Holographic Interaction with Ultra Haptics Technology

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Abstract - *What if in the world with the new technology arises with no controller, no wearable, no touch- screen are use all we can interact with other technology with the help of ultra-haptics technology by using our hand in midair. Here, in this research paper we present the unique demonstration of a human and haptic technology. There are some existing technologies that are used such as HoloLens from Microsoft, ultra-haptic touch development kit and Holograms. By the interaction of holographic display and ultrasonic transducers we can literally feel and sense (tangible feedback) the 3D image or shape which is formed by hologram. There are some limitations for the holographic interactions. Hence it gives the reference to interact with virtual world.*

Key Words: Ultra haptic technology, HoloLens, Ultra Haptic Development Kit, Holograms, Application, how does it work, Limitations.

1.INTRODUCTION

Haptic technology, conjointly referred to as proprioception communication or 3D bit, refers to associate degree technology that may produce an expertise of bit by applying forces and vibrations, or motions to the user. These technologies are often accustomed produce virtual objects during a model, to regulate virtual objects, and to reinforce device of machines and devices. tactual devices might incorporate tactile sensors that live forces exerted by the user on the interface. The word tactual, from the Greek word (haptikos), suggests that "tactile, touching on the sense of touch". easy tactual devices are common within the sort of game controllers, joysticks, and steering wheels.

Haptic technology facilitates investigation of however the human sense of bit works by permitting the creation of controlled actual virtual objects. Most researchers distinguish 3 sensory systems associated with sense of bit in human body covering proprioception and tactual. All perceptions mediate by body covering and proprioception sensibility are cited as tactual perception. The sense of bit is also classified as passive and active, and therefore the term "haptic" is commonly related to active bit to speak or acknowledge objects.

Fig -1: Touching the Virtual

Haptics is any type of interaction victimization but the thought of victimization one's skin as a measuring instrument system with a somatosensory feedback suit, that applies forces and vibrations to the user, was a plan that basically excited Pine Tree State.

The idea of victimization Ultrahaptic's sound technology, that uses ultrasound to project sensations onto a hand, as each somatosensory communication and somatosensory feedback includes a haggle of potential in several settings. Combining that with the utilization of the HoloLens exposes all forms of doors to new potential workflows, styles of recreation, and general interaction.

1. Technologies used in this experiment

1.1 HoloLens 2 from Microsoft

The HoloLens 2 is a mixture of conductor and laser-based stereoscopic & full-color mixed reality smart glasses developed and made put together by Microsoft and Micro Vision, Inc. in Redmond, Washington. it's the direct model successor to the pioneering Microsoft HoloLens and therefore the technical successor to the Micro Vision stereoscopic and monochromatic laser-based virtual retinal show (VRD) & helmet-mounted show (HMD) prototype-in-

the-running for the canceled RAH-66 Comanche hiding eggbeater and therefore the now-defunct monoscopic and monochromatic Micro Vision bird of passage increased Vision System. it absolutely was afterward discharged in restricted numbers on Gregorian calendar month seven, 2019. The North American nation military's Integrated Visual Augmentation System could be more developed of HoloLens 2.

Fig –2: HoloLens 2 by Microsoft

1.2 Ultra Haptics Technology

Ultrahaptic is a technology company creating mid-air haptics for making three-dimensional shapes and textures that may be felt that's headquartered in a port, the European country and was supported in 2013 by Sriram Subramaniam and Tom Carter. The company's technology is often accustomed to being added tactile feedback to virtual objects, produce an additional immersive holographic interface, and augment gesture management with tactile feedback.

Fig -3: Ultrahaptic Technology

1.3 Hologram

In easy terms, a holograph technology may be three-dimensional projection which may be seen while not victimization any special instrumentation like cameras or glasses. The image may be viewed from any angle, thus because the user walks around the show the article can seem to maneuver and shift realistically. Holographic pictures may be static, like an image of a product, or they will be animated

sequences that may be watched by multiple individuals from any viewpoint.

The technology accustomed to capture and project Holograms has advanced speedily in recent years. These latest techniques permit a lot of convincing and interactive models shall be displayed, and a square measure has expected to become even more widespread within the future.

Fig -4: Hologram

2. How does its work's

Holograms don't seem to be new technology, however, there's an art of the movement shiver is encompassing the subject. A computer-generated exposure is made by a sequence of three-dimensional (3D) pictures that a square measure has processed into a reflection, a visible illusion. If you are attempting to touch one, your hand can undergo it.

What is new is that the concept of physical holograms: not merely projected into the air, the associate degree has not merely superimposed onto an associate actual object, however, "haptic holograms" that you just simply cannot exclusively bit, however, act with and move. Computer haptics is that the system that needed each hardware and additionally the package to render the bit and a feel of virtual objects. Perception holograms take this one step further: you may presently "touch" a 3d projection, a virtual object, and actually feel it.

Haptic holograms manufacture virtual objects that have a digital interface associate with a degree interface that has been feelable additionally to visible, by sculpting a sound to form visible digital choice needs physical ones. The virtual 3D perception kind becomes a tactile holographic show.

Fig -5: Ultrahaptic Technology showing ultrasound

2.1 The Story of Touch

The skin is covering the hand is filled with receptors that communicate tactile feedback for touching, a serious bit, pressure, a vibration, hot and cold, and pain. This helps the brain perceives refined tactile details: smoothness, hardness, density, weight, and so on. An ultrasound creates vibrations within the air, projected at a group distance to match the surface of the photograph. The skin feels these vibrations at a completely different wavelength to simulate softness/hardness and additional. This info permits the virtual, 3D images to be touched.

3. Applications

Touchable 3D holograms can extend the use of touch interaction to unconventional situations. Here are some hands-on applications:

3.1 Real Estate

The latest developments in Ultra haptic feedback modify potential purchasers to truly bit the textures in a very home once viewing a digital tour: rough stone walls, sleek marble, and so on. At the instant, these textures' area unit solely accessible on a sample-size scale, instead of as a part of a life-size set, however, the technology remains a helpful sales tool.

Fig -7: No escaping from holographic technology

3.2 Military

Physical military science sandboxes are accustomed set up missions and train personnel since Roman times, however new technological innovations and therefore the latest developments in increased reality have created immense opportunities to style a military science sandbox suited 21st-century military needs," reads an announcement on the company's description of the software system.
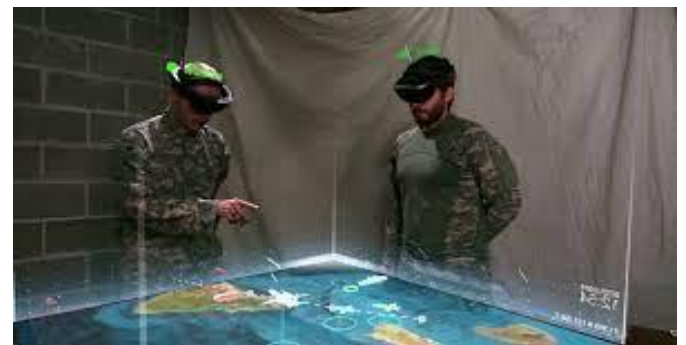

Fig -7: Air Force Testing Holographic Interaction

3.3 Medical

Medical examinations when tactile holograms area unit combined with CT, resonance imaging (MRI), and ultrasound scans of a part of the body, surgeons are able to feel a neoplasm, for instance, earlier of a live operation. This technology is already out there commercially from firms like Real View Imaging in Israel which has developed medical optics for interventional medical specialty and diagnostic imaging.

Fig -8: Virtual Surgical

3.4 Education

AR and VR have profound implications for the long run of education. Teaching and Learning with technology, before this time was largely restricted to supplementary collaboration tools for communication: learning management systems and electronic texts. The technology was merely associate with electronic aid to ancient informative teaching, adding a touch of trendy muscle to similar ways in which we've got instructed and learned for many years. Student can see the solar system and they can know how big the planets are as compare to sun or earth.
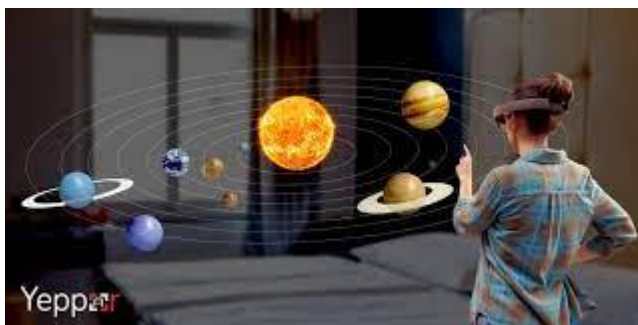

Fig -9: Solar system using HoloLens by Microsoft

4. Limitations

1. Millimeter exactness is tough or not possible to achieve. 40 kHz ultrasound has an associate 8.5-millimeter wavelength, and it inherently limits the exactness

2. The strength of the result is a problem because the mid-air tactile force is simply a little fraction of the force thresholds of hardware buttons. an oversized range of transducers strengthen the result, however not linearly, thanks to the restricted directionality of the transducers

3. Large arrays create the device larger, heavier, and more expensive.

4. Novel array hardware setups might strengthen the result. A hybrid focuses from 40 kilohertz and 70 kHz arrays made a stronger effect than either alone.

5. The recent size and weight of the arrays, because an oversized range of piezoelectric ceramic transducers are needed. There's a trade-off between moveables and feedback intensity.

6. A physical limitation is that they harmonize at ~200 Hz will only be felt by the palm of a hand.

7. Safety is a crucial thought. because ultrasound cannot be detected, there's a chance that dangerous exposure in the robust concentration may be ignored.

4. CONCLUSION

Holographic Interaction with Ultrahaptic Technology is a singular and surprising experience it has a large amount of future investigation from both points of view technical as well as usability. The most helpful technology for this experiment is MR Technology (Mixed Reality) but it goes further by increasing interaction modality with holograms. It has a unique future by giving physical presence to intangible objects.

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