

RESEARCH ARTICLE



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AUGMENTED REALITY SYSTEM

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ABSTRACT

Augmented Reality (AR) is a technology which combine virtual and real environment. AR is based on coupling between the virtual and the real object that is based on their geometrical relationship. This makes it possible to combine the virtual content with the right placement and 3D perspective with respect to the real. There are many fields in which AR is used such as education, military, commerce, business etc. In this system, we are going to develop augmented reality for education system. To develop this system, we are using ARToolKit, an open source non-commercial library that enables development of Augmented Reality applications. ARToolKit uses predetermined printed patterns to track computer graphics. But this system allow us to create new patterns to augment graphics on it. This system not only implements 3D models as animation input but also supplies a user interface that allows even non technical users to take a benefit from augmented reality. The AR system is developed as dialog-based Microsoft Foundation Class(MFC) application using C# language. This user interface accepts models and various parameters from the user by means of which the user can tailor the augmented environment according to his or her aim of usage. With these inputs, 3D objects are tracked on real world to manipulate animation based on real patterns and virtual objects.

Key Words— Augmented Reality, Markers, Pattern AR Toolkit, 3D Model

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INTRODUCTION

Currently most of the system use virtual reality technique or many hardware to see virtual object. The Virtual Reality (VR) based applications applies computer simulated environments that can simulate physical presence in real world, as well as in imaginary worlds. The hardware needed for VR experience is still cost prohibitive. Training with a virtual environment does not have the same probable causes as training and working in the real world. This means that even if someone does well with virtual environment, that person might not do

well in the real world. VR systems are capable of letting student to walk around the surfaces and see how the variables interrelate. To overcome this problem augmented reality based applications propose. As large energy is required for wireless communication network which leads to emit high power radio waves with very high battery consumption Causes various human health problems. In digital communication for every transmission of data we requires almost 4000 joules of energy for one bit of binary ,so if we transmit 8 bit of data then 4000 * 8 will require almost 32000 j

of energy every time, so our motivation is to find solution using which we can reduce these no of ones.

In this paper we introduce Overlaying Virtual Object Into Real World by Using Augmented Reality it uses Marker Based technology for displaying Augmented view by using web camera. This system uses Augmented reality (AR) is a live, direct or indirect view of a physical, real environment whose elements are augmented by input such as sound, video, graphics. This is augmented reality based desktop system

which allows the user to decide, where to place the object in real world. Once the object has been placed in the scene, it will be displayed accurate according to the perspective in the original scene. This system also supplies a graphical user interface that allows even non-technical users to take advantage from augmented reality.

MOTIVATION

In early days, there are virtual reality based applications which focuses on simulating the world rather than on invisibly enhancing the world that already exists. The views created with VR are sometimes lacks for user interfaces created for real life applications. A VR application doesn't allow the user to interact with real world. There are different VR based learning tools which are capable of letting student to walk around the surfaces and see how the variables inter-relate. Augmented reality systems are superior to VR systems because the students actually see three-dimensional objects proportional to their environment. AR allows the user to see combine view of virtual world with real world. Therefore, AR provides reality, rather than completely replacing it. It benefits from both real and virtual environments advantages.

AUGMENTED REALITY IN EDUCATION

Augmented Reality is enhancement over virtualization technology which combines 3-Dimensional computerized view with real view to create enhanced representation of reality. Virtual reality is complete simulation of real world (i.e. the real world is replaced by a virtual world), Augmented Reality is a modified version of

the virtual reality where virtual images are augmented onto real views.

In education field there are multiple applications of AR technology such as application[2] that utilizes augmented reality as the tools for kids to learn how to read and also help children in learning vocabulary. Construct3D [4] is a three dimensional geometry construction tools specifically designed for mathematics and geometry education. VECAR[5] system incorporate the latest AR and CV algorithms into a Virtual English Classroom, called VECAR, to promote immersive and interactive language learning.

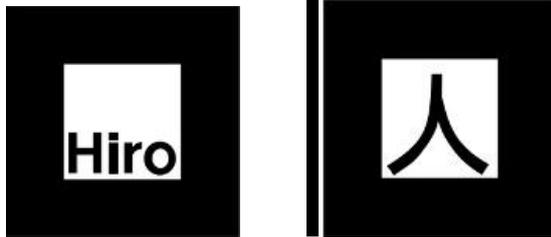
In the area of engineering design graphics, AR technology has been used successfully to superimpose 3D graphical objects onto markers. As a part of our work[10], we developed desktop based AR system which is used to show different views of graphics objects. This system used to interface with a printed marker which is specifically prepared to deliver AR content. The illustration of augmented reality is as shown in the fig.1



Fig -1: AUGMENTED REALITY

System Description

We present a marker-based Augmented Reality system that is simple, low-cost, and easy to learn. Our markers are black squares with a specific white pattern that the AR software can recognize using proposed algorithm. These markers are design using ARtoolkit. ARtoolkit is a software which is used to design markers of different size and shapes.



The 3D models which are required for our system are design using 3Ds MAX software. There are different phases in system which are as follows:

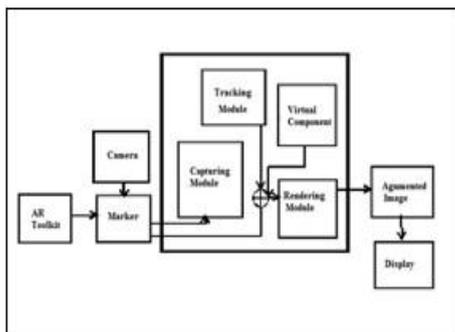
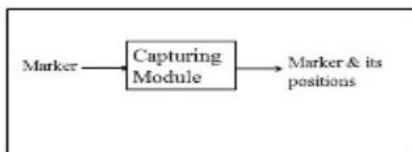


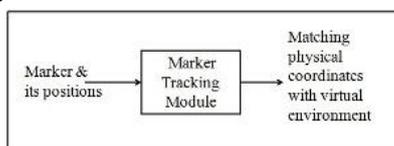
Fig -2 : SYSTEM ARCHITECTURE

Capturing Module



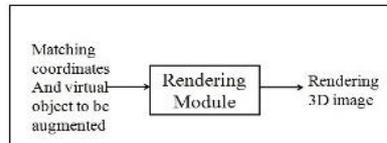
In Image Capturing phase, marker image is captured by camera. Marker patterns are basic shapes made up of black squares against white background. These marker pattern is stored as file with .patt extension and loaded from path which is displayed on screen when user click on load pattern tab.

Tracking Module



In Marker tracking phase, tracker module determine positions of 3D model which is to be displayed on real world marker. This 3D model is file with .3ds extension which is loaded from path which is given by user.

Rendering Module



In Rendering phase, rendering module combines original marker image and 3D model. And displays augmented world on computer screen when user click on Start Augmented World tab.

Algorithm

Marker detection steps are required to detect marker coordinates. Then marker tracking module is used to track marker coordinates and calculate 3D pose. Rendering module is used to map 3D model onto marker coordinates.

1. Detect marker by camera.
2. Calculate physical marker coordinates using capturing module.
3. Track marker coordinate and calculate pose. That is 3D location and orientation of 3D model.
4. Map marker coordinate with 3D model coordinates.
5. Render 3D object on actual marker coordinates.
6. Display augmented view on screen.

Mathematical MODEL

Mathematical model of the proposed system describes basic input, output and process along with algorithms. This model divides input, process and output into sub parts. This gives us an idea of dependencies of processed and output.

Let S be the 3d modeling system such that

$$S = \{s, e, I, O, F\}$$

Where , s = start state.

At the start state the system will take marker image print as input which is detected by camera.

e = end state.

The inputs that have been processed are produced as end state i.e.the rendering module map 3d model on marker and displays augmented view as an output .

I represents the set of inputs such that

$$I = \{I1, I2\}$$

Where ,I1 = A marker image in the form of matrix

I2 = xml code file of 3d model

O represents the set of outputs such that

O = augmented view

F represents the set of functions such that

$F = \{f_1, f_2, f_3\}$

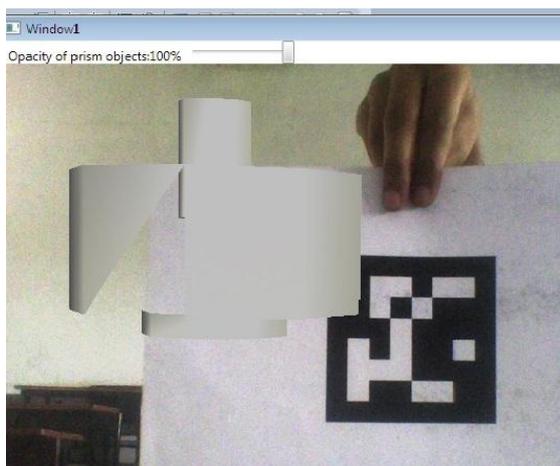
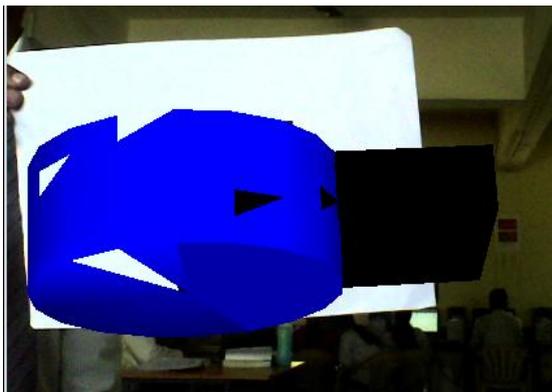
Where, f_1 = is the function that detect the marker and generate marker co-ordinates

f_2 = is the function that track the marker co-ordinates and generate pose(3d location and orientation of 3d model)

f_3 = is the function that map 3d model on marker to display augmented view on screen

RESULT

As a input we hold the marker in front of camera ,then it will recognized the marker ,track the marker co-ordinates with pose of 3D view, then display the output as augmented view.



Conclusion

In this research, we developed desktop-based AR tool in the area of engineering design graphics. This system will make learning efficient . In this paper, we presented AR system which is easy for non-

technical user to learn more about AR in efficient manner.

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REFERENCES

- [1]. R. Patkar, S. Singh, Swati V. Birje, "Marker Based Augmented Reality Using Android OS", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 5, 2013.
- [2]. H. Kaufmann, "Geometry Education With Augmented Reality". Vienna University of Technology, 2004.
- [3]. Lus Almeida, "Archeoguide: An Augmented Reality Guide for Archaeological Sites", IEEE Computer Graphics and Applications, 2002.
- [4]. Hannes Kaufmann, "Construct3D : An Augmented Reality Application for Mathematics And Geometry Education", Institute of Software Technology and Interactive Systems Vienna University of Technology, 2015.

- [5]. Mau-Tsuen Yang and Wan-Che Liao, "Computer-Assisted Culture Learning in an Online Augmented Reality Environment Based on Free- Hand Gesture Interaction", IEEE transaction on learning technology, Volume 7, No 2, April-June, 2014.
- [6]. Adrian Shatte, "Hand-held Mobile Augmented Reality for Collaborative Problem Solving: A Case Study with Sorting", Hawaii International Conference on System Science, 2014.
- [7]. Ahmed Amer, "Affordable Altered Perspectives Making Augmented and Virtual Reality Technology Accessible", IEEE, 2014.
- [8]. Rafael Radkowski and James Oliver, "Enhanced Natural Visual Perception for Augmented Reality-Workstations by Simulation of Perspective", IEEE, Volume 10, No 5, 2014.
- [9]. Jingang Wang, Xiao Xiao, Hong Hua, "Augmented Reality 3D Displays with Micro Integral Imaging", IEEE, DOI 10.1109/JDT 2361147, 2014.
- [10]. Jorge Camba, Manuel Contero, Gustavo Salvador-Herranz, "Desktop vs. Mobile: A Comparative Study of Augmented Reality Systems for Engineering Visualizations in Education", 978-1-4799-3922-0/14, 2014.

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