Augmented Reality: A Review of Applications

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Abstract - *This paper surveys the field of Augmented Reality, in which 3-D virtual objects square measure integrated into a 3-D real setting in real time. It describes the medical, manufacturing, visualization, path planning, entertainment and military applications that have been explored. This paper describes the characteristics of Augmented Reality systems, including a careful discussion of the tradeoffs between optical and video mixing approaches. Registration and sensing errors are two of the biggest issues in building effective increased Reality systems, so this paper summarizes current efforts to overcome these issues. Future directions and square measures requiring further analysis are mentioned. This survey provides a starting purpose for anyone inquisitive about researching or victimization increased Reality.*

Key Words: Augmented Reality, Virtual Reality, Guide Assistance, Application of Virtual reality

1.INTRODUCTION

Augmented reality (AR) is a live direct or indirect view of a physical, real-world environment whose elements are augmented (or supplemented) by computer-generated sensory input such as sound, video, graphics or GPS data. It is related to a more general concept called mediated reality, in which a view of reality is modified (possibly even diminished rather than augmented), by a computer. As a result, the technology functions by enhancing one's current perception of reality [1]. By contrast, virtual reality replaces the real world with a simulated one. Augmentation is conventionally in real-time and in semantic context with environmental elements, such as sports scores on TV during a match. With the help of advanced AR technology (e.g. adding computer vision and object recognition) the information about the surrounding real world of the user becomes interactive and digitally manipulable. Information about the environment and its objects is overlaid on the real world. This information can be virtual or real, e.g. seeing other real sensed or measured information such as electromagnetic radio waves overlaid in exact alignment with where they actually are in space [2].

2. APPLICATIONS OF AR TECHNOLOGY:

AR technology has many applications. First used for military, industrial, and medical applications, it has also been applied to commercial and entertainment areas. Some of the applications are discussed below in this paper.

1.1 Construction

With the continual improvements to GPS accuracy, businesses are in a position to use increased reality to ascertain georeferenced models of construction sites, underground structures, cables and pipes using mobile devices [3]. Augmented reality is applied to gift new comes, to solve on-site construction challenges, and to enhance promotional materials. Examples include the Daqri sensible Helmet, an Android-powered arduous hat used to produce increased reality for the economic employee, including visual directions, real time alerts, and 3D mapping.
Following the Christchurch earthquake, the University of Canterbury free, City View AR, this enabled town planners and engineers to visualize buildings that were destroyed within the earthquake [4]. Not only did this give planners with tools to reference the previous cityscape, but it additionally served as a reminder to the magnitude of the devastation caused, as entire buildings were demolished.

1.2 Military

In combat, AR can serve as a networked communication system that renders helpful field of honor information onto a soldier's glasses in real time. From the soldier's viewpoint, people and numerous objects will be marked with special indicators to warn of potential dangers. Virtual maps and 360° view camera imaging will conjointly be rendered to assist a soldier's navigation and field of honor perspective, and this can be transmitted to military leaders at a far off command center.

An attention-grabbing application of AR occurred once illustrator International created video map overlays of satellite and orbital scrap tracks to assist in house observations at Air Force Island Optical System. In their 1993 paper "Debris Correlation Using the illustrator Worldview System" the authors describe the use of map overlays applied to video from house police investigation telescopes [5]. The map overlays indicated the trajectories of various objects in geographic coordinates. This allowed telescope operators to identify satellites, and also to determine - and catalog - probably dangerous house scrap.

Starting in 2003 the United States of America Army integrated the SmartCam3D increased reality system into the Shadow pilotless Aerial System to assist sensing element operator's victimization telescopic cameras to find individuals or points of interest. The system combined both mounted geographic data together with street names, points of interest, airports and railroads with live video from the camera system. The system offered "picture in picture" mode that allows the system to indicate an artificial read of the world encompassing the camera's field of read. This helps to solve a problem within which the sector of read is so slender that it excludes vital context, as if "looking through a soda straw". The system displays real-time friend/foe/neutral location markers integrated with live video, providing the operator with improved situation awareness.

Researchers at USAF analysis science laboratory (Calhoun, Draper et al.) found a more or less two-fold increase in the speed at that UAV sensing element operators found points of interest victimization this technology [6]. This ability to maintain geographic awareness quantitatively enhances mission efficiency. The system is in use on the US Army RQ-7 Shadow and therefore the MQ-1C grey Eagle pilotless Aerial Systems.

1.3 Tourism and sightseeing

Augmented reality applications will enhance a user's expertise once traveling by providing real time informational displays concerning a location and its options, including comments created by previous guests of the web site [7-9]. AR applications allow tourists to expertise simulations of historical events, places and objects by rendering them into their current view of a landscape. AR applications can additionally gift location info by audio, announcing options of interest at a specific web site as they come into sight to the user.

1.4 Education

Augmented reality applications will complement customary information. Text, graphics, video and audio can be superimposed into a student's real time setting. Textbooks, flashcards and other academic reading material will contain embedded "markers" that, when scanned by associate degree AR device, produce supplementary data to the student rendered in an exceedingly multimedia system format. Students can participate interactively with pc generated simulations of historical events, exploring and learning details of each important space of the event web site. On higher education, there are some applications that will be used. For instance, Construct 3D, a Studiers tube system, allows students to learn engineering science ideas, math or pure mathematics. This is an energetic learning process within which students learn to be told with technology. AR can aid students in understanding chemistry by permitting them to visualize the abstraction structure of a molecule and act with a virtual model of it that seems, in a camera image, positioned at a marker held in their hand. It can conjointly modify students of physiology to envision completely different systems of the build in 3 dimensions.

Augmented reality technology conjointly permits learning via remote collaboration, in which students and instructors not at constant physical location will share a standard virtual learning setting inhabited by virtual objects and learning materials and act with another inside that setting. This resource could also be of advantage in Primary School. Children can learn through experiences, and visuals can be used to help them learn. For instance, they can learn new knowledge about astronomy, which can be difficult to understand, and children might better understand the solar system when using AR devices and being able to see it in 3D. Further, learners could change the illustrations in their science books by using this resource [10-11]. For teaching anatomy, teachers could visualize bones and organs using augmented reality to display them on the body of a person.

1.5 Emergency management / Search and Rescue

Augmented reality systems square measure used in public safety things - from super storms to suspects at massive. Two attention-grabbing articles from Emergency Management magazine discuss the power of the technology for emergency management [12]. The first is "Augmented Reality--Emerging Technology for Emergency Management" by Gerald Baron. Per Adam Crowe: "Technologies like augmented reality (ex: Google Glass) and the growing expectation of the general public can still force skilled emergency managers to radically shift once, where, and how technology is deployed before, during, and after disasters" [13].

Another example, a search aircraft is probing for a lost footer in rugged mountain tract. Augmented reality systems offer aerial camera operators with a geographic awareness of forest road names and locations mixed with the camera video. As a result, the camera operator is best able to hunt for the hiker knowing the geographic context of the camera image. Once found, the operators can a lot of with efficiency direct rescuers to the hiker's location [14].

1.6 Gaming and Entertainment

Merchlar's mobile game Get on Target uses a trigger image as fiducially marker [15]. Augmented reality permits gamers to expertise digital game play in world surroundings. In the last 10 years there have been plenty of enhancements of technology, resulting in higher movement detection and therefore the chance for the Wii to exist, but additionally direct detection of the player's movements. Companies like Lyteshot AR rising as the more modern interactive increased reality diversion [16].

1.7 Medical

Since 2005, a device that films subcutaneous veins, processes and projects the image of the veins onto the skin has been used to find veins. The device is called Vein Viewer [17]. Augmented Reality will offer the Dr. with data, which are otherwise hidden, such as showing the heartbeat rate, the blood pressure, the state of the patient's organ, etc. AR can be accustomed let a doctor look within a patient by combining one supply of pictures like AN X-ray with another like video [18]. Examples include a virtual X-ray read based mostly on previous picturing or on real time pictures from ultrasound and confocal research probes, visualizing the position of a tumor in the video of a medical instrument, or radiation exposure risks from X-ray imaging devices. AR can enhance viewing a fetus within a mother's female internal reproductive organ. It has been also used for dictyopterous insect phobic disorder treatment. Also, patients wearing increased reality glasses will be reminded to require medications [19-20].

3. AR RELATED WORKS:

Frank Biocca et.al discussed distributed systems technologies supporting 3D visualization and social collaboration 3D visualization, as well as remote 3D collaborations. AR systems allow users to interact with 3D objects and other agents located around a user or remotely. Other local users in the physical space in order to support spatial interaction among active users, while also providing remote users a potential face-to-face collaboration [21].

Peter Barrie et.al discussed about the capture system using low-power wireless sensors. System uses body motion to visualize and interact with virtual objects populating AR settings. An extension to VR, where virtual worlds and objects, or worlds made by the user's body and help create a wearable AR system source less sensor packs attached to the user's body to trap body motion, a VR headset and a web camera attached to the users recognition of the users gestures, whilst the camera gives a live [22].

James C. Maida et.al discuss that AR technology besides being used onboard the space shuttle and space station and as a ground-based system for mission operational support, it also has great potential for science and medical training and diagnostics, remote learning, team learning, video/media conferencing, and educational outreach. The primary sources of control feedback for robotic manipulation tasks on the space shuttle and space station are the video monitor views used by the operators. These lines, arcs, dots, etc. are referenced to objects or positions in the three-dimensional space viewed by the camera [23].

Andrei State et.al present a hybrid tracking method that combines the accuracy of vision-based tracking with the robustness of magnetic tracking without compromising real-time performance or usability. To evaluate the registration performance their system, consist of three experimental AR systems. Here they also demonstrated 3D a virtual object, a knot, casting an experimental system creates a virtual display of the images from this system [24].

Michael Bajura and Ulrich Neuman discussed coordinate system registration in order to improve apparent of dynamically measuring registration error in combined images Coordinate system registration error which in turn improves Registration in the combined images. It achieves improved image registration, stability, and Objects registered in a user's natural environment. Where a user can visualize an as-yet half construct building in its objects and real-world objects to be visually registered with respect to each other in every image the user objects appear to float around in the user's natural environment [25].

Zhanpeng Huang et.al discussed A mobile augmented reality (MAR) application from scratch on mobile devices is complicated Cloud Rid AR, a framework for MAR developers to facilitate The development, deployment, and maintenance of MAR applications in this paper they present Cloud Rid AR, a cloud-based framework it is reasonable to design a mobile 3D engine for local rendering. That will design a cloud rendering subsystem that leverages to solve the problem of remote user interaction and rendering to cloud for updating rendering [26].

Patrick Maier et.al Understanding and ease the learning of chemistry for college students by visualizing and controlling virtual models of molecules in an intuitive approach. Molecules rendered to a camera picture at the position of special markers. The intuitive controlling of the position and program has the potential to increase the understanding and easy learning. This paper present Cloud Rid AR, a cloud-based framework it is reasonable to design a mobile 3D engine for local rendering. A design of cloud rendering subsystem that leverages to solve the problem of remote user interaction and rendering to cloud for updating rendering [27].

Puneet Jain et.al discussed the idea of augmented reality the ability to look at a physical Enable augmented reality on smartphones today. Cutting across smartphone sensing, computer vision, the environment from smartphone sensors and using this Geometry to prune down the visual search space. Annotations may seamlessly appear when the camera is recognizing an object and pop-up its annotation without cameras viewfinder, and pops up the corresponding annotation. Matching the image in the cameras view against various images many images of the same object, image matching [28].

Ivan E. Sutherland Discuss the fundamental idea behind the three-dimensional display is to present the user with a perspective image which changes as he moves. The image presented by the three-dimensional display must change in exactly the way that the image of a real object would change for similar motions of the user's head. Psychologists have long known that moving perspective images appear strikingly three-dimensional even without stereo presentation; the three-dimensional display described in this paper depends heavily on this kinetic depth effect. Our objective in this project has been to surround the user with displayed three-dimensional information. Although it is easy to compute the perspective positions of all parts of a complex object, it is difficult to compute which portions of one object are hidden by another object [29].

Ronald Azuma et.al gives a symposium on Augmented Reality, the International Augmented Reality Environments workshop. on AR, notably the Mixed Reality Systems Laboratory the spirit of the original survey we define AR systems to Blends real and virtual, in a real environment that the virtual objects exist in the real environment is Augmented Reality and Virtual Environments, the surrounding environment is virtual, while in AR the surrounding environment is real Augmented Reality or Virtual Environments [30].

4. CONCLUSION:

This paper discusses the application and uses of the augmented reality and also reviews the previous work based on the application and uses of the augmented reality in real world.

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