Comparative Study of Augmented Reality and Virtual Reality

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ABSTRACT : In the Reality to Virtuality continuum, the phases begins with "Physical Reality" where real people interact with each other then the next phase comes as "Television or Cinema" where the real people connect with the virtual world in a one way communication path. Then comes the phase of "Augmented Reality" where the virtual environment is superimposed on the physical environment followed by a phase of "Augmented Virtuality" where the real world objects are merged into the virtual world objects. The final phase of this continuum is the "Virtual Reality" which sometime is referred as Immersive Multimedia, is a computer-simulated environment that can simulate physical presence in places in the real world or imagined worlds. In this paper, we will conduct the comparative study of 'Augmented Reality' and the 'Virtual Reality'.

KEYWORDS : AR, VR, Reality, Virtual, Augmented

I.INTRODUCTION

Augmented Reality:
Augmented Reality also commonly known as 'AR' is a relatively new technology which allows overlaying of virtual objects on the real world. This is depicted with the following example. In the following image, a girl is sitting by the dining table having her breakfast i.e. she is in the real world. While a virtual cartoon character in a smart phone is overlaid on the real world giving an impression that the real cartoon character is next to the girl.
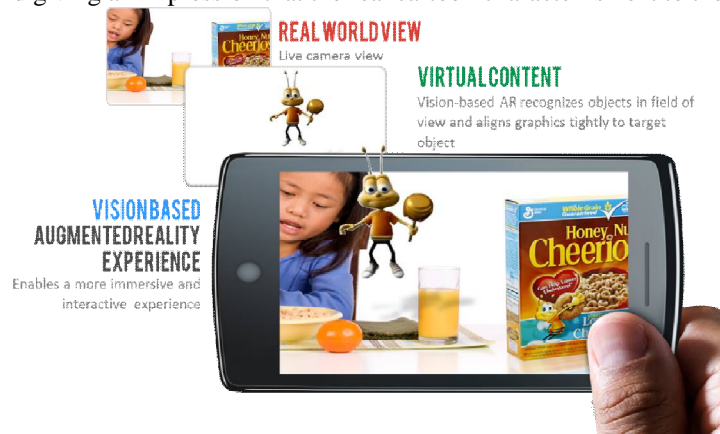
Virtual Reality:
Virtual Reality which is commonly known as 'VR' is the way to use realistic 3D environment created using 3D modeling software or a 360 degree recording of real world locations to immerse the users into this virtual world. It tricks user's brain to believe that she is in this virtual world and blocks the real world around the user. In short, Virtual Reality substitutes the real senses of the users like Sight or Hearing with the virtual world so that the brain starts believing that the virtual world itself is the real world.

II. LITERATURE REVIEW

Augumented Reality

Augmented Reality (AR) is a technology or an environment where the additional information generated by a computer is inserted into the user's view of real world scene.

The augmenting information may consist of virtual geometric objects placed into the environment, or a display of non-geometric information about existing real objects such as distribution of room temperature.
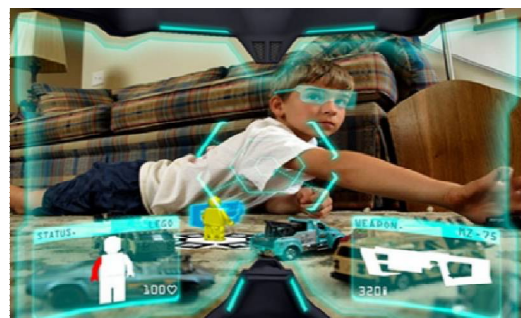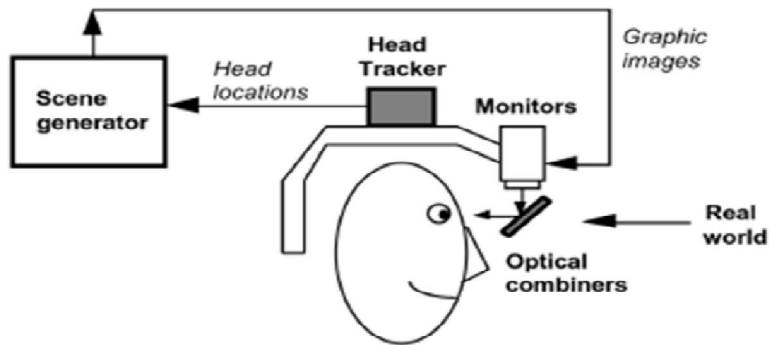

Optical see-through: Partly trans missive optical combiners are placed in front of the user's eyes, allowing the user to see in them the reflection of virtual images portrayed on miniature displays in their line of sight.

AddVisor 150

Uses miniature cameras to capture the view of the world that would be seen by each eye. The video images of the real world are then combined with the computer-generated images of the virtual world, to create augmented-reality images that can be displayed on a traditional (non-see-through) HMD
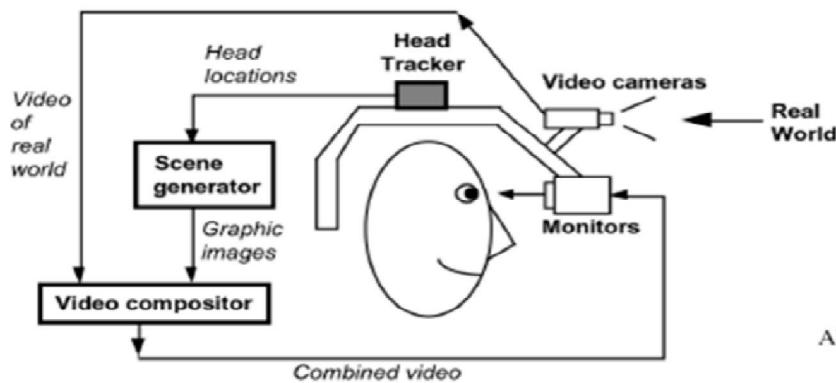
AR Vision 3D HMD (commercial system)
(cameras mounted over the eyes)

There are 2 ways to achieve Augmented Reality – with Marker-based or Marker-less
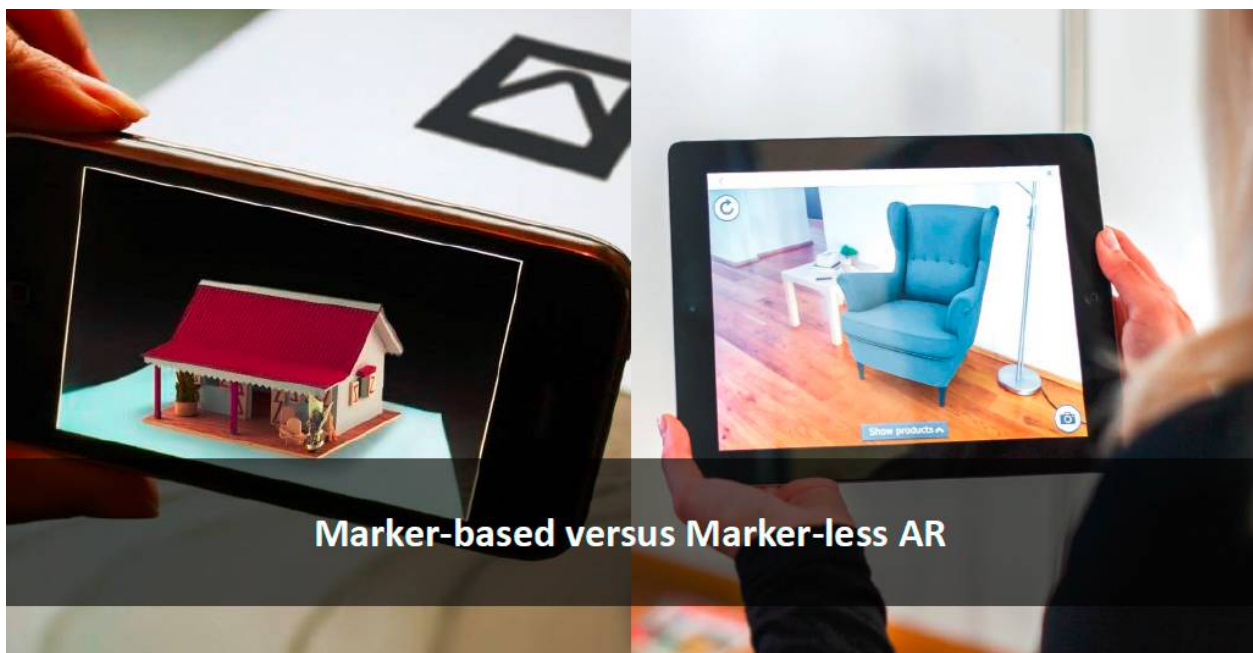
Marker-based versus Marker-less AR
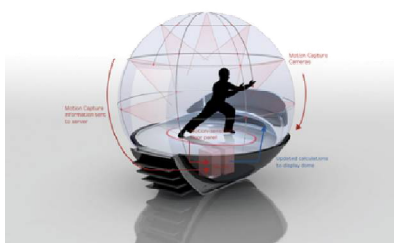
Virtual Reality

Brooks (1999) defines it as: "[an] experience ... in which the user is effectively immersed in a responsive virtual world" …

Sherman and Craig (2003) defines it as a medium composed of interactive computer simulations that sense the participant's position and actions and replace or augment the feedback to one or more senses, giving the feeling of being mentally immersed or present in the simulation (a virtual world)

There are 3 modes in Virtual Reality: Immersive, Semi-immersive and Non-immersive,

Immersive   **Semi-Immersive**   **Non-Immersive**

Four Key Elements in Experiencing Virtual Reality,

- A virtual world an imaginary space, often (but not necessarily) realized through a medium (rendering pipeline, display, etc.)
- Immersion (physical and mental) having a sense of "presence" within an environment; this can be purely a mental state, or can be accomplished through physical means.
  - Mental Immersion: a state of being deeply engaged, with suspension of disbelief.
  - Physical Immersion: bodily/physically entering into a projected area
- Sensory feedback: visual/aural/haptic feedback to a participant
- Interactivity: in a virtual reality experience, participants are able to move around and change their viewpoint, generally through movements of their head.

III. APPLICATIONS

- **Applications of Augmented reality in real world :**
1. **Navigation**
   Enhanced GPS systems are using augmented reality to make it easier to get from source to destination.
2. **Sightseeing**
   There are a number of applications for augmented reality in the sightseeing and tourism industries. The ability to augment a live view of displays in a museum with facts and figures is a natural use of the technology.
3. **Military**
   The Head-Mounted Display (HMD) is used by ground troops. Critical data such as enemy location can be presented to the soldier within their line of sight. This technology is also used for simulations for training purposes.
4. **Medical**
   - Augmented reality can reduce the risk of an operation by giving the surgeon improved sensory perception. This technology can be combined with MRI or X-ray systems and bring everything into a single view for the surgeon.
   - Neurosurgery is at the forefront when it comes to surgical applications of augmented reality.

- **Applications of Virtual Reality :**

1. **Virtual reality in the Military**
Virtual reality is used to treat post-traumatic stress disorder. Soldiers suffering from battlefield trauma and other psychological conditions can learn how to deal with their symptoms in a 'safe' environment.

2.   Virtual Reality in Education

Education is another area which has adopted virtual reality for teaching and learning situations. The advantage of this is that it enables large groups of students to interact with each other as well as within a three dimensional environment.

3.   Virtual reality in astronomy

Astronomy students can learn about the solar system and how it works by physical engagement with the objects within. They can move planets, see around stars and track the progress of a comet. This is useful for students who have a particular learning style, e.g. creative or those who find it easier to learn using symbols, colours and textures.

4.   Virtual Reality in Healthcare

Healthcare is one of the biggest adopters of virtual reality which encompasses surgery simulation, phobia treatment, robotic surgery and skills training.

5.   Virtual Reality in Entertainment

The entertainment industry is one of the most enthusiastic users of virtual reality and other equally popular areas include: Virtual Museums, Galleries,Theatre,Virtual theme parks,Discovery centres.

IV. REALITY – VIRTUALITY CONTINUUM
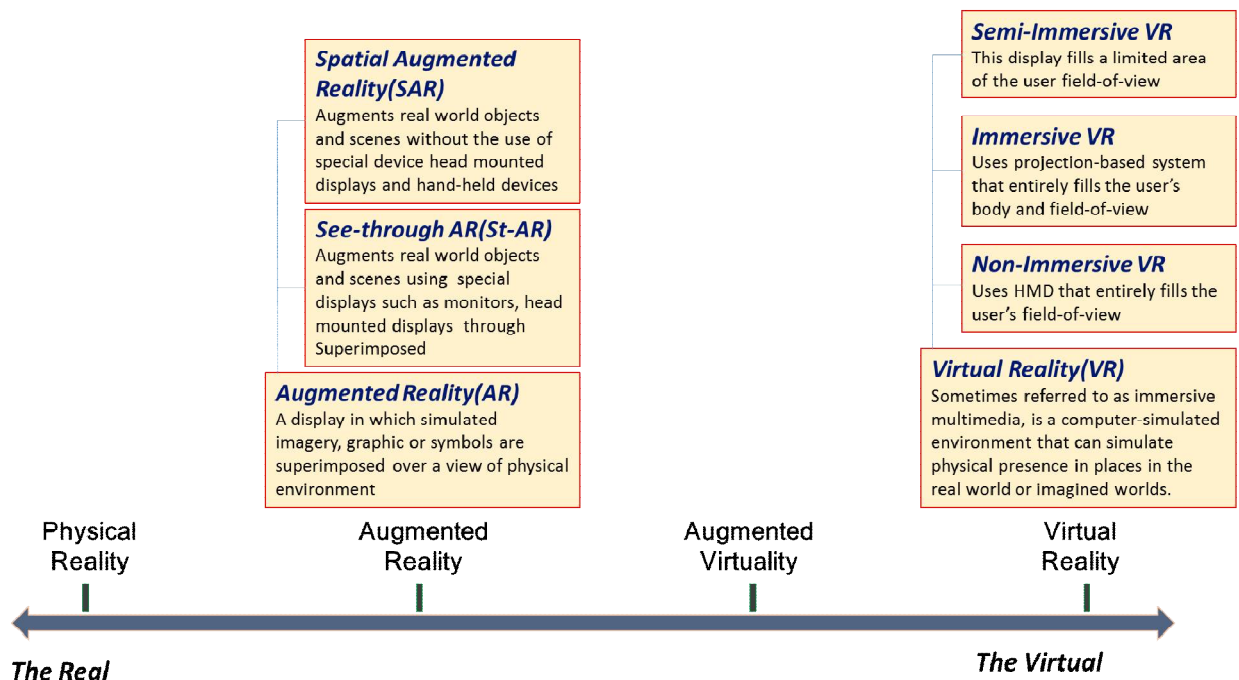
- As depicted in the above image, the Real to Virtual world has multiple phases with important phases like Augmented Reality and Virtual Reality.

V. AR Vs VR

They're both cutting edge new technologies and are the subject of fascination to the world's most influential people in technology. Virtual reality is able to transpose the user. In other words, bring us some place else. Through closed visors or goggles, VR blocks out the room and puts our presence elsewhere.

Considering a film analogy if virtual reality is "The Matrix", then augmented reality is "The Terminator". As the name suggests, the point of VR is to persuade users that they have entered an entirely new reality. The result of VR is a reasonably convincing illusion of being somewhere else entirely. Augmented reality, by contrast, does not dispense with the real world, but uses computers to improve it in various ways. But the two technologies have one fundamental difference. VR is immersive: the headsets must, by necessity, block out the external world. AR, by design, maintains its

users' connection with the real world, and that means that a headset is not necessary. Heads-up displays are an early example of AR. Many existing smartphone apps also make use of AR.

VI. CONCLUSION

- The advent of AR or VR could lead us down very different paths in entertainment, gaming, communication and industry. So it is difficult to predict which technology will rule the world in future.
- Augmented reality overlays virtual 3D graphics onto our view of the real world whereas virtual reality immerses us in 360 degree views of new worlds with little or no sensory input from the room your body is actually in.
- Augmented and virtual realities have one big thing in common. They both have the remarkable ability to alter our perception of the real world. Where they differ, is the perception of our presence.

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