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Mobile Application for Product Showcase using AR

[1]Shashank Gupta, [2]Sujay B R, [3]Shruthi S M, [4]Supreeth S, [5]Sourav Gowda

[4]Assistant Professor
[1,2,3,4,5]School of C&IT, Reva University, Bangalore, India
[1]chiku.gupta4242@gmail.com, [2]sujaybr1997@gmail.com, [3]sshruthi9141@gmail.com,
[5]souravgowda7@gmail.com

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Abstract

There was a time when we had to go to a house or believe the estate seller who can tell false things about the estate but the days are gone when we had to go to the shop and see the products and imagine about its compatibility in our homes. In this paper we describe an application which uses the concept of Augmented Reality which is multi platform compatible, is a real world application which uses augmented reality to display a 3D version of the products so that users can view all the smallest of details of the products on their Mobile Devices and place them according to their desire. This application can be developed in the real world. Here, an application is developed which is having voice-controlled functionalities for the AR Objects. The application's creation consists of two steps i.e. Creation of 3D Models from real objects using an image based modeling tool and Conversion of 3D Model into an interactive AR element using an AR authoring tool. Our application uses augmented reality to display a 3D version of the products so that users can view all the smallest of details of the products on their Mobile Devices and place them according to their desire. The application can also be used by voice control for several functionalities like opening, closing the roof, to switch to night time, etc. With this cross platform application, people can see the 3D Model of a house with the angles of user's interest and also with a first person view.

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1. Introduction

There was a time when we had to go to a house or believe the estate seller who can tell false things about the estate. But now the days are gone when we had to go to the shop and see the products and imagine about its compatibility in our homes. We develop an Cross-Platform Mobile Application which uses the concept of Augmented Reality which is multi platform compatible, is a real world application which uses augmented reality to display a 3D version of the products so that users can view all the smallest of details of the products on their Mobile Devices and place them according to their desire. Our application uses continuous image detection for image targets for AI Objects. The application can also be used by voice control for several functionalities. The proposed system introduces about the Augmented Reality with markup targets in respective of the real estate. The section II explains all the works related to the proposed system. In section III, we explain the working of all modules in our proposed system/application. Section IV explains the Methodology used in our application and in section V the results are explained and the conclusion is given in section VI.

2. Related Works

The literature [1] implements a method to manipulate an object in the virtual world, they simultaneously also touch or manipulate a corresponding object in the physical world. All these elements enable users to interact with each other as well as with their environment almost as naturally as they would in the real world. But the portability is very less since it supports only VR supported

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devices. Here in the literature [2] RoMA's proxemics-inspired handshake mechanism between the designer and the 3D printing robotic arm is allowing the designer to quickly interrupt printing to access a printed area or to indicate that the robot can take full control of the model to finish printing. The cost to buy the equipments like mounted displays, VR Gear is more and everyone cannot afford to buy it. The literature [3] gives us the idea of using the image capturing and authoring tools in an easy way with efficient tracking with low computing cost. But the image must have significant details and proper contrast and it uses more complex image tracking. Paper [4] deals with Voice recognition technique for AR interaction are presented. In our case, predefined commands are used to recognize users' voice. A set of voice commands are selected for interaction in AR world. These commands are: bring, select, move and assemble 3D object on an AR application. But it works only for a particular protocol and is using obsolete and old fashioned technologies. And also it will not work without the image target and the platform compatibility is less.The main purpose of this paper[5] is to present an Open Source application called Eva, which is a virtual pet that lives in the Augmented Reality world. Here the disadvantage is the Bluetooth and the heavy impact caused by the application. In paper [6], as a touchable and graspable interface based on 3D CAD data, we propose Augmented Foam, which applies Augmented Reality technologies to physical blue foams. Using Augmented Foam, a blue foam mockup is overlaid with a 3D virtual object, which is rendered with the same CAD model used for mock-up production. It is having the flaw of marker-based object tracking failure by hand occlusion. In paper [7] we have developed a desktop-based AR application that teaches young children the English words for colors, shapes, and spatial relationship. In this research[9], an android app has built using Augmented Reality aims to help the domestic and international tourists in selecting the location of tourism in Indonesia by way of an interactive and exciting as exploring the Indonesian tourism. But the platform portability is the biggest problem for other platform users.

Year	Title of the Paper	Author Names	Advantages	Disadvantages
2016	Bringing real objects, spaces, actions and interactions into Social VR[1]	Misha Sra, Chis Schmandt	When users manipulate an object in the virtual world, they simultaneously also touch or manipulate a corresponding object in the physical world. All these elements enable users to interact with each other as well as with their environment almost as naturally as they would in the real world.	The portability is very less since it supports only VR supported devices.
2017	RoMA: Interactive Fabrication with Augmented Reality and a Robotic 3D primer[2]	Huaishu Peng, immy Briggs, Cheng-Yao Wang, Kevin Guo,Joseph Kider, Stefaine Mueller, Patrick Baudish	RoMA's proxemics-inspired handshake mechanism between the designer and the 3D printing robotic arm allows the designer to quickly interrupt printing to access a printed area or to indicate that the robot can take full control of the model to finish printing.	The cost to buy the equipments like mounted displays , VR Gear is more and everyone cannot afford to buy it.
2018	From Reality to Augmented Reality: Rapid Strategies for Developing Marker-based AR Content using Image Capturing and Authoring Tools[3]	Jorge D. Camba, Manuel Contero	• Common and easy to find and create. • Relatively low computer requirements. • Efficient tracking.	• The image must have significant details and proper contrast. • More complex image tracking. • More hardware demanding.
2019	Head-up Displays for Augmented Reality Applications[4]	Matteo Corno, Luca Franceschetti, Simone Gelmini, Sergio Savaresi	Voice recognition technique for AR interaction is presented. In our case, predefined commands are used to recognize users' voice. A set of voice commands are selected for interaction in AR world. These commands are:	• It works only for a particular protocol and is using obsolete and old fashioned technologies.

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			bring, select, move and assemble 3D object on an AR application.	
2019	Eva: A virtual pet in Augmented Reality[5]	Afonso Costa, Rachel Lima, Sergio Tamayo	Eva is an application for Smartphone's using the Android platform and its built using Samsung XR framework.	Usage of Bluetooth technology which increases the load on the mobile.
2005	Augmented Foam: A Tangible Augmented Reality for Product Design[6]	Woohun Lee, Jun Park	Haptic presence: AF allows users to grasp and touch virtual products for efficient evaluation. Natural visual presence: By using physical mock-ups, AF provides shadows and reflectance in the real environment.	. It is having the flaw of marker-based object tracking failure by hand occlusion
2019	TeachAR: An Interactive Augmented Reality Tool for Teaching Basic English to Non-native Children[7]	Che Samihah Che Dalim, Thammathip Piumsomboon, Arindam Dey, Mark Billinghurst, Shahrizal Sunar	TeachAR utilizes the ARToolkit plugin for the Unity game engine for square marker tracking and game development.	Learning a different language than their native language can be very challenging for most young children. It is available only for Desktop platform.
2018	Future Agriculture Farm Management using Augmented Reality[8]	Mingze Xi, Matt Adcock John McCulloch	Recent successes in AR-based information presentation and interaction, and shared views and face-to-face collaborations have made AR a potential choice to tackle the problems in aquaculture pond management	The availability of devices/resources for farmers is the main disadvantage.
2017	Mobile Tourism Application Using Augmented Reality[9]	Riri Safitri, Deska Setiawan Yusra, Denny Hermawan, Endang Ripmiatin, Winangsari Pradani	Requirement of fewer resources is the main advantage and the features.	Platform Portability is the biggest problem and the way it is processed.

3. Proposed Work

The proposed system is a Cross Platform Mobile application which helps users to see the house which they want to buy. This application is handled by the category of users, i.e. the buyers. Buyer first gets the choice of house which is available then he has to select the house and we get a plane where we can view the intro video of the house which is followed by the 3rd person view of the house which he has selected followed by some virtual buttons which can be used to give some of the commands like opening, closing roof, day light and night light, etc. Then if a user wants to go to the 1st person view of the house, they select the virtual button of 1st person view and they go through a confirmation panel which gives us a choice of selecting of reverting back. But firstly the buyer first needs an image target which can be triggered through a camera. The video plane, 3rd person view are having their own identities that is identified by the image targets with help of Vuphoria engine. And also voice commands are given using wit.ai which is given an app id.

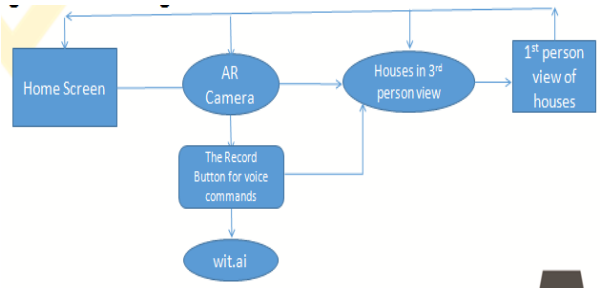

Figure 1: Architecture Diagram

A. Home screen

The Home screen is the main screen in the application which is opened after our application is launched. It consists of the list of the houses and the number of bedrooms it is having. We can go to the 1st person view or the 3rd person view which triggers the AR Camera i.e. the rear camera in our mobiles. It also displays the price at

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which the house is being sold. The user can select the scene where he wants to navigate to.

B. AR Camera

This module consists of the camera which is going to be triggered in the devices in which it is going to be used. The user needs to keep an image based target i.e. the paper and which is specific to our AR Maker with himself. It detects the AR Objects which is triggered by image targets which are further detected by the Vuphoria Engine. It makes the object appear according to the image marker's size, the height is automatically adjusted. AR Camera enhances the user's experience about the object by making it like it exists in real.overlays digital content and information onto the physical world — as if they're actually there with you, in your own space. AR Camera is powered by Vuphoria Engine which is present in Unity 3D software. It also consists of the record button to trigger the wit.ai.

C. The Record Button and Wit.Ai

The record button triggers the "wit.ai" framework based on NLP which is responsible for creating voice commands using entities and bot training. It also consist of stories which make the bot training much better. So the user of the application needs to press the button which will start the wit.ai, then the user needs to specify the command like "night time please". Then we need to press the same button again and the command will be identified by the wit.ai, if the command doesn't match, it displays a text box telling that the command is not a valid command.

D. Houses in 3rd Person View

This module starts the moment the AR Object is identified which is called by the AR Camera. The houses will appear in an image target according to the size of the image target, then the virtual buttons will also appear which look like they exist but they don't exist in reality. The houses in 3rd person view can be given commands through the Record Button or the Virtual Buttons. User can freely roam inside or outside the house without any barriers. The user can change the house view from daytime to night time and vice versa. The user can also see the house from any angle irrespective of the time.

C. 1st Person View of Houses

This module consists of a on screen dual controller which allows the user to move freely in the house. It consists a specialized controller which helps us to look at all directions as the human can do The 1st person view is also connected with the Home Screen. In this mode we can really experience the view of a human like real-like environment. And the outside view from the top floor is also realistic. From Home Screen also, we can select the 1st person view of a house.

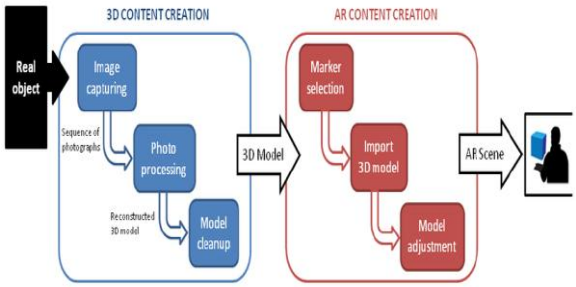
4. Methodology Used

1. To Create Vuphoria Image Target:

- Firstly a sample image target is imported from unity and placed in the scene. Then an application license is supposed to be entered from Vuphoria website where we create our new image-target.
- In Vuphoria website, under the target manager, a database is created and in that database, the target image is uploaded which has to be used.
- The database after getting created is downloaded and imported to Unity.
- Now the type of Image target is set and the 3D object which has been created is imported on the image target.

2. Conversion of real object into 3D model:

- The first step requires the acquisition of 3D information of the object that needs to be modeled. Because of the nature of image-based modeling software, objects with plain, transparent, glossy, or reflective surfaces will not work correctly.
- Multiple pictures will be taken by shooting at least a loop of sequential photographs about the subject.
- Additionally, to facilitate the 3D construction, it is also recommended that the object being photographed occupies at least 70% or more of the pixels in the images and that the sequence of pictures has some overlap.



3. To Link All the modules like 1st person view and 3rd person view:

- A C# file named as gameController.cs is created which is having the logic of linking all the scenes and here changeScene() function is used for it and SceneManagement class is imported.
- It also contains the logic of Quitting the Application and to setActive a scene.

4. To control the behavior of virtual button:

- A C# file named as vbButton.cs is created which consists of Vuphoria package and IVirtualButtonEventHandler is used and game objects are used as Array or as single game object.
- Start() function is used for getting the virtual button. Here for loop is used to trigger all the virtual buttons at same time and also the video player.
- Now if condition is used for checking for the virtual button name, if it matches then the function which is written in the house script is triggered and that virtual button is set as Active.

5. To control the Behavior of the house:

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- Here also a C# script is used for using the game objects for functioning and execution of the given commands.
- Here, game objects are declared as public so that they can be accessed by any file in the project.
- Here, all the functions like toggling the roof is written and that is triggered using either the virtual button or the wit.ai.
- Here, a simple for loop is used for setting the game object to be active or inactive or to execute the given command.
- Here, to change to night time, the directional light component is fetched and the color of the night is changed accordingly.
- To check the activeness of the GameObject, ActiveInHierachy function is used.

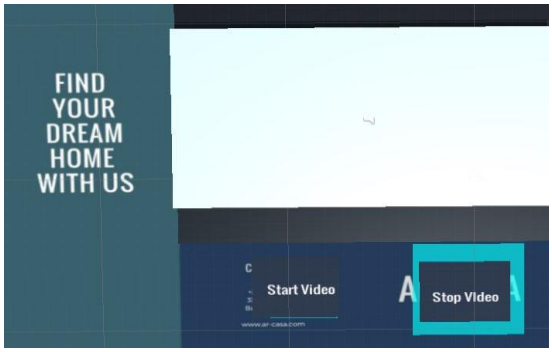
5. Results

This cross-platform application is having the following results:-

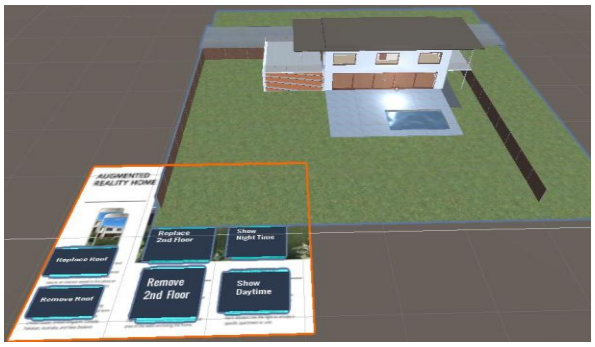
1. Home Screen to select the House:

From the Home Screen, we can select the house which we want to see i.e. the 3rd person view which is Lead to opening of AR Camera.

2. The AR Camera resulting into 3rd person view and the video Panel:



The video panel is consisting of two virtual buttons which control the playback of the video as the command is mentioned in C# script which is linked with the virtual button.

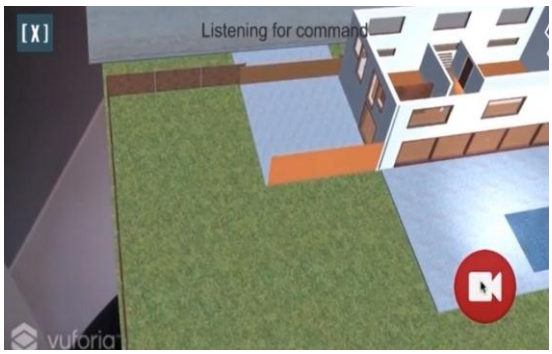


Here the virtual buttons are displayed with the house where the commands can be executed like switching to daylight, nightlight, removing the 2nd floor, etc.

3. 1st person view of the Houses:

This image shows the house with dual touch controls for a better 1st person experience in seeing the house and the view from inside and the spacing of the house.

4. Voice Commands:



This image shows when we press the record button, wit.ai listens to our command, i.e. “Replace Roof Top please”, the wit.ai listens to our commands and processes it accordingly.

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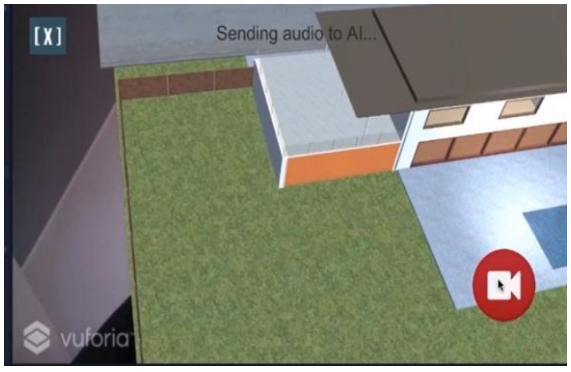

The above image shows the completion of the command has been done successfully and the rooftop is back in our house.

6. Conclusion

The primary motive of this project is to provide a real estate system which can be viewed from home rather than visiting the site itself and to save a lot of time. Other approaches have used a fixed sized images or videos of the site. This technique is inaccurate if the screen size is small and also it takes a lot of processing power. A major problem for other approaches is also the platform compatibility and portability. So we have proposed a system which overcomes the above problems which less resource usage and more real like view. Our application overcomes the application portability problem and it is cross platform which enables us to run it on various platforms. The other approaches do not give the feature of interacting with the houses but our application overcomes that problem with 1st and 3rd person view and commands. Our approach enables user to view the game object i.e. the house in different sizes according to their image target size which was not present in previous works. As a result, the user gets a better experience in terms of usability and reliability. Hence, if our project is commercially developed, it will save a lot of people's time and money with a better user experience.

7. Acknowledgment

We extend our gratitude towards REVA University for giving us the opportunity to take up this project. We are thankful to our department lecturers who have guided us through our project. We extend our heartfelt gratitude towards our guide Prof. Supreeth S. for guiding us by providing all the ideas required for this project. Above all I thank my team mates for working cordially in completing this project.

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