOLOGY



Changing our Worlds

FROM CLASSROOMS TO EMERGENCY ROOMS





What is Mixed Reality?

Mixed reality (MR), sometimes referred to as hybrid reality, is the merging of real and virtual worlds to produce new environments and visualizations where physical and digital objects co-exist and interact in real time. Mixed reality takes place not only in the physical world or the virtual world, but is a mix of reality and virtual reality, encompassing both augmented reality and augmented virtuality via immersive technology. The most obtainable display technology is the head-mounted display like Microsoft's HoloLens released in March of 2016. However, more displays have been created like the cave automatic virtual environment in which the user interacts with a four-screen room and the head-up display where a transparent surface presents data layered over a user's view.

Mixed reality *unlocks possibilities*
that before now were restricted to our imaginations.

Matt Zeller

Program Manager for Windows
Mixed Reality at Microsoft

What's the difference between MR, AR and VR?

Mixed reality is a subset of augmented reality (AR), a direct or indirect live view of a physical, real-world environment whose elements are "augmented" by computer-generated perceptual information. However, like not all rectangles are squares, not all AR technologies qualify as MR. For example, a smartphone app adding a figure to an environment through the screen is an AR experience, but lacks the same interactivity of an MR experience. Apps, including Snapchat and Pokemon Go, have incorporated AR technology in their interfaces and revolutionized the way people use their devices.

Virtual reality (VR), is a computer-generated scenario that simulates a realistic experience. Unlike MR which renders virtual content within a real environment, VR technology creates a completely new virtual environment. Although VR environments can imitate real life, its creation of a fictional world is not to be confused with AR that provides a live, direct or indirect view of a physical, real-world environment. An example of VR in practice is Microsoft's HTC VIVE system that uses the technology to create interactive worlds for gamers to explore.

What are the dangers?

There's still much to learn about MR's potential applications and much to learn about its ramifications. VR health risks including falling, motion sickness, eye growth interference, and hearing damage apply to MR technologies as well. Time may also reveal currently undiscovered health risks.

Another concern is MR's potential to breach users' privacy. Franziska Roesner from MIT Technology Review reflects, "You might find it a bit creepy that the device and its applications have access to a constant video and audio feed of your surroundings, not to mention that you're being recorded by other people's devices." Despite the amazing possibilities of MR technology, its power could easily backfire.



The Anatomy of Mixed Reality Technology

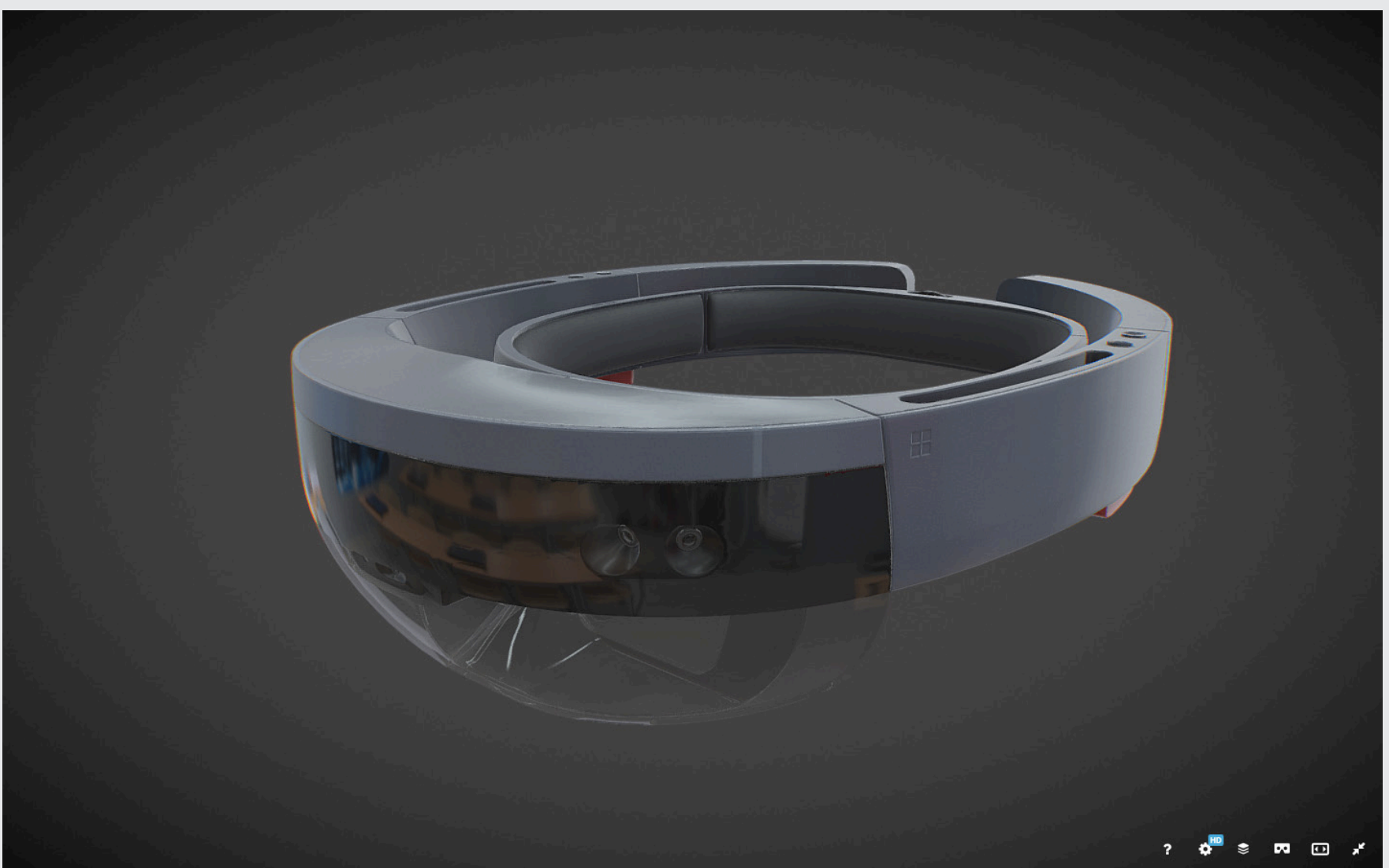
Hardware

An MR headset is a complex composite of hardware features, the primary components being:

- Optics
- Sensors
- Human Understanding
- Input / Output / Connectivity
- Power
- Processors

The Microsoft HoloLens is the forerunner of mixed reality and the world’s first fully untethered holographic computer. The HoloLens features an inertial measurement unit (IMU) (which includes an accelerometer, gyroscope, and a magnetometer) four “environment understanding” sensors, an energy-efficient depth camera with a 120°×120° angle of view, a 2.4-megapixel photographic video camera, a four-microphone array, and an ambient light sensor. The HoloLens contains an internal rechargeable battery, with average life rated at 2–3 hours of active use, or 2 weeks of standby time. HoloLens also features IEEE 802.11ac Wi-Fi and Bluetooth 4.1 Low Energy (LE) wireless connectivity. The headset uses Bluetooth LE to pair with the included Clicker, a thumb-sized finger-operating input device that can be used for interface scrolling and selecting.

The interactive 3D model below provides a close-up view of the HoloLens hardware.



Software

The software of a mixed reality headset is the mastermind behind the MR experience. Headsets receive, understand, and respond to different stimuli almost instantly and applications allow users to cater mixed reality to their personal reality.

The Microsoft HoloLens uses sensual and natural interface commands—gaze, gesture, and voice—sometimes referred to as “GGV”, inputs. Gaze commands, such as head-tracking, allow the user to bring application focus to whatever the user is perceiving. “Elements”—or any virtual application or button—are selected using an air tap method, similar to clicking an imaginary computer mouse.

The HoloLens also comes with a number of default apps:

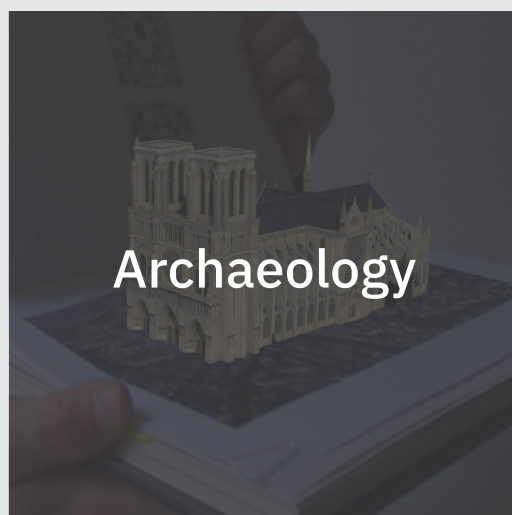
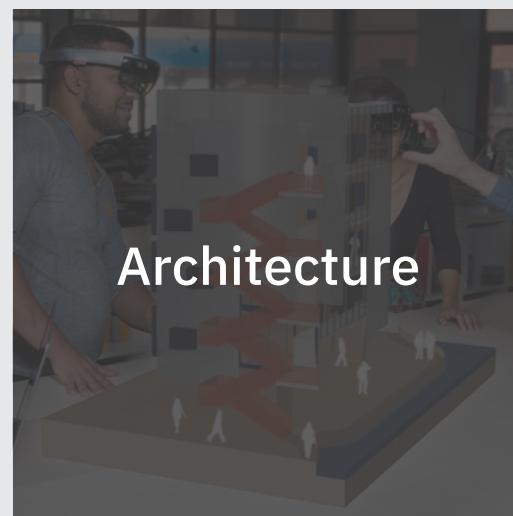
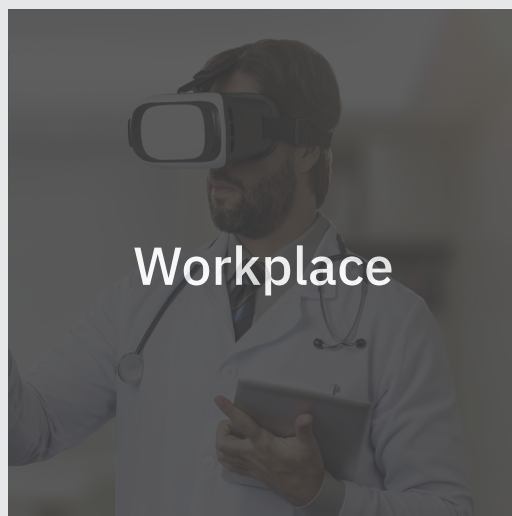
- Windows Store
- Holograms
- Microsoft Edge
- Photos
- Settings
- Windows Feedback
- Calibration
- Learn Gestures

As of 2016, a number of augmented-reality applications have been announced or showcased for Microsoft HoloLens. A collection of applications will be provided for free for developers purchasing the Microsoft HoloLens Developer Edition.



Mixed Reality Applications

MR has the potential to change environments big and small. Although the extent that this technology will shift our world is still unknown, developers are exploring new application possibilities for mixed reality every day.





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