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An Application for Interior Design Using Augmented Reality

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ABSTRACT: In an augmented reality environment, the virtual furniture can be displayed and modified in real-time on the screen, allowing the user to have an interactive experience with the virtual furniture in a real-world environment. Accordingly, this Project will present an augmented reality system for designing interior design projects using overlaid virtual furniture in a physical environment based on a regular PC home system. Tracking markers are placed on the floors or walls to define the scale and coordinate system of the room. Next, the user selects virtual furniture on the screen and places it in the design space. In the augmented reality scene, the 3D virtual furniture is integrated into a real environment and can be arranged alongside real furniture.

KEYWORDS : Augmented Reality (AR), Head Mounted Display(HMD), Marker-based, Tracking, Telepresence, Virtual Reality(VR).

I. INTRODUCTION

Augmented reality is a technology which integrates user's digital information with the real world. Augmented reality technology is categorized into two types – marker-based and marker-less. Marker-based system is inexpensive and easy to use.

The user is required to install the application on his/her device. Then place the markers on the floor at required positions. Start the application which will allow to start the camera. Bring the marker into the view. The marker will be detected, the co-ordinates of marker will be calculated and 3D objects will be created dynamically. This application is able to detect multiple markers and create multiple virtual objects.

The objects are viewed virtually in the real world and the user can rotate it virtually. Also user can resize the object and select different colors for the object to select the best suitable furniture design for the house.

Augmented Reality (AR) is a new technology that involves the overlay of computer graphics on the real world. As a result, the user can see the real world augmented with virtual objects and can interact with them. Within a more general context, AR is also termed Mixed Reality (MR), referring to a multi-axis spectrum of areas that cover Virtual Reality (VR), Augmented Reality (AR), telepresence, and other related technology. Augmented Reality systems combine digital information and the real world in a way that the user experiences them as one. A particularly important property of AR is locating virtual objects in the right place and position, which makes the Tracking System one of the most important components of an AR system..

II. OBJECTIVE OF THE WORK

1. To design a system to enhance the user perception of and interaction with the real world through supplementing the real world with 3D virtual objects that appear to coexist in the same space as the real world.
2. To implement marker based augmented view which can be mapped to real world objects.

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III. LITERATURE SURVEY

The identified area of discussion is Augmented Reality or AR and the article is Augmented Reality: its like real life, but better. AR, a medium for interactivity and cool visuals, has been around for about 50 years but the term was coined in 1992. There are many uses of AR but best known are the yellow First Down line used in the American National Football League or NFL and the Hawkeye computer system used in Cricket (pictured below) to find out whether the ball would have actually hit the stumps by overlaying analytic information over the playback footage. With the use of smart phones like Apples own iPhone (Pictured Below), AR has begun to get more widely noticed and for good reason. Its potential as an advertising tool is almost limitless. It can be used to find a specific restaurant or hotel and then get reviews on that restaurant or hotel. This feature is the application or app built by Layar which can be downloaded to the iPhone.

Incredibly useful applications are being developed all the time. For example, the Augmented Reality for Maintenance and Repair (Armar) project. It combines sensors, head-up displays, and instructions to tackle the militarys maintenance needs: start working on a piece of kit, and the details about it pop up in front of you. This improves the productivity, accuracy, and safety of maintenance personnel. You just put a pair of goggles on your head and a 3D model appears in front of your eyes, giving you all the information you need. The applications outside the military are also numerous, people can use it on their computer, televisions and other electronic appliances. If and when Armar is introduced to the public for home use, it could make everyones lives a lot easier. Armar also has the added bonus of being a really cool bit of kit.

IV. EXISTING SYSTEM APPROACH

- Related Work Done

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Figure 1: Computer system used in cricket

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Figure 2:Armar Project

Ludwig and Reimann (2005) offer an organizational scheme which argues that potential AR applications fall into three main categories: (a) presentation and visualization, (b) industry, and (c) education. Additionally, Hamilton (2011) offers an extensive breakdown and analysis of AR applications within education, as well as within the media and entertainment industry, the gaming industry, the travel and tourism industry, the field of marketing, the expanding field of online social networks, and in everyday life. While Hamilton (2011) and others point out that many current AR applications may seem gimmicky and transient, the fact remains that many of the AR applications discussed by Azuma (1997) have been refined and continue to play important parts in our modern world.

V. PROBLEM STATEMENT

The HMD (Head Mounted Display) devices are too big, heavy and expensive. Now a days we have smart phone which also have camera and display both devices. This Smartphone can replace HMD devices and are very handy Hence we would like to demonstrate Virtual Furniture in Augmented View .We wanted to replace Computer, Camera and Display hardware's with single handset.

VI. PROPOSED SYSTEM APPROACH

Major Tasks in the Project stages are:

Task 1: Image acquisition

Task 2: Preprocessing

Task 3: Detection of potential markers and discard of obvious non-markers

Task 4: Identification and decoding of markers

Task 5: Calculation of the marker poses

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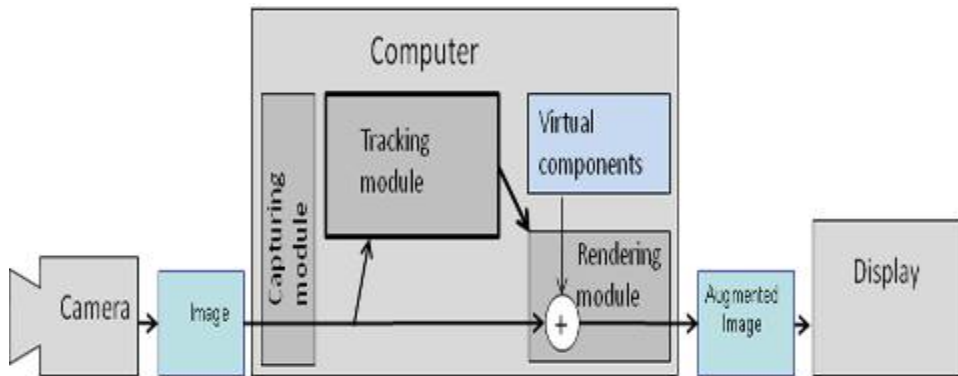


Figure 3: Task Network

The capturing module captures the image from the camera. The tracking module calculates the correct location and orientation for virtual overlay. The rendering module combines the original image and the virtual components using the calculated pose and then renders the augmented image on the display. The tracking module is the heart of the augmented reality system; it calculates the relative pose of the camera in real time. The term pose means the six degrees of freedom (DOF) position, i.e. the 3D location and 3D orientation of an object. The tracking module enables the system to add virtual components as part of the real scene. The fundamental difference compared to other image processing tools is that in augmented reality virtual objects are moved and rotated in 3D coordinates instead of 2D image coordinates[4]. The rendering module draws the virtual image on top of the camera image. In basic computer graphics, the virtual scene is projected on an image plane using a virtual camera and this projection is then rendered. The trick in augmented reality is to use a virtual camera identical to the systems real camera. This way the virtual objects in the scene are projected in the same way as real objects and the result is convincing. To be able to mimic the real camera, the system needs to know the optical characteristics of the camera. The process of identifying these characteristics is called camera calibration. Camera calibration can be part of the AR system or it can be a separate process.

For implementation, two separate modules were developed: one for creating and managing the 3D database, and the other for displaying. A description of the program architecture is presented.

First, CAD applications extract information from a drawing and link it to a

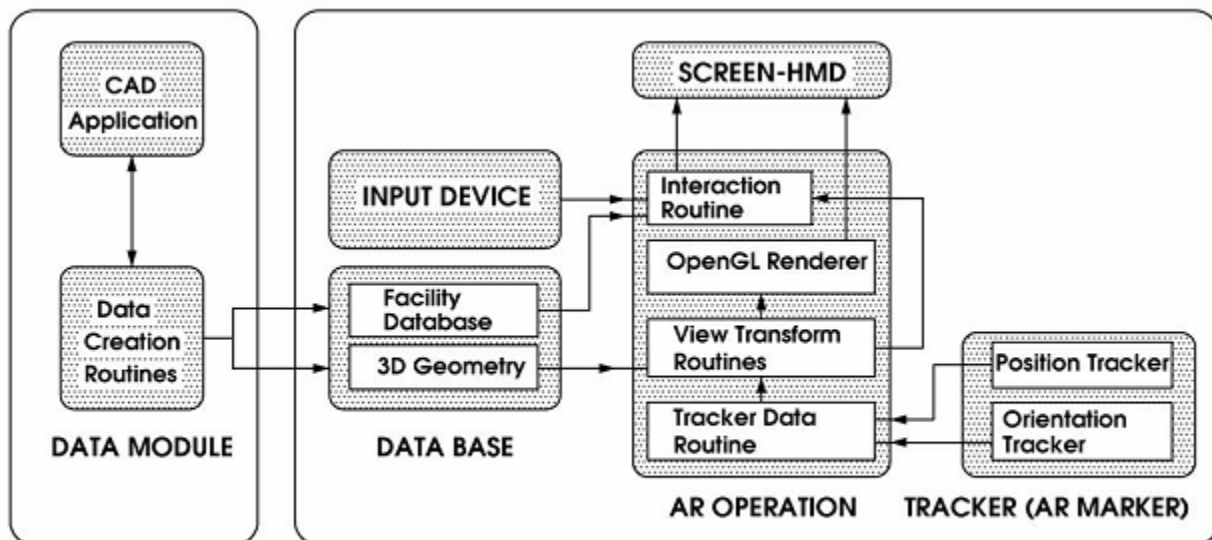


Figure 4: Architecture Design



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database. For the given space, geometrical information is then extracted from a three-dimensional database of furniture. After loading the geometries, the position and direction of the views for the user are calculated based on data marker tracking. Simultaneously, the location- and direction- based geometry data are transformed using transformation matrices to produce images that align beside other objects in the real view. As such, the position tracker and orientation tracker are important elements of AR systems and the development AR technology. The properties of the furniture graphics are saved in a database generated by a CAD application, e.g. 3DSMax software, while OpenGL renders the final graphics. Plus, an ARToolKit software library is used to calculate the 3D positions and orientations of the virtual furniture. Application works as follows:

1. The camera captures video of the real world and sends it to the application.
2. Application searches through each video frame for any square shapes.
3. If a square is found, the application calculates the position of the camera relative to the black square.
4. Once the position of the camera is known a computer graphics model is drawn from that same position.
5. This model is drawn on top of the video of the real world and so appears stuck on the square marker.
6. The final output is shown back in the handheld display, so when the user looks through the display they see graphics overlaid on the real world.

VII. RESULTS

Screen Shots Of Output:

1. Open the Augmented Reality Installed App

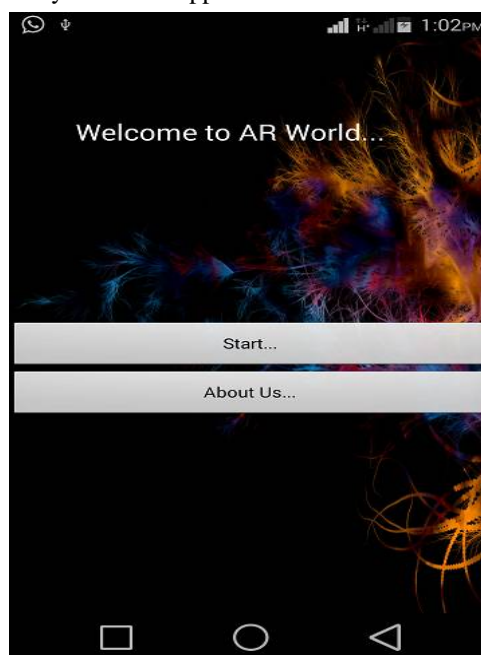


Figure 5: Main page of Application



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2. Click on Start Button

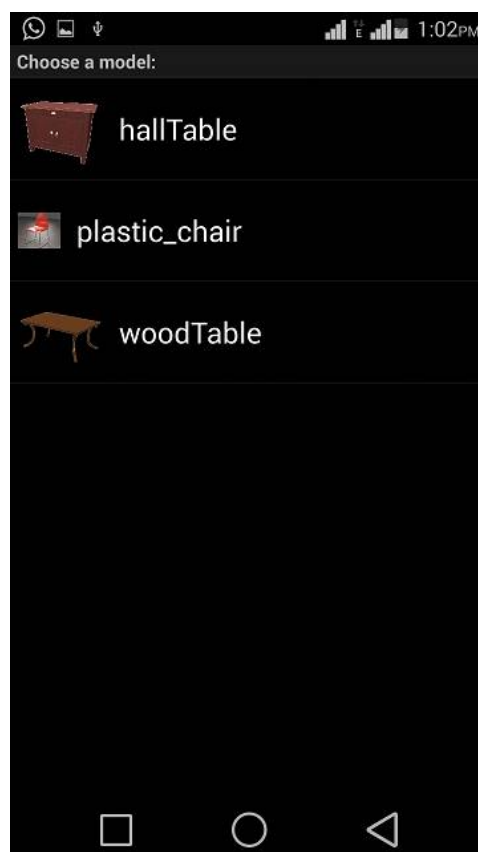


Figure 6: Model Selection

3. Click on Hall-table image



Figure 7: Rendered hall-table on marker

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4. Click on Plastic-chair image



Figure 8: Rendered chair on marker

5. Click on Wood-table image



Figure 9: Rendered wood-table on marker

VIII. CONCLUSIONS

Considering the problem faced by the people while selecting the furniture for interior design we have proposed the marker based Augmented Reality application. Augmented reality technology makes it possible for the customer to try out different products in real time. It helps decrease common problems furniture shoppers often have when making the decision to purchase. Will it fit in my living room? Will this look okay in my bedroom? This application can be used by all the users having smartphone or tablet to get a perspective of how a particular furniture item will look in their room.



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