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E-Furnishing using Augmented Reality

Er. Swati Ganar, Adnan Dahodwala , Mansoor Bagwala, Tahir Kadiwala
Department of Information Technology, MH Saboo Siddik College of Engineering
swati.ganar@mhssce.ac.in,mansoorbag53@gmail.com,adnan.dahod98@gmail.com,
tahirabbaskadiwala@gmail.com

***Abstract* – Our Approach seeks to support interaction with real-world so, to ensure the best place position, model and colour for an object into a real-world. By contrast, Augmentation is conventionally in real- time and in semantic context with environmental elements The disadvantage of the existing system was to use markers closer to users in order to generate good results otherwise the system suffers performance degradation. Therefore, the proposed system will try to achieve an Augmented Reality with an instant marker, which will eventually reduce the burden of carrying the marker each and every time closer to objects.**

***Keywords* – Augmentation,Image Generation,Marker, Tracker.**

I. INTRODUCTION

Augmented reality (AR) is the technology that has been expanding our physical world. It is adding the layers of information onto it making everything much more interesting. Unlike the Virtual Reality (VR), AR doesn't make the complete artificial environment to replace real with the virtual one. AR appears in a direct view of an environment and adds videos, sounds and graphics to it. Augmented Reality is a technology that overlays computer generated objects (information, images or data) on the real world objects providing composite view. The significance of Augmented Reality lies in the fact that it not only projects the digital information onto person's perception of the real world, but does it using immersive sensations that are perceived as natural objects of the environment. AR as technology has existed from several decades, but it has gained a lot of popularity over the last few years. The principal reason for this development has been the evolution of mobile and handheld devices coupled with the advances in the technologies such as Computer Vision and Object Recognition. Applications in Augmented Reality that make use of these technologies make the user's surroundings interactive and manipulative.

Augmented Reality (AR) is a way of overlaying the virtual animated objects on to the real world surroundings using mobile devices. A live environment augmented by digital data – images, sounds and videos. There are 2 groups of AR apps:

1. Marker-based apps
2. Location-based apps

First ones work with image recognition using a camera to scan an image (marker) and then add a virtual image on the phone screen. Example, there are many apps that read QR codes and present additional information. Location based AR applications make use of GPS to locate places nearby and/or to offer directions, etc.

Overall, using augmented reality applications businesses can:

1. Personalize shopping experiences
2. Entertain and amaze customers
3. Engage and retain customers
4. Be ahead of the competition

We propose an Augmented Reality based application to visualize the furniture. AR offers solution to the problem of visualizing objects in real world. AR applications can be of two types, marker-based applications and marker-less applications. In marker-based AR applications, the images or the image descriptors to be identified from the camera data are provided ahead of time. The application is aware of what it is looking for in the camera data (frames). On the other hand, a marker-less AR application recognizes all the natural features in the user's environment. These applications don't have any information about what exactly they should look for in the camera data, hence it is difficult to design or implement such systems Most of the AR applications that are designed for Interior design visualization purposes, to the best of our knowledge, are marker-based applications. The support for marker-less Augmented Reality has not evolved much in comparison to marker-based Augmented Reality.

Some of the Software Development Kits are not available in all countries and some of them are limited to only IOs platforms. In this paper we discuss design, implementation and evaluation of one such marker-based AR android application for visualizing furniture in the real world. We make use of the Vuforia SDK for tracking the features of all the objects in a scene and augmenting the virtual object on top of a horizontal surface.Due to the increase of interest in Augmented Reality (AR), the potential users of AR are increasing. Cell phones now have cameras and screens allowing the combination of real world data to intertwine with virtual data.The aim of our system is to develop an application so that the users can get a great understanding of the reality.

II. LITERATURE REVIEW

The approach that Snehal Mangale et,al used is based on the idea of augmenting the object that is a furniture piece according to the marker detection which is set as a black square in this case, which on detection processes the information and augments the object accordingly. This concept on implementation gives an object as per the black marker detection
but it can have an improvement where the marker can be anything not just a black square which is one of the constraints here [1].

Raju Rathod et.al had suggestions based on smart phone app that changes building interior 3D object viewing design style using augmented reality. This system is designed to deal with locating an object with respect to its best place, model, position, and color into a smart home and efforts to develop a planning tool that focuses on best place, to place the 3D object and also visualize in all orientation has been made. With the development of augmented reality (AR) technology, it has been observed that collaborative and interactive scenario modeling of different computer generated objects into real environment is possible. To augment the virtual objects into real world black and white markers were used and with help of Unity 3D detection of these objects becomes feasible.Creating the application using the Unity3d software is an easy and productive way of developing an AR application which can be adopted [2].

The approach used in "Shared Space [1998]" states that for 3D computer supported collaborative work Virtual Reality appears to be a natural medium in many ways. Rather than separating the user from the real world as does immersive VR, the current trend is to adapt the computer interface so that it can work with traditional tools made by the users. Augmented Reality can be a good solution; in the real world we overlay the virtual objects. Here it explains about the concept - the application of Augmented Reality which is for three-dimensional space. It can be observed that it combines various advantages available with virtual reality [3].

According to the view of Jonathan Grudin et.al various problems faced in the design and evaluation of augmented reality system for an organization. Two types of characteristic are shared by every system or application that supports features like cooperative work: A lot of investments have been done for development of such type of system, and also their success rate has been fallen consistently as per their expectation. It says that it is kept into consideration about who will benefit from the system and additional work to support it must be done by whom otherwise it may lead to application failure [4].

The "Transvision: A Hand-held Augmented Reality System for Collaborative Design[1996] " states that the system shows that user can create a 3D model which is computer generated and see it superimposed on the real world by viewing in a palmtop size see through display. The 3D model and user can experience same virtual environment in real world environment. In this type of design during collaboration, natural mutual communication such as body gestures can be effectively used, since users are not isolated from real world [5].

III. METHODOLOGY

The major goal of our system is to achieve building an application of AR which includes the advantage of creating an instant marker. How does the computer system know where it should place the graphic overlay? Graphics system needs to know how the user is viewing the 3D environment. To show realistic merging, which requires objects to behave in physically plausible manners when manipulated, proper handling of occlusion, collision detection, to apply proper shadows.In E-Furnishing, first we capture the image which is to be made as a marker and is stored in the database. So the user can have advantage of having multiple marker of any size.If the marker traced in the video is matched with the one in the database, then the option of selecting the object to be projected on the marker is showed, through which the user will have multiple option of selecting any of the listed 3D objects as required.. After selection, the specified 3D object will be projected on the marker with notable user intervention since the 3D object from virtual environment share same real world environment with user.The user will also have option to resize the 3D object, or change the color of the 3D object if required.

1. Marker Generation.

A small image is captured by the camera component which is going to be further used as a marker. Then Pixel format converter converts image from the camera format to a format suitable for rendering and tracking internally. Using Down Sampling It even adjusts the resolution of the image . The input image is tracked by the Tracker which is the computer vision algorithm.

In Marker Generation, tracker is used to set the input image as a marker and saves it in Device as well as Cloud Database for further use. This image is stored at both device and cloud database. Storing at both places helps in accessing marker from remote device and can be accessed instantly as well.

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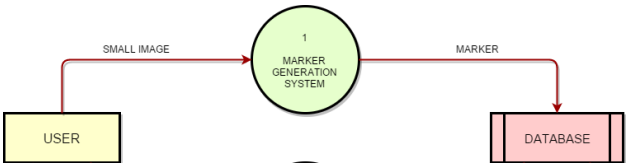

Fig.1.Marker Generation.

1. Image Generation

Image frames are captured continuously by the camera component and it sends the frames to the tracker and triggers the query state object of the Application. Pixel

format converter converts image from the camera format to a format suitable for rendering and tracking internally, it converts the image for the use of Tracker. The resolution of the image is adjusted using Down Sampling.
As the tracker is a computer vision of the system it detects the Image targets then finds the corresponding object for the image target (Marker) from the Database and then it tracks the object on the targeted location. State object is updated and Render Camera Preview is called for each frame. It renders each frame obtained from state object and using the render graphics of Application the output is displayed..
It must initialize all the above mentioned components and perform following three main steps in Application Code Queries the state object for detected targets, markers and updated states of these elements. Application logic is updated with new input data. Render Graphics augmented graphics overlay is rendered.

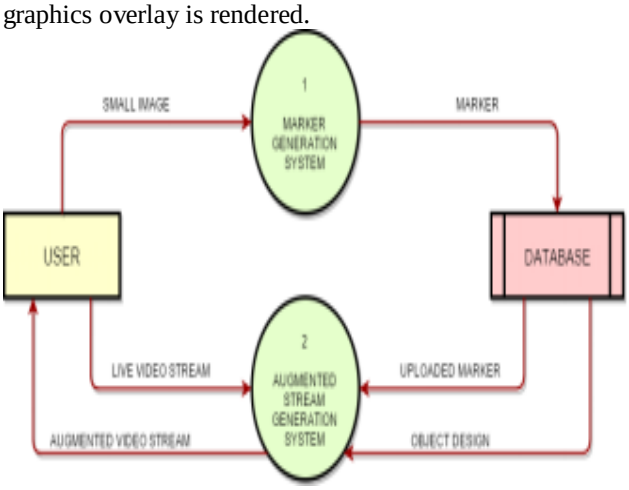

Fig .2. Image Generation And Projection Module.

IV. RESULTS AND DISCUSSION

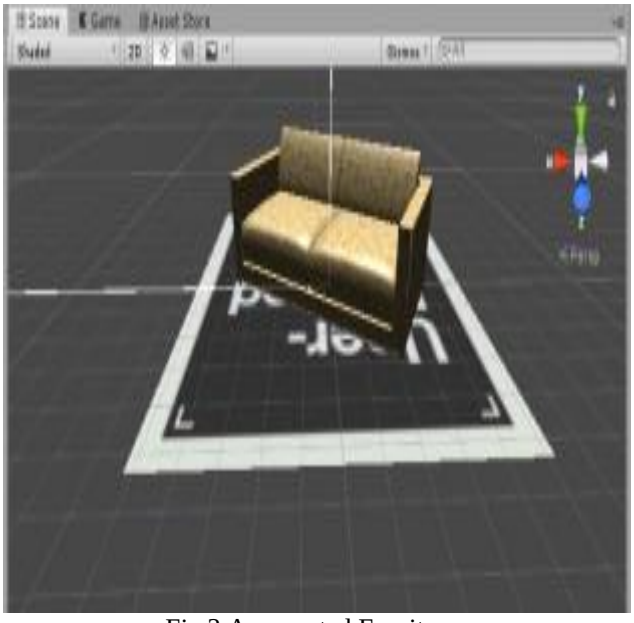

Fig.3.Augmented Furniture.

The User defined target builder is set which are Image Targets that are created by the user at runtime from camera frames selected. Upon detection of the marker the object can be projected in realtime.

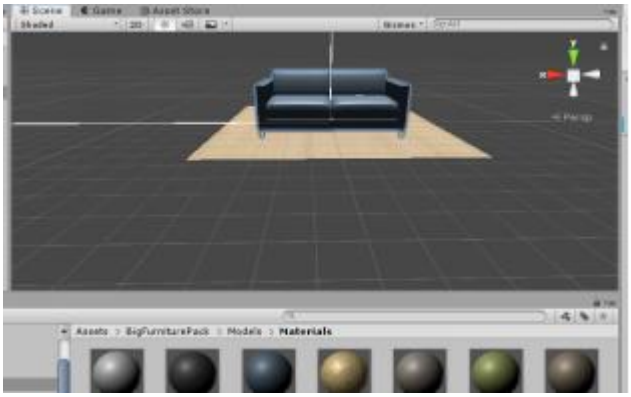

Fig.4. Customize the furniture.

Customization and personalization comes in handy with application where the user can select from the available colors and patterns according to the home environment and to their own convenience. The customization option could be provided to change the colors or material of the object.

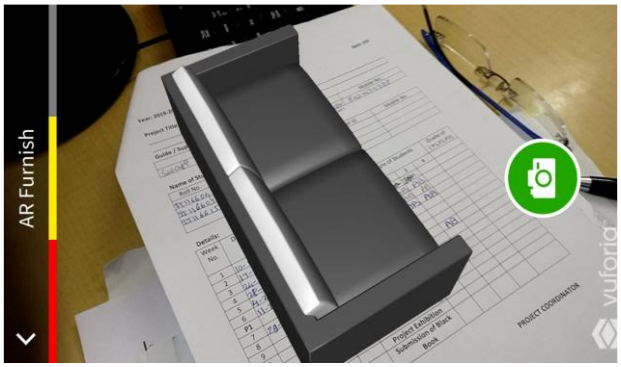

Fig .5. Real time Augmentation of Furniture.

The default unity interface is very user friendly and provides an easy to understand feature where there is a camera icon which initialises capturing the camera frames on click. The colors seen above show the accuracy of the captured frames. The realtime execution of the AR application which on proper detection of a marker projects the Sofa and we can move the object by moving the marker.

V. CONCLUSION AND FUTURE SCOPE

We have successfully implemented an application that uses Augmented reality to project the furniture in realtime and gives valuable interior insights to the user. The application makes use of Vuforia SDK to provide AR feature in Unity.

As we are constrained by a single object in this application , our future scope does include having a menu of furniture from which the user has to select a particular piece of furniture to augment it into realtime and it is suitable that we could have the liberty to manage the object size, rotate the object, pinch out to zoom in, pinch in to zoom out, these features would be very ideal for this app that could be provided in the future.

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