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Survey Of Augmented Reality Technology

Ms.Saini Nadar.S
MCA (IMCOST), Mumbai University
C-4,Wagle Industrial Estate, Near Mulund (W)
Check Naka, Thane (w) - 400604

***Abstract*— This paper surveys the sphere of increased Reality, within which three-D virtual objects area unit integrated into a three-D real atmosphere in real time. It describes the medical, producing, visualization, path designing, diversion and military applications that are explored. This paper describes the characteristics of increased .Reality system .Registration and sensing errors area unit 2 of the largest issues in building effective increased Reality systems, therefore this paper summarizes current efforts to beat these issues.**

Keywords— Real atmosphere ,Virtual Objects.

I. INTRODUCTION

This paper describes the current state of the Augmented Reality .It describes work performed at many different sites and explains the issues and problems faced when building Augmented Reality Systems .It summarizes the approaches taken so far to overcome these problems .Augmented Reality(AR) is a variation of Virtual Environment(VE) .In VE the user is completely inside a virtual environment .The user cannot see the real world around him whereas AR allows the user to see the real environment with the virtual objects .The virtual objects display information that the user cannot directly detect with his own senses .Fig 1 shows an example of AR .It shows a real desk with a real phone with virtual lamps and two virtual chairs.

Fig 1: Real desk with virtual lamp and two virtual chairs.

Augmented Reality as systems have the following three characteristics:
1) Combination of real and virtual
2) Interactive in real time
3) Registered in 3-D

With AR we can also remove objects .Current work focuses on adding virtual objects to a real environment however graphic overlays can be used to remove or hide parts of the real environment from a user .For example ,to remove a desk in real environment ,draw a representation of the real walls and floors behind the desk ,thus effectively removing it from users sight .This has been done in feature films.AR could also be extended to include sound .The user would have to wear headphones equipped with microphones on the outside .The headphones would add 3D sound ,the external microphones would detect incoming sounds from the environment .The system would select the real sounds from environment and cancel the incoming real sounds .This is not easy but it might be possible.

II.OPTICAL VS.VIDEO

A basic design decision in building an AR system is how to accomplish the combining of real and virtual .The basic available choices are : optical and video technologies .Each has its own advantages and disadvantages .A see-through HMD is one of the device used to combine real and virtual objects .Standard closed view HMD do not allow any direct view of the real world .Optical see-through HMD work by placing optical combiners in front of the users eye .This allows the users to directly see the real world .The optical combiners usually reduce the amount of light that the user sees from the real world.

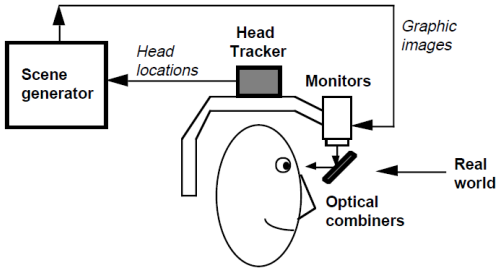

Fig 2: Optical see-through HMD conceptual diagram

Fig 3: Two optical see-through HMDs

A video-see through HMD work by combining closed read HMD with one or 2 head mounted video cameras .the video cameras give the user's read of planet .The video from these cameras is combined with the graphic pictures that are created by the scene generator ,mixing the real and virtual .The results of this mixing is distributed to the monitors before of the users eyes within the closed read HMD.

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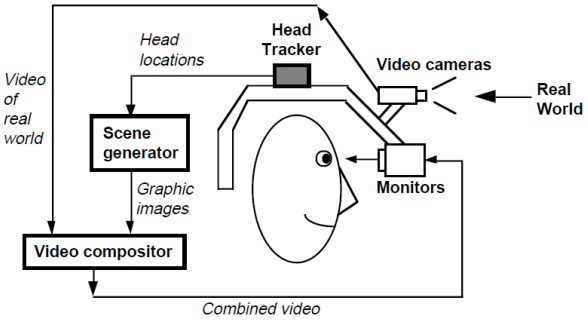

Fig 4. Video see-through HMD conceptual diagram

Fig 5. Actual video see-through HMD

III.APPLICATIONS

- *MEDICAL*

Doctors can use Augmented Reality for visualization and training purpose for surgery. AR technology might give an inside read while not want for larger incisions.AR may additionally be useful for general medical image tasks in surgical area .Surgeons will notice some options with the eye that they can't see in imaging or CT scans, and vice-versa .This might provide a guide to the surgeon such as where to drill a hole into the skull for brain surgery or where to perform a needle biopsy of a tiny tumor.AR might also be useful for training purpose .Virtual instructions could remind a surgeon of the required steps without need for a manual .Virtual objects could also identify organs and specify locations . At UNC Chapel Hill ,a research cluster has conducted trial runs of scanning the uterus of a pregnant ladies with associate ultrasound device ,generating a three-D illustration of the fetus within the uterus and show that during a vaporous HMD.

Fig 6. Virtual fetus inside womb of pregnant patient.

- *MANUFACTURING AND REPAIR*

Another application of Augmented Reality is the assembly ,maintenance and repair of complex machinery. Instructions will be easier to understand if they are available as 3D drawings superimposed upon the actual equipment ,showing step by step the task that need to be done and how to do them and not as manuals with text and pictures .

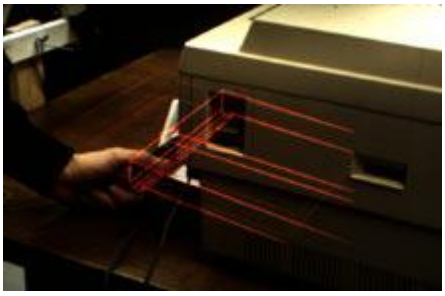

Fig 7: Prototype laser printer maintenance application, displaying how to remove the paper tray.

- *PATH PLANNING*

Teleoperation of a robot is always a difficult problem ,especially when the robot is far away with long delays in the communication link .Under such condition it is better to control a virtual vision of a robot rather than that of the robot itself .The user plans the robot action ,once the plan is tested ,the user tells the real robot to execute the specified plan.AR is an easier and accurate way of doing robot path planning than traditional interfaces.

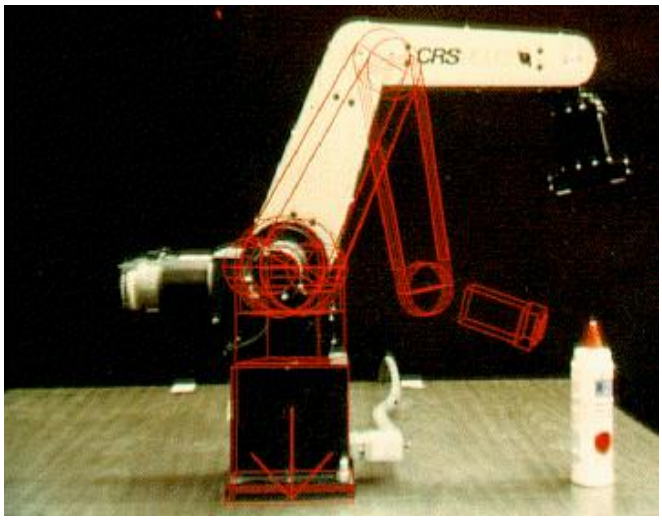

Fig 8: Virtual lines show a planned motion of a robot arm

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- *MILITARY AIRCRAFT*

  Aircraft and helicopters have being using Head-Up Displays(HUD) and Helmet-Mounted Sights(HMS) to superimpose vector graphics upon the pilots view of the real world for many years .Future generation of combat aircraft will be developed with an HMD built into the pilots helmet.

Fig 9 : The Integrated Helmet and Display Sight System (IHADSS)

- *EDUCATION*

  In most places studying and teaching are done using flash cards ,textbooks ,charts .Education can become much simpler and easier with the use of Augmented Reality as teaching aid.

IV.THE REGISTRATION PROBLEM

One of the issues with AR is that the registration problem .The objects within the real and virtual worlds should be properly aligned with relevancy one another .Many applications need correct registration .For example in diagnostic test application ,if the virtual object isn't wherever the particular neoplasm is ,the doctor can miss the neoplasm and diagnostic test can fail .Registration issues conjointly exist in virtual surroundings however they're not as serious as AR since the user solely sees the virtual objects in virtual environments. Registration of real and virtual objects isn't restricted to AR. With special-effects artists seamlessly integrate computer-generated 3D objects with live actors in film and video. The distinction lies within the quantity of management on the market. With film, a director will rigorously set up every shot, and artists will pay hours per frame, adjusting
each by hand if necessary, to attain good registration. As AN interactive medium ,AR is much harder to figure with. The AR system cannot management the motions of the HMD user. The user appearance wherever she needs, and therefore the system should respond at intervals tens of milliseconds .Registration errors square measure troublesome to adequately management owing to the high accuracy necessities and therefore the various sources of error. These sources of error is divided into 2 types: static and dynamic. Static errors square measure those that cause registration errors even once the user's viewpoint and therefore the objects within the surroundings stay utterly still. Dynamic errors square measure those that haven't any impact till either the perspective or the objects begin moving.

1) STATIC ERRORS

The four main sources of static errors are as follows:
• Optical distortion
• Errors in the tracking system
• Mechanical misarrangement
• Wrong viewing parameters

2) DYNAMIC ERRORS

Dynamic errors occur due to system delays ,or lags .The end-to-end system delay is outlined because the time distinction between the instant that the following system measures the position and orientation odf the perspective to the instant once the generated pictures cherish that position and orientation seem within the displays. These delays occur as a result of every part in Associate in Nursing increased Reality system needs a while to try and do its work. The delays within the following system, the communication delays, the time it takes the scene generator to draw the acceptable pictures within the frame buffers, and also the scan out time from the buffer store to the displays all contribute to end-to-end lag. End-to-end delays of one hundred ms square measure fairly typical on existing systems. less complicated systems will have less delay, however alternative systems have additional. Delays of 250 ms or additional will exist on slow, heavily loaded, or networked systems.

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Fig 10: Effect of motion and system delays on registration.

3) DEPTH PERCEPTION

Accurate depth perception is considered the most tough type of registration to attain in an AR display because many facts are involved. Some facts (such as the accomodation-vergence conflict or the fact that low resolution and displays with low light make an object appear far away than it really is) are being addressed through the design of new displays .Other factors can be solved through rendering occlusion correctly .Eye point location also plays a significant role. An examination of distinct eye point locations to use in rendering an image concluded that the eye's center of rotation returns the best position correctly ,but the center of the entrance pupil yields much better angular accuracy .

V.CONCLUSION

Augmented Reality is way advanced than Virtual Environments in maturity. many vendors sell complete, Virtual atmosphere systems. However ,no seller at this time sells AN HMD-based increased Reality system. A few monitor-based "virtual set"

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systems are out there, however presently AR systems are primarily found in educational and industrial analysis laboratories .The first deployed HMD-based AR systems can most likely be within the application of craft producing .Annotation and visualization usage restricted, limited-range environments are deployable these days, though rather more work has to be done to form them price effective and versatile. Applications in medical visualization can take it slow.AR can most likely be used for medical coaching before being used in surgery. consecutive generation of combat craft can have Helmet-Mounted Sights with graphics registered to targets within the atmosphere .Augmented Reality could be a relatively new field, wherever most of the analysis efforts have occurred within the past years. AR displays may show what projected field changes would appear as if before they're allotted. AN urban designer may show purchasers and politicians what a brand new arena would appear as if as they walked round the neighboring neighborhood, to higher perceive however the arena project can have an effect on near residents .After the fundamental issues with AR are solved , the last word goal are going to be to get virtual objects that are thus realistic that they're just about indistinguishable from the important atmosphere

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Ms.Saini Nadar – Currently pursuing Master's in Computer Application (Third year) at ASM's Institute of Management & Computer Studies (IMCOST), Mumbai.

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