

A Review on Holo-Lens the Technology Beyond Imagination

Priyanka Patidar¹ Mandvi Alreja² Akshat Trivedi² Mohammad Sabir⁴

^{1,2,3}B.Tech Student ⁴Assistant Professor

^{1,2,3,4}Department of Electronics & Communication Engineering

^{1,2,3,4}GITS, Udaipur

Abstract— The ability to interact with three-dimensional holograms in our real world, we will have a new medium to express our creativity, a more efficient way to teach and learn, and a more effective way to visualize our work and share our ideas with others. There isn't a screen to touch or a mouse to click, Use gestures to create, shape, and size holograms. Use our eyes to navigate and explore. Use our voice to communicate with your apps. Microsoft HoloLens is a smart-glasses headset which is actually a wireless Windows 10 computer. It has state of the art sensors, a high-tech stereoscopic 3D optical head-set display, and authentic sound to allow augmented reality applications and Holograms a natural UI that the user will interact using eye gaze, voice input, and hand gestures. Complete with advanced sensors and a new Holographic Processing Unit (HPU) that understands the world around you, Microsoft HoloLens is able to run without any wires while processing terabytes of data from the sensors in real-time.

Key words: Holo-Lens, IMU, HPU

I. INTRODUCTION

As the virtual reality gadget for Windows Holographic, Microsoft has introduced HoloLens, a smart-glasses headset that is a wireless, self-contained Windows 10 computer. It might look like a big chunk of hardware at first with all the cameras and the speakers and the CPU, but Microsoft has promised it in a whole computer in front of your eyes. HoloLens gives the most efficient attempt to launch augmented reality into our homes with a natural user interface that the user interacts with through eye gaze, hand gestures and voice. The headset is a combination of virtual reality, augmented reality as well as live video for a new computing experience.

Instead of waiting for us to have all sorts of new equipment built into our existing world, the HoloLens headset overlays its VR display over existing environment; so that we can interact with our real world using virtual elements. It's a mixed reality, a mixture of your digital world with your real world using 3D objects that show up as floating images.



Fig. 1:

II. WORKING OF HOLOLENS

There are some important things before taking a head-mounted computer-headset and turning it into a high-tech hologram machine, Number one is getting the images in front of the eyes. To do that, HoloLens has a combination of translucent screens for eye gaze, ones that allow for the transmission of floating content into your line of sight without completely blocking you off to the world.

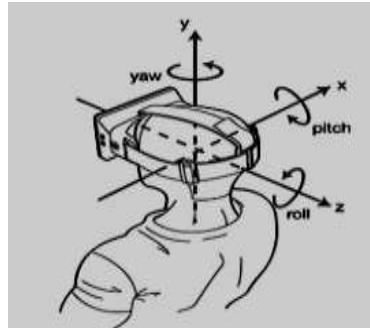


Fig. 2: Sensing Head Movements

But it's about more than just putting projecting images in front of your eyes. The real hardship is turning that visual information into an actual 3D-object that will co-exist around your room with real life objects.

Now is when the rest of the HoloLens' sensors come in action. In the top part of the HoloLens section there are a number of cameras solely to scan the area and collect as much data as possible. The Lens then turns that data into a digital environment where the holograms exist in 3D space. There are a combination of standard video and infrared state of the art vision to have a digital picture of your world around you. These digital cameras are set at a 120-degree gaze, at the end, there is:-

- An accelerometer (to calculate the speed your head is moving),
- A magnetometer (to function as a compass),
- A gyroscope (to measure the tilt and orientation of your head).

With all those sensors, it becomes to collect enough data to know what your room looks like and where your head is. That's enough data to decide where the holograms should appear to be and what they should look like.

The HoloLens has a chip that is called the Holographic Processing Unit (HPU). The processor analysis all the sensor data and translates it into a smaller and much more accessible parts of data, which the HoloLens' GPU and CPU can use. The HoloLens is independent of a computer, a mobile phone, or anything at all. Everything is inside the headset.

Finally, the department of sound. HoloLens has microphones access the ambient sound and taking voice inputs via voice control. It also has speakers, which have two purposes. Firstly, they don't block out the sound of the real world. But more importantly they'll also use binaural sound to trick your ears into thinking they're hearing things in 3D space. It's like stereo sound but without the earpiece. The illusions—images that change like real objects according to the movement of your head, and noise that sounds like its directed to a real place to add up to a holographic projection that is apparently pretty convincing. It'll be at least a few months before you can have one on your head to see for yourself, though.

III. DESIGN OF HOOLENS

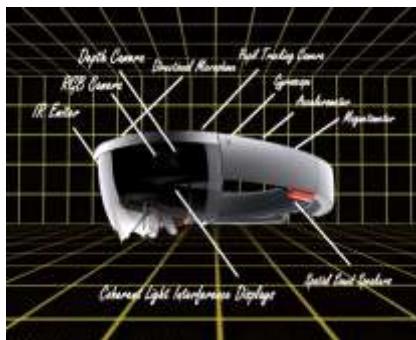


Fig. 3:

A. Designed for Ease

The headset is designed with great weight distribution for a proper fit. Weight distribution around the edges of your head, saving your ears or nose from pressure.

B. Adjustable Fit

The device can be aligned up and down, as well as adjusted forward and backward according to the headband. To wear the HoloLens, the user uses an adjustment rotator wheel at the back of the headset to align it around the crown of their head, supporting the weight of the unit.

C. Built-In Speakers

At the bottom edges of the side are a pair of small red stereo speakers. Unlike headphones, the speakers do not obstruct external sound, allowing the user to hear virtual sounds together with the real-world sounds.

D. Buttons

On the top are two pairs of buttons: brightness and display buttons around the left ear, and volume buttons above the right ear. These buttons are shaped like—concave and convex respectively so that the user can distinguish them by touch. At the end of the left is a power button and band of five tiny LEDs, which are used to indicate system status, as well as for power management, setting power/standby mode and indicating battery level.

E. Advanced Optics

Advanced projection optical system is used in HoloLens to generate full color high definition multi-dimensional images with very low latency so you can see holograms in your world like they are as real as it can get.

F. Sensor Fusion

There is a combination of an energy-efficient depth camera with a $120^\circ \times 120^\circ$ angle of view a photographic video camera, and an inertial measurement unit (IMU) which includes an accelerometer, gyroscope, and a magnetometer.

IV. TECHNOLOGIES USED IN HOOLENS

A. Augmented Reality

Augmented reality (AR) is a live indirect or direct view of a real-world environment where objects are altered by computer-generated elements such as video, graphics, sound, or GPS data. It is related to a more general concept of altered reality, in which a view of reality is modified or as we can say augmented by a computer.

B. Virtual Reality

Virtual Reality (VR) can be referred as to immersive multimedia or computer-simulated information which alters an environment that simulates real-life appearance in places in the imagined or real worlds and lets the user interact in that environment in real time. Virtual reality artificially generates sensory experiences, which can include touch, smell, sight, hearing, and taste.

C. Holographic Processing Unit

Holographic Processing Unit (HPU) is responsible to for processing all the holographic information so that the lens is independent of any other device thus being wireless.

V. ADVANTAGES

- 1) No cords, no phones, no wires, no tethers.
- 2) Transparent lens and state of the art sensors that allow you to see your environment and move assuredly in it.
- 3) Lightweight and adjustable to fit any head size. Do anything, comfortably.
- 4) In-built high definition sound lets you hear audio wherever they are in the room with pinpoint precision.
- 5) Sensitive and responsive to the presence of people.

VI. DISADVANTAGES

- 1) Can be easily damaged or broken.
- 2) It may lead to accident while driving.
- 3) Privacy of people may be hindered due to new glasses.
- 4) Radiation can cause health issues.

VII. FUTURE SCOPE

As we all know HoloLens is the device with lots of benefits. We can say that HoloLens is the future of Google glass and Oculus Rift. But there is scope for developing HoloLens in future. If Microsoft implements the mentioned things then HoloLens can be become unbeatable.

- Pinning holograms to real-life objects so user can resize them in each angle and with gesture do all new creation.
- Visual diagrams would actually show up in space around the user showing exactly what needs to be done.
- Also they can implements some technology for the reduction of Radiation.

VIII. CONCLUSION

- 1) Experiencing Holograms with Microsoft HoloLens are different from existing experiences, such as virtual reality (VR) and augmented reality (AR).
- 2) HoloLens looks incredibly out of the world, but what we've seen so far is a small head start.
- 3) The team is working with creators and developers all over the world on exciting new holographic experiences.
- 4) The era of holographic computing is here. And it's just about time we experience it.

REFERENCES

- [1] <http://www.cnet.com/news/microsoft-hololens-explained-how-it-works-and-why-its-different/>
- [2] <http://www.pcworld.com/article/2917512/microsoft-designed-a-special-processor-to-handle-hololens-data.html>
- [3] <https://hololens.wordpress.com/>
- [4] <https://www.microsoft.com/microsoft-hololens/en-us/experience>
- [5] <http://www.popularmechanics.com/technology/gadgets/a15324/how-microsofts-hololens-works/>
- [6] <https://www.lri.fr/~mackay/pdf/AVI98.AugmentedReality.pdf>
- [7] [http://www.iosrjournals.org/iosr-jmce/papers/sicete \(mech\)-volume4/43.pdf](http://www.iosrjournals.org/iosr-jmce/papers/sicete (mech)-volume4/43.pdf)