Technological Institute & Augmented Reality

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Abstract— Technological advances enable the use of innovative learning tools for education. This work gives a brief insight into the potential and challenges of using collaborative Augmented Reality (AR) in education within the greater context of immersive virtual learning environments.In this paper we describe the use of advance technologies in field of education by using image processing in MATLAB. Augmented reality is such technology which opens a new interactive way of teaching style. It is a technology which adds virtual objects in real world and these objects interacts with real environment. It combines virtual world and real world in 3-dimensional. Recent trends in these technologies enables it use in field of education. Here the tough concepts in engineering and other fields can be explained using these technologies by creating virtual object of the subject and made an interactive presentation of its working using animations.

Keywords— *Augmented Reality (AR), ARToolKit, Head Mounted Devices, MATLAB.*

I. INTRODUCTION

AR is a very efficient technology for both higher education such as universities and colleges. Students in both schools can improve their knowledge and skills, especially on complex theories or mechanisms of systems or machinery.

Augmented reality appears as an emerging technology that promises to make "educational immersion" available to practically everyone. Augmented Reality (AR) is a technology that permits to overlay computer graphics onto the real world. Unlike immersive Virtual Reality, AR interfaces allow users to see the real world at the same time as virtual imagery attached to real locations and objects. In an AR interface, the user views the world through a handheld or head mounted display (HMD) that is either see-through or overlays graphics on video of the surrounding environment. AR interfaces enhance the real world experience, unlike other computer interfaces that draw users away from the real world and onto the screen

Augmented Reality (AR) is a recent technology that is similar to the Virtual reality (VR) paradigm. As is the case for virtual reality, several formal definitions and classifications for augmented reality exist (Milgram & Kishino, 1994). Some define AR as a special case of VR; others argue that AR is a more general concept and see VR as a special case of AR. AR combines 3-dimensional (3D) computer-generated objects and text superimposed onto real images and video all in real time. An interesting definition of AR has been described by Azuma (Azuma, 1997), as a variation of Virtual Reality. VR technology completely immerses a user inside a synthetic environment. While immersed, the user cannot see the surrounding real world. In contrast, AR allows the user to see the real world, with virtual objects superimposed upon or composited with the real world. Therefore, AR supplements reality, rather than completely replacing it. With AR applications it is possible to show to the user a common space where virtual and real object coexists in a seamless way. From a technological point of view AR applications must fulfil the following three requirements (Azuma, 1995): Combination of real and virtual worlds, real time interaction and accurate 3D registration of virtual and real objects.

AR applications can be designed for different subjects and student levels. As an example, the Malaysian government recently created educational materials for a Road safety initiative, which included modules that combined mixed learning environments, interactive multimedia, AR and VR (Bakar, Zulkifli, and Mohamed, 2011). Other example is the work of Lin, Hsieh, Wang, Sie, and Chang (2011). In their project,the authors used AR and a touch-screen to enhance the educational resources about fish conservation in Taiwan. Their results focused on system usability, which was positive in an educational context. There are also a number of studies that explore the applications of AR technology to language learning. An interesting study was conducted by Ibáñez, Delgado, Leony, García, and Maroto (2011), where a multiuser AR platform for learning Spanish as a foreign language was developed. Results showed that AR has a positive effect on student motivation and improves the language learning process. Connolly, Stansfield, and Hainey (2011) developed an AR game for learning English as a foreign language to study how motivation could be improved through collaborative methods. 328 secondary school students and 95 language teachers from 17 European countries participated in this study. Most students and teachers were satisfied with the tools and expressed interest in learning other subjects using similar approaches.

The combination of virtual and real world in AR is accomplished through Head-Mounted Device (HMD) and trackers. A typical AR system consists of a HMD equipped with one or two cameras. When a user looks around, certain features in the video images captured by the camera are detected to track the camera's position and orientation relative to the objects in the real world. The graphic images generated

with this information are rendered on the HMD. A typical wearable computer may be composed of a computer processor and a battery mounted on a belt or backpack, a head mounted display (HMD), wireless communications hardware and an input device such as a touchpad or chording keyboard or voice input capabilities. A wearable computer enables mobility and promises exciting applications with augmented reality .A prominent example is Columbia's "Touring Machine", which assists a user in locating places and allowing a user to query information about items of interest, like campus buildings and library. Augmented Reality can be implemented by using ARToolKit and MATLAB.

Besides adding objects to a real environment, Augmented Reality also has the potential to remove them. Current work has focused on adding virtual objects to a real environment. However, graphic overlays might also be used to remove or hide parts of the real environment from a user. For example, to remove a desk in the real environment, draw a representation of the real walls and floors behind the desk and "paint" that over the real desk, effectively removing it from the user's sight. This has been done in feature films. Doing this interactively in an AR system will be much harder, but this removal may not need to be photorealistic to be effective.

2. APPLICATIONS OF AR

It cannot be denied that AR applications have tremendous potential for all fields where rapid information transfer is critical. This is especially true for education. However, around the world, the cutting edge of AR research and development is being driven more by business-related interests than by groups focused on augmenting education. A majority of AR tech-nologies are being developed with no actual educational agenda. However, teachers, as always will be able to examine what is available and put it to use effectively. For this reason, we will first examine the development of AR in several non academic fields, before specifically addressing the application of AR in technological institutes and in education.

2.1 ROBOT PATH PLANNING

Teleoperation of a robot is often a difficult problem, especially when the robot is far away, with long delays in the communication link. Under this circumstance, instead of controlling the robot directly, it may be preferable to instead control a virtual version of the robot. The user plans and specifies the robot's actions by manipulating the local virtual version, in real time. The results are directly displayed on the real world. Once the plan is tested and determined, then user tells the real robot to execute the specified plan. This avoids pilot-induced oscillations caused by the lengthy delays. The virtual versions can also predict the effects of manipulating the environment, thus serving as a planning and previewing tool to aid the user in performing the desired task. The ARGOS system has demonstrated that stereoscopic AR is an easier and more accurate way of doing robot path planning than traditional monoscopic interfaces. Others have also used registered overlays with telepresence systems. Fig.5.3.1 shows how a virtual outline can represent a future location of a robot arm.

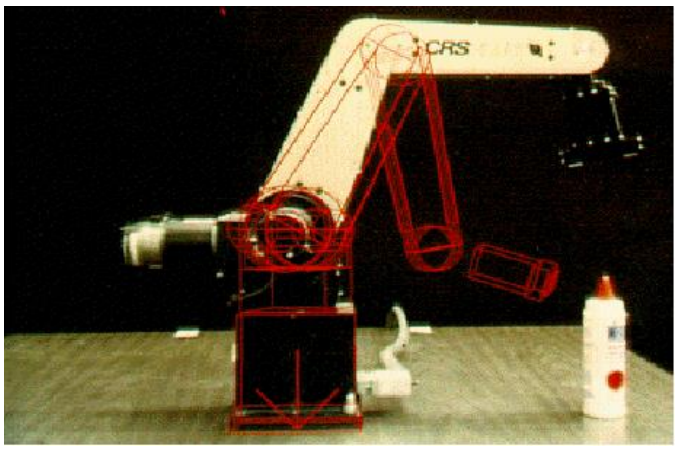

Fig.1: Virtual lines show a planned motion of a robot arm.

3. APPLICATION IN TECHNOLOGICAL INSTITUTE.

The exciting developments and the manifest functionality of AR as an improved user interface technology, researchers believe that AR has vast potential implications and numerous benefits for the augmentation of teaching and learning environments. AR has potential to:

(a) engage, stimulate, and motivate students to explore class materials from different angles.
(b) help teach subjects where students could not feasibly gain real-world first-hand experience
(c) enhance collaboration between students and instructors and among students.
(d) foster student creativity and imagination.
(e) help students take control of their learning at their own pace and on their own path.
(f) create an authentic learning environment suitable to various learning styles

In this paper, Augmented Reality implementation is done by using MATLAB which is replacement of ARTool kit and HMDs to show college campus and to use AR in teaching and learning process. When new students join college or when some guest arrive to college using this technology campus can be viewed. For this, virtual campus is augmented around real person who is visiting the college and all departments of college will come around him and he/she can see campus at standstill position.

4.RESULT

The following fig.3 shows an example of collected database which include captured images of background and aero-plane which are test objects taken for experimentation purpose.

(a)background (b)CRO

Fig.3: An example of collected database

The results are obtained by using MATLAB to implement the augmented reality for the data base mentioned above.Fig.4 shows the obtained results which includes both virtual (database as mentioned above) and real images.

Fig.4: Augmented reality

5 CONCLUSION

Although AR is not new, it is still in infancy, especially regarding its educational applications. There are still many problems to overcome and issues to explore in order to optimize existing AR applications and technologies for use in education. Currently, though it is new and captivating, AR content is still quite difficult to create and deploy. However, easier-to-use development kits are the goal of many firms investing in AR, so these problems should ease with time. For the present, educators and researchers should continue to keep up with the development of AR technology, closely monitor the impact of AR on society, consciously evaluate the implications of AR for education, and continuously explore, seeking to determine how AR can best be applied to expand our teaching and learning environments.

When researching the Augmented Reality it was found that there is a lot potential existing. The biggest challenge is to replace AR toolkit which is having high cost. While algorithms are evolving towards more complexity and the hardware is creating problems as for size and implementation. MAT LAB is one of the alternate for AR Tool kit which will overcome for all the problems.

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I would like to highlight that I have completed my M.E in VLSI & Embedded Systems in University of Pune with FCD . I completed BE (E&C) from GNDEC Bidar I was the topper in my branch since 2009 to 2011. I have 7 years of teaching experience in Engineering Colleges. I have the pleasure of having distinguishing features, several achievements, technical skills and expertise in specific area. My research area is VLSI and Augmented Reality.