

Innovations to Create a Digital India: Distinguishing Reality from Virtuality

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Abstract – Mixed reality (MR) also referred as hybrid reality, is the combination of real and virtual worlds in order to produce some new environments and visualizations where physical objects and digital objects synchronize in real time. In this paper, our focus is on virtual reality related technologies that collate the real and virtual worlds i.e. mixed reality. Even though the term mixed reality is now defined with a related term augmented reality. Augmented reality refers to any case in which an otherwise real environment is "augmented" by means of virtual (computer graphic) objects. This paper focuses on mixed / augmented reality visual display i.e. the Windows Holographic System called Project HoloLens that is developed and manufactured by Microsoft.

Index Terms – Mixed reality, Augmented Reality, virtual, Microsoft.

1. BASIC CONCEPTS BEHIND WINDOWS HOLOGRAPHIC PLATFORM

• Introduction

Interactive holograms have always seemed like something for the very far future, but Microsoft is making it a soon to be a reality with Windows Holographic [1]. Windows Holographic, a mixed reality platform that is built as per the API of Windows 10. In Microsoft, the Holographic works team has developed numerous applications in which they have incorporated the live presentation of physical real-world elements with that of virtual elements in such a way that they can be perceived to exist together in a shared environment. The Windows Holographic system features an augmented-reality operating environment in which any universal application can run with Windows holographic platform APIs. Microsoft announced its Windows holographic work through the smart headset called Microsoft HoloLens. Microsoft HoloLens, known under development as Project Baraboo, is a pair of mixed reality head-mounted smart glasses developed and manufactured by Microsoft [2].

• Design and Hardware

The HoloLens is a head-mounted display unit connected to an adjustable headband that could tilt HoloLens up and down or forward and backward. On the top edge are two pairs of buttons: display brightness buttons above the left ear, and volume buttons above the right ear. Adjacent buttons are shaped differently—one concave, one convex—so that the user can distinguish them by touch [3]. The HoloLens features an inertial measurement unit (IMU) that includes:

- An accelerometer.
- Gyroscope.
- A magnetometer four "environment understanding" sensors (two on each side).
- An energy-efficient depth camera with a 120°×120° angle of view.
- A 2.4-megapixel photographic video camera.
- A four-microphone array.
- An ambient light sensor.



- 3D audio speakers.
- Microsoft holographic processing unit (HPU), a coprocessor manufactured specifically for the HoloLens by Microsoft. HPU handles tasks such as spatial mapping, gesture recognition, and voice and speech recognition.
- IEEE 802.11ac Wi-fi.
- Bluetooth 4.1 low energy (LE) wireless connectivity.
- Visor piece is a pair of transparent combiner lenses, in which the projected images are displayed in the lower half.
- Internal rechargeable battery, with average life rated at 2–3 hours of active use, or 2 weeks of standby time.



The HoloLens needs a dark room for the formation of the hologram. Therefore the room should be closed for the projection of the hologram for best output [3].

2. APPLICATIONS OF MICROSOFT HOLOLENS

Numerous augmented-reality applications have been developed for Microsoft HoloLens and only some of them will be provided for free with purchase of Microsoft HoloLens Developer Edition. Applications available at launch of HoloLens include:

- **Holograms**, a catalogue of a variety of 3D objects that you can place around you.
- **HoloStudio**, a full-scale 3D modelling application by Microsoft with 3D print compatibility [4].
- **Skype telecommunications application**: An implementation of the Skype telecommunications application by Microsoft [5].
- **HoloTour**, an audiovisual three-dimensional virtual tourism application [6].
- **Actiongram**, an application for staging and recording short video clips of simple mixed reality presentations using pre-made 3D virtual assets [7].
- **Adventure Games**:
 - **Fragments**: a high-tech crime thriller adventure game developed by Microsoft and Asobo Studio, in which the player engages in crime-solving [8].
 - **Young Conker**: a platform game developed by Microsoft and Asobo Studio, featuring a young version of Conker the Squirrel [6].

- **RoboRaid / Project X-Ray**: an augmented-reality first-person shooter game by Microsoft in which the player defends against a robot invasion, aiming the weapon via gaze, and shooting via the Clicker button or an air tap [9][7].



Other applications announced or showcased for HoloLens include:

- **FreeForm**, a joint project between Autodesk and Microsoft integrating HoloLens with the Autodesk Fusion 360 cloud-based 3D development application



- **Galaxy Explorer**, an educational application about the Milky Way in development by Microsoft Studios, pitched and chosen by the developer community via the *Share Your Idea* campaign, and to be open-sourced upon completion.

- **NASA's Visualization Application:** A spacecraft design/visualization application in development by NASA's Jet Propulsion Laboratory (JPL).

3. FEATURES THE HOLOLENS 'COMMERCIAL SUITE'

Some of the features the HoloLens Commercial Suite include [10]:

- **Kiosk mode.** With HoloLens kiosk mode, you can limit which apps to run to enable demo or showcase experiences.
- **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.
- **Identity.** Azure Active Directory and next generation credentials with PIN unlock.
- **Windows Update for Business.** Controlled operating system updates to devices and support for long term servicing branch.
- **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.
- **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.

4. CONCLUSION

In this paper, we focused upon a virtual reality related technology that collates the real and virtual worlds i.e. mixed reality. This technology is named HoloLens: it features a custom-made Microsoft Holographic Processing Unit (HPU), a coprocessor manufactured specifically for the HoloLens by Microsoft. Numerous augmented-reality applications have been developed for Microsoft HoloLens and many of them will be provided for free with purchase of Microsoft HoloLens Developer Edition. The HoloLens invention will surely become popular and in the top list of commonly used devices of future.

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