An Application for Interior Design Using Augmented Reality

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Abstract: People always have difficulty with the interior designing of their house. They process of choosing which furniture is to be purchased that will be best suited for their room is hectic. Sometimes after purchasing furniture they may feel that the purchased furniture does not match with the environment. Thinking upon such problem we came up with a solution as our project which will help people to have virtual view of furniture in the real world before purchasing it using a technology augmented reality.

KEYWORDS: Augmented Reality, Marker based, Image Capturing Module, Image Processing Module, Tracking, Rendering

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.

II. MOTIVATION

The main motivation behind this project idea is to allow people to have virtual view of furniture design before purchasing it.

III. RELATED WORK

Various existing systems are:
A. HEAD MOUNTED DISPLAY
Head Mounted Display, abbreviated as HMD, is a wearable device as a part of helmet. It is used to display just a computer generated image as a part of real world. The disadvantage of HMD (Head Mounted Display) devices are too big, heavy and expensive.

Fig-1 Head Mounted Display

B. ZOOBURST

Zooburst is a digital storytelling tool which is used to create a 3D pop-up book. The books created using this tool are web based. It works with the augmented reality. It makes the use of a webcam. The book can have maximum 10 pages. It uses either images created by own or vector images created by open source tool that can be sized, rotated and coloured. To sign up for an account you'll have to give your name, and email and explain why you would like to try Zooburst.
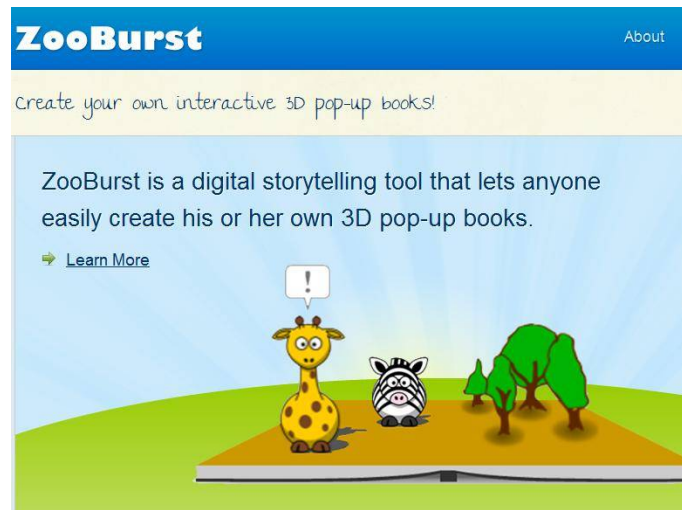

Fig 2 Zooburst

IV. PROPOSED WORK

A. SYSTEM ARCHITECTURE
The system architecture of marker based system consists
of 6 modules :
1. Camera
2. Image Capturing Module
3. Image Processing Module
4. Marker Tracking Module

5. Rendering Module
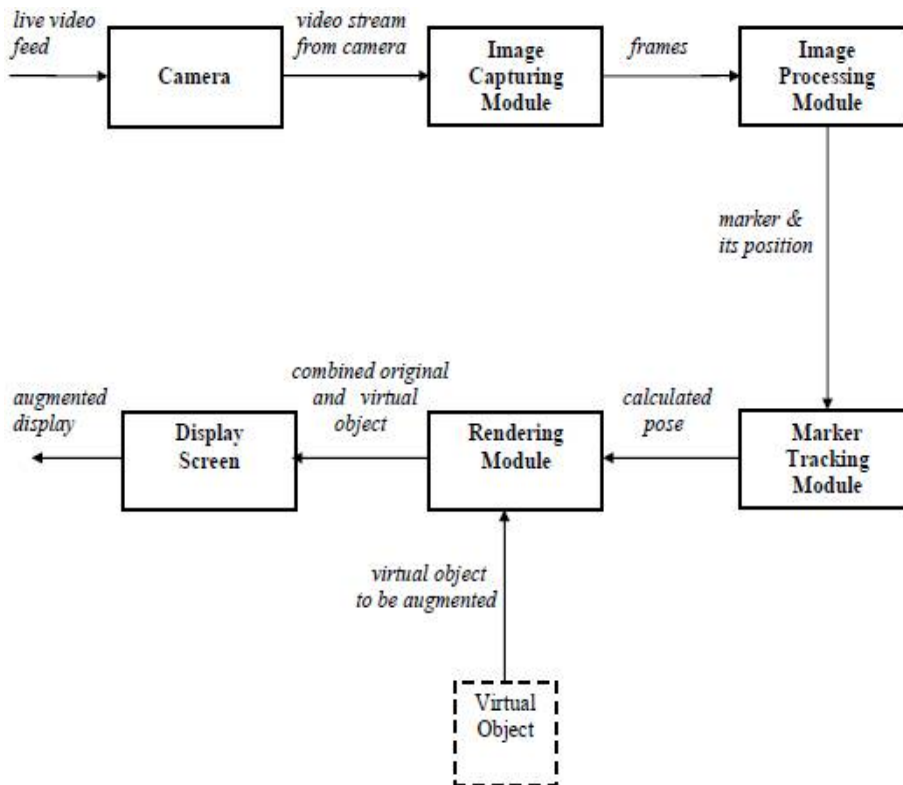6. Display Module

Fig 3 System Architecture

1.1.1 Camera:
The camera will capture a continuous video frame in which the image will be displayed.

1.1.2 Image Capturing Module:
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.

1.1.3 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.

1.1.4 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.
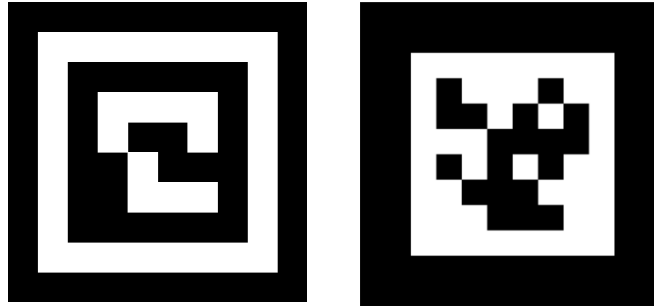
Fig 4. Markers for tracking

1.1.5 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 handset.

V. MATHEMATICAL MODEL

1. Let S be the Virtual Furniture
Set S is divided into 6 modules
S= S1, S2, S3, S4, S5,S6
S1= Camera
S2= Image Capturing Module (ICM)
S3= Image Processing Module (IPM)
S4= Tracking Module (TM)
S5= Rendering Module (R)
S6= Display Module (D)
2. Identify the inputs.
Inputs = X1, X2, X3, ..Xn
X1= Video frame with marker
X2= Video frame without marker
3. Identify the output as O.
Outputs = Y1, Y2, Y3, ..Yn
Y1= 3D Augmented View
Y2= Table View
Success Conditions:
Virtual object is created in the real world
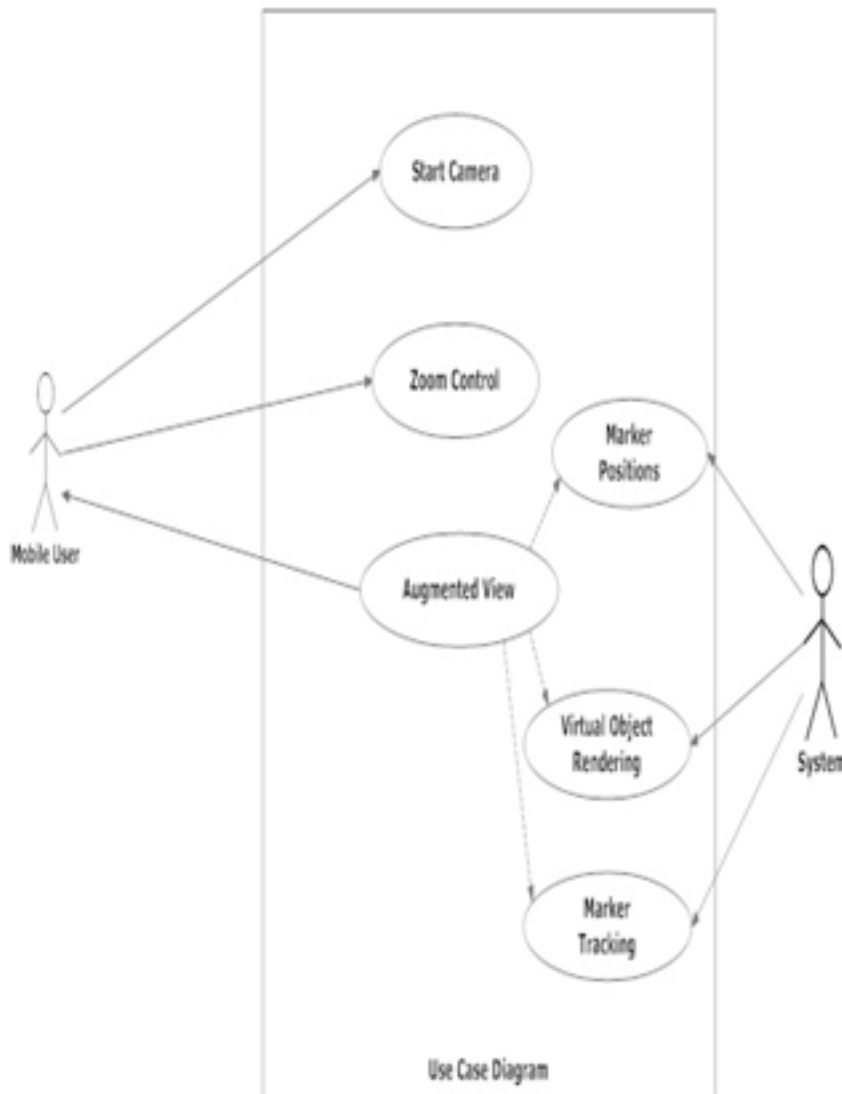Failure Conditions:
1. Marker is not detected
2. Marker do not match

B. USE CASE

Use Case Diagram

VI. 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 if 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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