

Assignment 1**Part 2**

1. Summarize the applications of each technology (AR and VR) and roughly how each technology (AR and VR) works (1 paragraph for each paper)

Augmented Reality

Based on the survey^[1], Augmented Reality (AR) can be defined as a system that combines real and virtual objects in a real environment and runs interactively, and in real-time as well as registers (aligns) real and virtual objects with each other. AR is not only limited to visual augmentation but also includes augmentation of any sense of the human body such as hearing, smell, or touch. Here we are discussing about the most common form of AR which is visual augmentation.

Some of the technologies that enable this AR are as discussed below. Displays such as Head-worn displays (HWD) with optical see-through or video see-through allows for the virtual objects to be overlaid on top of the real-world. Similarly, Handheld displays provide video see-through-based augmentations on a flat-panel LCD such as smartphones or tablets, while projection displays the desired virtual information is projected directly on the physical objects to be augmented.

Tracking sensors allow the users to interact with the virtual objects that were augmented on the real world, while also tracking the movement of the user in the environment to provide a cohesive environment for the user. The user interface and interaction system and the rendering systems are also some of the important technologies of Augmented Reality.

Some of the applications for AR are as follows:

- Assembly line - assembling aircraft wire bundles
- Generate and view 3D models in 3D
- Refining their tracking and display techniques to support laparoscopic surgery
- Augmenting the video stream collected by a handheld video camera
- Presents the user with world-stabilized information about an urban environment (the names of buildings) or even render models of buildings that previously existed
- Augment the environment with dynamic 3D information (such as goals or hazards) usually conveyed on 2D maps.
- Enhances collaboration practice by supporting remote and collocated activities that would otherwise be impossible

Virtual Reality

According to the report^[2], Virtual Reality is defined as any in which the user is effectively immersed in a responsive virtual world. This implies user dynamic control of viewpoint. In other words, Virtual Reality is a branch of computer graphics in which the user is immersed and has control over their viewpoint.

The four major technologies of VR are, the displays, the graphics renderer system, the tracking system and the database construction and maintenance system. All these technologies along with additional minor technologies such as spatial audio, haptic devices, and such, are interconnected and work together to produce an immersive

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environment for the user to experience and interact with. The displays are primarily Head-mounted displays (HMDs) provide the user with an enclosed environment for the user to experience the virtual world without distractions from the real-world. The virtual world is generated by the graphics renderer system in which the movement of the user and their interactions are tracked using the tracking system (usually controllers or gloves).

Some of the applications of VR are as follows:

- Vehicle simulation - first and still much the best
- Entertainment - virtual sets, virtual rides
- Vehicle design - ergonomics, styling, engineering
- Architectural design and spatial arrangement; submarines, deep-sea oil platforms, process plants
- Training - only the National Aeronautics and Space
- Administration
- Medicine - psychiatric treatment
- Probe microscopy

2. Summarize the differences/similarities you notice between the technologies (1 paragraph)

Augmented Reality (AR) and Virtual Reality (VR) has several similarities as well as differences. AR is the augmentation of virtual world over the real-world while VR replaces the real-world with the virtual world. Both VR and AR tracks the user to enable the interaction with the virtual world. For now, VR requires a headset device, while AR can be accessed with a smartphone. VR only enhances a fictional reality while AR enhances both the virtual and real world.

References

1. Ronald Azuma, Yohan Baillet, Reinhold Behringer, Steven Feiner, Simon Julier, Blair MacIntyre, "Recent Advances in Augmented Reality"
2. Frederick P. Brooks, Jr, "What's Real About Virtual Reality?"