Interior Design Of A House Using Augmented Reality

N.Bhavani[1], P.Akshaya[2], M.Anushya[3], K.Udhayanithi[4]
[1, 2, 3, 4] Department of Information Technology
[1]Associate Professor, Saranathan College of Engineering,, Trichy
[2, 3, 4] Final Year, Saranathan College of Engineering,, Trichy

Abstract-*Augmented Reality is defined as the technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view. This new technology helps the users to overcome the traditional systems. Augmented reality provides a major impact on the emerging technologies among the developers for maintaining the design features over the construction and interiors business. It appears from the recent study that there is a high demand for easy-to-use applications among the architects for developing the interior designs.*

This paper focuses on capturing the interior of a house and design using the virtual reality. This enables a user to effectively design the interior according to the space. The paper proposes ideas to enable the emerging architects to conveniently use the application and help them to understand the user requirements. This also prevents the dimensions problem in rendering the virtual image to the object as all the suggestions for the user are provided in the image. Here the input for the system is the image feed of the area or place to be designed. The system also accepts the size of the place as an input parameter from the user. The suggestions of the interiors are then provided depending upon the area chosen to be decorated. . In this system since the static images are produced, the user has the wide options for choosing the various suggestions he opts for.

Keywords*-* Interior design, Augmented reality, Image processing, Architecture, Consumer-needed application.

I. AUGMENTED REALITY

Augmented reality (AR) is a technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view. It 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 [4].
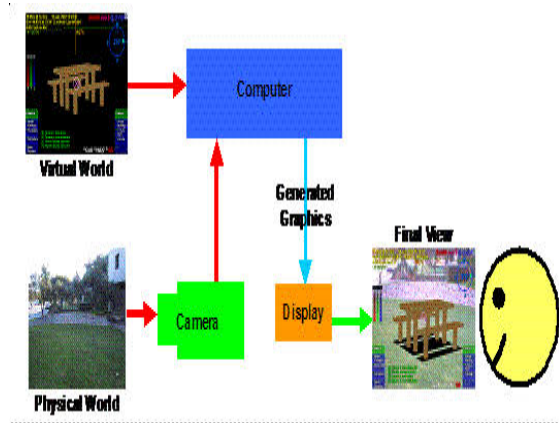
As a result, the technology functions by enhancing one's current perception of reality. By contrast, virtual reality replaces the real world with a simulated one. With the help of advanced AR technology (e.g. adding computer vision and object recognition) the information about the surrounding real world 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. Augmented reality brings out the components of the digital world into a person's perceived real world. One example is an AR Helmet for construction workers, which displays information about the construction sites. The first functional AR systems that provided immersive mixed reality experiences for users were invented in the early 1990's, starting with the Virtual Fixtures system developed at the U.S. Air Force's Armstrong Labs in 1992.

AR can aid in visualizing building projects. Computer-generated images of a structure can be superimposed into a real life local view of a property before the physical building is constructed. AR can also be employed within an architect's work space, rendering into their view animated 3D visualizations of their 2D drawings. Architecture sight-seeing can be enhanced with AR applications allowing users viewing a building's exterior to virtually see through its walls, viewing its interior objects and layout. With the continual improvements to GPS accuracy, businesses are able to use augmented reality to visualize geo-referenced models of

construction sites, underground structures, cables and pipes using mobile devices. Augmented reality is applied to present new projects, to solve on-site construction challenges, and to enhance promotional materials [4].

II. OBJECTIVES

The main objective is to create an interior design application using augmented reality to benefit people and to enhance traditional catalog which is only printed with 2D images. User just needs to download the application and install it in their device and interact with the 3D virtual furniture in the house spaces. By having an interior design application, user can view the front view, side view and back view of the virtual furniture and at the same time interact with the virtual model.

The next objective is to provide user a new interactive technology used in interior design. Three types of gestures have been included in this application which is drag, pinch and rotation gesture. And user is allowed to view the 3D virtual model of the furniture in real-time. Users just need to install the application in the device and start to design the ideal environment with several 3D virtual furniture models. The required furniture is chosen from the list and the model will appear on the screen of the device. User can drag, rotate, enlarge and minimize the 3D furniture model to fit the model in the house. This technology has great potentials to reduce costs, shorten design time for decorate the home space or room (Wang et al., 2007). The other objective to develop an augmented reality mobile application in interior design that will be more convenient to the user. By having this augmented reality application, user can use their mobile to view a 3D interior design anytime. Thus interior design using augmented reality in Android application provides more precise, power-driven and easier platform for users to choose the furniture that suit to the room or house, without wasting their time and energy to go to various stores. User need not seek advice from the expert on how to decorate the house because user can decorate the room or house on own phones by using the application.

An augmented reality application for interior design is developed to produce realistic virtual furniture model in interior design. That is the 3D virtual furniture will looks similar to the real furniture model. The user can decide which furniture will suit to their house. Therefore, the objectives of the research are: i) To create an interior design application using augmented reality technology. ii) To provide users a new interactive technology to get practised in interior design. iii) To develop an augmented reality mobile application in 3D interior design that more convenience to the user. iv) To produce realistic virtual furniture model in interior design similar to the real furniture [6].

ARCHITECTURE:

Augmented reality is based on two types,
- Marker based
- Marker less

MARKER BASED:

Different forms of augmented reality markers are considered as images which can be detected only by a camera and AR software as a digitized virtual contents that are available on the scene.

MARKER LESS:

Markerless AR is a term used to denote an Augmented Reality application that does not need any pre-knowledge of a user's environment to overlay 3D content into a scene and hold it to a fixed point in space.

This paper deals with marker based interior design. In the architecture diagram, image is being loaded or captured via camera. This Image is given as input to the image capturing module which will generate the image as binary images which is 0's and 1's ie.0 for black and 1 for white for each pixel. This binary images is given as the input to the image processing module. This module process the binary images and detect the marker. To place the object in the real world, marker position should be determined. The location of the detected marker is provided to the tracking module which is the heart of the heart of the augmented reality system. It will calculate the relative pose of the camera in real time which is given as input to the rendering module. The other input to the rendering module is virtual object. It displays the augmented view on the screen.
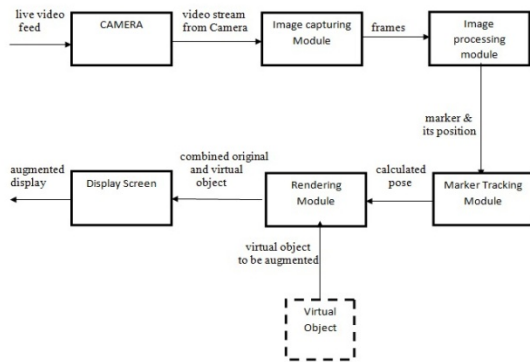
a) Image Capturing Module:

A continuous video frame is given as input to the camera of android handset.

The input to Image Capturing Module is given via camera i.e. live video frame. This module analyses each frame in the video and generate the binary image consisting of only two values for each pixel i.e. 0 for black and 1 for white.

b) Image Processing Module:

The binary images generated by the Image Capturing Module are input to the Image Processing Module. This module process the binary images and detects the marker using image processing techniques. To place the object in the real world, marker position is determined.

c) Tracking Module

The location of detected marker is provided to the Tracking module which is the heart of augmented reality system. It calculates the relative pose of the camera in real time.

d) Rendering Module:

The Rendering Module has 2 inputs. First is the calculated pose from the Tracking Module and other is the Virtual Object to be augmented. This module combines the original image and virtual components. It displays the augmented view on the screen of android handset.

III. ADOBE FLEX BUILDER

Adobe flex builder is also known as he adobe flash player. It is an integrated development environment. It is built on the eclipse platform that speeds up the development of rich internet applications and cross platform applications for the adobe products. It is available in two editions such as standard

and premium. Adobe flash builder includes an interactive debugger allowing developers to step through code execution while inspecting variables and watching expression. Flex Builder 3 added support for performance analysis. The profiling view displays the statistical information about memory use in addition to function call execution time. Prior to version 4, this product was known as the flex builder . The name change is meant to signify its connection to other products in the adobe flash platform and to create a clear distinction between the open source free flex sdk and ide.
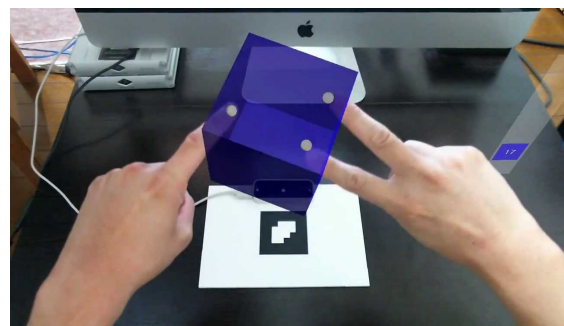
PAPERVISION 3D:

Papervision 3D is the open source platform for adobe flash products. Rendering 3D content within Adobe Flash Player and Adobe AIR.
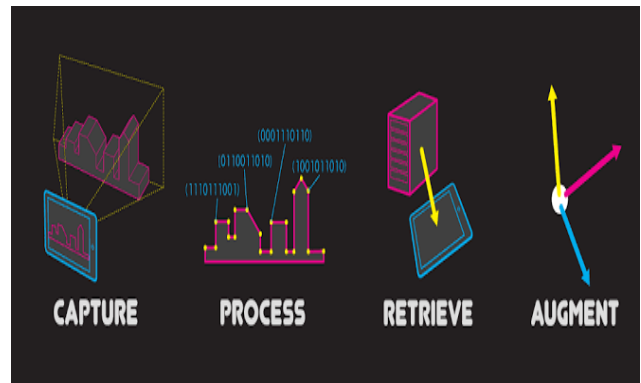
ARTOOLKIT:

ARToolkit is the open source computer tracking library for creation of strong augmented reality applications that overlays virtual imagery in the real world.

In order to create strong augmented reality, it uses video tracking capabilities that calculate the real camera position and orientation relative to square physical marker or natural feature marker in real time. Once the real camera positions is known a virtual camera can be positioned at the

same point and 3D computer graphics models drawn exactly overlaid on the real markers.

OUTPUT GENERATION:

Initially, using the design toolkit, user designs the environment of their choice by specifying the 3D image to be superimposed [3].

The user first selects the image which is to be placed and which should be viewed virtually.

Marker generation:

Image should be loaded. If the object is marked with red squares, the marker is in preview. After detecting the marker we should get pattern. Then pattern will be generated for that maker. After getting the pattern, all the red squares turn into green squares which means marker position is generated. Marker generation is done by using ARToolkit tool. After the generation of the marker, rendering process takes place[7].

Rendering module:

Rendering is the process of generating an image from a 2D or 3d model by means of computer programs. This rendering module consist of two inputs which is the calculated pose and the virtual object .after this rendering process , augmented image will be displayed . User can make an interaction with the virtual object. This gives the feel of interacting the virtual object with the real world.

IV. CONCLUSION

Considering the problem faced by the people while selecting the furniture for interior design proposed the marker

based Augmented Reality application. The system also accepts the size of the place as an input parameter from the user. The suggestions of the interiors are then provided depending upon the area chosen to be decorated. The generated images are produced to the customer for suggestions. In this system since the static images are produced, the user has the wide options for choosing the various suggestions he opts for. This also prevents the dimensions problem in rendering the virtual image to the object as all the suggestions for the user are provided in the image. This application can be used by all the users having Android handset or tablet.AR technology opens up many new research fields in engineering and architecture. For the interior design application created in an AR environment, design work can become more lively, convenient, and intelligent. Design work and manufacturing can be conducted at the same time. Modules can be developed and easily integrated using various AR tools. The result shows that furniture were rendered on the marker and scaled accordingly. The size of the object depends on the size of the marker and the distance from the camera. The users could manipulate the objects and place them according to the scene. Also, the user interface is simple allowing beginners as well as professional users to use the application.

REFERENCES

[1] Ronald T. Azuma Hughes"A   survey of augmented reality"http://www.cs.unc.edu/~azuma.

[2] Arti Yadav, Taslim Shaikh, Mr. Abdul Samad Hujare, Prof. Murkute P.K. "interior design using augmented reality"International journal of advanced research computer engineering and technology, Volume 4, issues 5, may 2015.

[3] Prabhakar mudhaliyar, Yuvaraj ingale , "A survey of virtual reality" International journal of research in Advent Technology, Volume 2, March 2014.

[4] www.augmentedreality.com/search_caf?php

[5] Akshay adiyodi, kalyani pampattiwar, Manasvini agrahara, pankaj gamnani, "Interior design using augmented reality", An international journal of innovative research in science, engineering and technology, volume 5,issue 10, October 2016.

[6] Veit Toan , Seung yeon cho , "interior design augmented reality environment" International journal of computer applications, Volume 5, August 2010.

[7] Khushal khairnar, Kamaleshwar khairnar,Rahul chaudhari,"Furniture layout application based on marker detection using Augmented reality" International research journal of engineering and technology ,Volume2 issues 7, October 2015.

[8] Paswan, Woodward, " Implementation of an augmented reality systems on a PDA" Symposium of Mixed and augmented reality,2003.