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Augmented Reality

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ABSTRACT

This paper presents a precise review of Augmented reality and basic technology used in it. It describes the main domains in which AR is applied these days and Vital AR devices. Some properties of AR are mentioned and the paper provides an encapsulation of them, along with-it Future aspects are also mentioned.

INTRODUCTION

Augmented Reality (AR) renders the digital objects, images and data and present the real world around us in an enhanced way by using digital visual elements, sound, or other sensory stimuli delivered via technology. Its foremost objective is to emphasize peculiar elements of the physical world, increase comprehension of its elements, attain smart and convenient vision which can have to real-world utilization.

AR dates back in 60s and 70s when a Harvard professor and computer scientist first invented a head mounted display called 'The Sword of Damocles' allowing user to experience computer-generated graphics enhancing their visual perception of the world. In 1990, the term Augmented Reality was coined and has been used ever since in fields such as entertainment, sports and even by NASA in their vision system of X38-Spacecraft^[1]

AR Components

2.1 Scene Generator

The scene generator is a tool or software accountable for rendering the scene.

2.2 Tracking System

The objects should accurately align in the real and the virtual world or else the belief that these worlds coexist will be compromised. For this, the tracking device should have high accuracy.^[12]

2.3 Display

Display technology is another important component of AR. Such devices should have sufficient brightness, good field of view and contrast to seamlessly blend a wide range of real and virtual imagery.

AR Devices

There are four major categories of AR devices. One of them is Optical See-Through AR which use a transparent Head Mounted Display showing the virtual environment directly on to the real world. It works by placing optical combiners in front of the user's eyes.^[7]

The VRD (Virtual Retinal Display) was aimed to produce wide field-of-view, high resolution, full color, high brightness, low cost virtual display.^[16]

Next is Video See-Through AR, it uses an opaque HMD for displaying merged video of the VE and view from cameras on the HMD. Proper location of the camera is required because this approach is a bit more complex than optical see-through AR.

Monitor Based AR again use merged video streams but the display is a more conventional desktop monitor or a hand-held display. As it eliminates HMD issues, it is considered to be the least difficult AR setup.

AR and Google Maps

The technology has come a long way with growing list of use of AR. From NASA simulations to immersive marketing experiences, AR makes tasks easier. Accurate positioning and orientation for aligning and registering the virtual information for navigating any physical object is required in AR, making it a potential technology to use in Google maps.

When the user is ready to go, they have to select their destination. Considering the ideal condition, the location should be relatively close because AR mode works only in walking navigation. The map screen will be available at the bottom for a top down view. User needs to pan their phone slowly

so that the camera can recognize the buildings and signs around. The camera will take few seconds to scan its surrounding to understand where the user is.

Once the app has figured it out, a giant virtual marker can be seen showing the user which street he/her is on, also you will get audio notifications. If a new virtual marker comes in the way, more audio notifications will automatically pop. Move the camera around to see the next marker. Following these markers will eventually lead to the destination.

Photorealistic Rendering

Automatically capturing the environmental illumination information by rendering quality of virtual objects is an important upgrade required in AR.^{[11][12]}

Collaborative AR

Hand-held and head-worn displays (collaborative AR) have been built by using projectors. Projectors are used to o augment the surfaces in a collaborative environment, allowing the unnumbered users to each other's eyes, and are guaranteed to see the same augmentations.^[9]

Both see-through handheld displays and see through head-worn displays are examples of Collaborative AR.^[10]

Conclusion and Future of Augmented Reality

Augmented Reality has seen a lot of technological developments over the decade. With advancement of technologies, it is becoming easy to overcome the shortcomings we face now. AR has its applications in not just technical field but it offers a wide range of uses from education, entertainment, military training etc.^[10]

Future of AR is making devices which are wearable and portable, having high accuracy for navigation. Also, the goal is to make AR devices user-friendly so that it is operable by non-expert

users. Overcoming other problems like designing simple graphics so that virtual objects will be indistinguishable from the real ones is in process. [11].

Eventually, AR environment might go through changes to introduce some more senses as well (touch, hearing).

AR has seen many changes ever since it was discovered. Its one of the leading technologies in today's world having wide range of applications. It comes with both challenges and advantages of its own. However, the experience it provides to people is the reason it is growing gradually.

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