Lab Manual

Subject: Augmented and Virtual Reality

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Experiment No. 2

Aim: Demonstration of the working of HTC Vive, Google Cardboard, Google Daydream and Samsung gear VR.

Theory:

A VR handset is tool used to experience VR. It is a gear that fits on your eyes and tricks your sight. It is an essential component if you want to get immersive experience. Following is acase study on VR handsets: HTC Vive, Samsung Gear VR, Google Daydream, Google Cardboard.

HTC Vive

VIVE, sometimes referred to as HTC Vive, is a virtual reality brand of HTC Corporation. It consists of hardware like its titular virtual reality headsets and accessories, virtual reality software and services, and initiatives that promote applications of virtual reality in sectors like business and arts.

The brand's first virtual reality headset, simply called HTC Vive, was introduced. HTC has also released accessories that integrate with the Vive and SteamVR, including sensors for motion capture and facial capture.

In February 2022, HTC unveiled Viverse, a metaverse ecosystem comprising its 5G products, Vive VR devices, and related initiatives, as well as partners like ENGAGE and VRChat.

VIVERSE is said to offer multiple routes into the metaverse by providing accessibility to virtual worlds from non-VIVE and non-VR devices like smartphones through software tools like VIVEConnect.

WORKING

Using two sensors in each corner of the room, the HTC Vive tracks and maps your movement around the room. The headset is connected to the computer via a long cord, and the controllers are wireless. A computer that has the processing power to run virtual reality is also required, which can get pretty expensive. The Vive is powered by SteamVR, which is a virtual reality based gaming software.

Samsung Gear VR

The Samsung Gear VR is a virtual reality headset developed by Samsung Electronics, in collaboration with Oculus VR, and manufactured by Samsung. When in use, a compatible Samsung Galaxy device acts as the headset's display and processor, while the Gear VR unit itself acts as the controller. The Gear VR headset also includes a touchpad and back button on the side, as well as a proximity sensor to detect when the headset is on.

The Gear VR was first announced on September 3, 2014. To allow developers to create content for the Gear VR and to allow VR and technology enthusiasts to get early access to the technology, Samsung had released two innovator editions of the Gear VR before the consumerversion.

Google Cardboard

Google Cardboard is a discontinued virtual reality (VR) platform developed by Google. Named for its fold-out cardboard viewer into which a smartphone is inserted, the platform was intended as a low-cost system to encourage interest and development in VR applications. Users can either build their own viewer from simple, low-cost components using specifications published by Google, or purchase a pre-manufactured one. To use the platform, users run

Cardboard-compatible mobile apps on their phone, place it into the back of the viewer, and view content through the lenses.

Through March 2017, over 160 million Cardboard-enabled app downloads were made. After thesuccess of Cardboard, Google developed an enhanced VR platform, Daydream, which was launched in 2016. Following declining interest in Cardboard, Google announced in November 2019 that it would open-source the platform's SDK. In March 2021, the Google Store stopped selling Cardboard viewers. As of November 2021, third-party companies continue to sell compatible viewers.

WORKING AND ASSEMBLY

Google Cardboard headsets are built out of simple, low-cost components. The parts that make up a Cardboard viewer are a piece of cardboard cut into a precise shape, 45 mm focal length lenses, magnets or capacitive tape, a hook and loop fastener (such as Velcro), a rubber band,and an optional near field communication (NFC) tag. Google provides extra recommendationsfor large scale manufacturing, and pre-assembled kits based on these plans are available for less than US$5 from multiple vendors, who have also created a number of Cardboard variations.

Once the kit is assembled, a smartphone is inserted in the back of the device and held in place by the selected fastening device. A Google Cardboard–compatible app splits the smartphone display image into two, one for each eye, while also applying barrel distortion to each image tocounter pincushion distortion from the lenses. The result is a stereoscopic (3D) image with a wide field of view.

The first version of Cardboard could fit phones with screens up to 5.7 inches (140 mm), and used magnets as input buttons, which required a compass sensor in the phone. An updated design released at Google I/O 2015 works with phones up to 6 inches (150 mm), and replacesthe magnet switch with a conductive lever that triggers a touch event on the phone's screen for better compatibility across devices.

Google Daydream

Daydream is a discontinued virtual reality (VR) platform which was developed by Google, primarily for use with a headset into which a smartphone is inserted. It is available for select phones running the Android mobile operating system (versions "Nougat" 7.1 and later) that meet

the platform's software and hardware requirements. Daydream was announced at the Google I/O developer conference in May 2016, and the first headset, the Daydream View, was released on November 10, 2016. To use the platform, users place their phone into the back of a headset, run Daydream-compatible mobile apps, and view content through the viewer's lenses.

Daydream was Google's second foray into VR following Cardboard, a low-cost platform intended to encourage interest in VR. Compared to Cardboard, which was built into compatible apps and offered limited features, Daydream was built into Android itself and included enhancedfeatures, including support for controllers. Daydream was not widely adopted by consumers or developers, and in October 2019, Google announced that the Daydream View headset had been discontinued and that they would no longer certify new devices for Daydream.

SOFTWARE

Android Nougat introduced VR Mode, a low-latency, "sustained performance mode" to optimize the VR experience for Daydream. It dedicated a CPU core to the user interface thread to reducevisual issues that could induce nausea. Whereas the GPU normally sends frames to the device display in a "double buffering" mode on Android, VR Mode switched to "single buffering" to avoidintermediate frame buffer and instead draw frames directly to the display. The mode also allowed for asynchronous reprojection, whereby frames were slightly transformed to account forpositional changes in the user's head that occurred during the 16 milliseconds that each frame was rendered and sent to the display. VR Mode also performance tuned the motion sensor pathways to result in quicker input from the device's accelerometer and gyroscope. The mode assisted developers in optimizing apps to a device's thermal profile. Overall, the performance improvements of VR Mode resulted in motion-to-photon latency decreasing on the Nexus 6P phone from 100 milliseconds on Android Marshmallow to less than 20 milliseconds on Android Nougat. Daydream also included a new head tracking algorithm that combined the input from various device sensors, as well as integration of system notifications into the VR user interface. Daydream allows users to interact with VR-enabled apps, including YouTube, Google Maps Street View, Google Play Movies & TV, and Google Photos in an immersive view. Google recruited media companies like Netflix and Ubisoft for entertainment apps.

COMPARISON CHART

Factors	HTC Vive	Samsung Gear VR	Google Cardboard	Google Daydream
Discontinued	No	No	Yes	Yes
Approximate Price	**₹ 19,400**	**₹ 6000**	**₹ 250**	**₹ 2000**
Position tracking	Yes	No	No	No
Newer versions or successors	HTC Vive Focus series, HTC Vive Pro series	Samsung Gear VR with handheld controller	No successors	No successors
360˚ head movement	Yes	No	No	No