

PROFESSIONAL TRAINING REPORT
at
Sathyabama Institute of Science and Technology
(Deemed to be University)

Submitted in partial fulfillment of the requirements for the award
of Bachelor of Technology Degree in Information Technology

By
JITHIN ABHISHEK FERNANDO
(REG.NO: 37120036)



DEPARTMENT OF INFORMATION TECHNOLOGY
SCHOOL OF COMPUTING
SATHYABAMA INSTITUTE OF SCIENCE AND
TECHNOLOGY
JEPPIAAR NAGAR, RAJIV GANDHI SALAI,
CHENNAI – 600119. TAMILNADU

AUGUST 2020



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with "A" Grade by NAAC

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SCHOOL OF COMPUTING

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the Bonafide work of JITHIN ABHISHEK FERNANDO (Reg. No. 37120036) who carried out the project entitled "E-BROCHURE With Virtual tour " under our supervision from July 2020 to August 2020.

Internal Guide

Dr. V. NIRMALRANI,

Head of the Department

Dr. R. SUBHASHINI M.E.,Ph.D.,

Submitted for Viva voce Examination held on _____

Internal Examiner

External Examiner

DECLARATION

I, **JITHIN ABHISHEK FERNANDO (Reg. No. 37120036)** hereby declare that the Project Report entitled **“E-BROCHURE WITH VIRTUAL TOUR”** done by me under the guidance of **Dr. V. NIRMALRANI**, at Sathyabama Institute of Science and Technology (Deemed to be University), Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119 is submitted in partial fulfillment of the requirements for the award of Bachelor of Technology degree in Information Technology.

DATE:

PLACE: CHENNAI

SIGNATURE OF THE CANDIDATE

ACKNOWLEDGEMENT

I am pleased to acknowledge our sincere thanks to Board of management of **SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. I am grateful to them.

I convey our thanks to **Dr. T. SASIKALA M.E., Ph.D., Dean, School of Computing** and **Dr. R. SUBHASHINI M.E., Ph.D., Head of the Department, Department of Information Technology** for providing us the necessary support and details at the right time during the progressive reviews.

I would like to express our sincere and deep sense of gratitude to our Project **Dr. V. NIRMALRANI**, for her valuable guidance, suggestions and constant encouragement paved way for the successful completion of my project work.

I wish to express our thanks to all Teaching and Non-teaching staff members of the Department of **INFORMATION TECHNOLOGY** who were helpful in many ways for the completion of the project.

TRAINING CERTIFICATE



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JITHIN ABHISHEK FERNANDO J

has successfully completed

Introduction to Virtual Reality

an online non-credit course authorized by University of London and Goldsmiths,
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Dr Sylvia Xuerui Pan
Lecturer, Department of Computing
Goldsmiths, University of London

A handwritten signature in black ink.

Dr Marco Gillies
Computing Department,
Goldsmiths, University of London

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CHAPTER 1

INTRODUCTION

1.1 OUTLINE OF THE PROJECT

The project is about creating an Mobile Application which will Help the People who Are new to this using Augmented Reality. By integrating with an android application, There is a additional Virtual Tour Option. The brochure can display a lot more information than before. This project will provide a video walk through of our college using the customized App built out of Unity application supported by Vuforia engine. This brochure can be printed as a hard copy and supplied or can be displayed on website

1.2 INTRODUCTION TO AUGMENTED REALITY

Augmented reality (AR) refers to computer displays that add virtual information to a user's sensory perception. Most AR research focuses on see-through devices, usually worn on the head that overlay graphics and text on the user's view of his or her surroundings. In general, it superimposes graphics over a real-world environment in real time.

CHAPTER 2

AIM AND SCOPE OF THE PRESENT INVESTIGATION

2.1 AIM

This E-brochure is used to help those who have no idea on the university to gain some information on it. Creation of brochures has always been a specialized activity.

2.2 PROBLEM STATEMENT

This project will provide a video walk through of our college using the customized App built out of Unity application supported by Vuforia engine. Any person with the help of the Application and the Brochure will get a video walk through of our college campus. Augmented reality will have enormous number of applications. This project is done with the help of advanced Augmented Reality technology, object recognition to provide information about the surrounding real world of the user becoming interactive and digitally manipulee, the brochure can display a lot more information than before. This brochure can be printed as a hard copy and supplied or can be displayed on website.

2.3 SCOPE

An Android Application built out of Unity application supported by Vuforia engine. This can help the people to help them to know about the university, it has brochure to display additional information about the product in an interactive way. This project will provide a video walk through of the object that is scanned.

CHAPTER 3

EXPERIMENTAL OR MATERIALS AND METHODS; ALGORITHMS USED

3.1 GENERAL

Augmented reality (AR) refers to computer displays that add virtual information to a user's sensory perception. Most AR research focuses on see-through devices, usually worn on the head that overlay graphics and text on the user's view of his or her surroundings. In general, it superimposes graphics over a real-world environment in real time.

Getting the right information at the right time and the right place is key in all these applications. Personal digital assistants such as the Palm and the Pocket PC can provide timely information using wireless networking and Global Positioning System (GPS) receivers that constantly track the handheld devices. But what makes Augmented Reality different is how the information is presented: not on a separate display but integrated with the user's perceptions. This kind of interface minimizes the extra mental effort that a user has to expend when switching his or her attention back and forth between real-world tasks and a computer screen. In augmented reality, the user's view of the world and the computer interface literally become one.

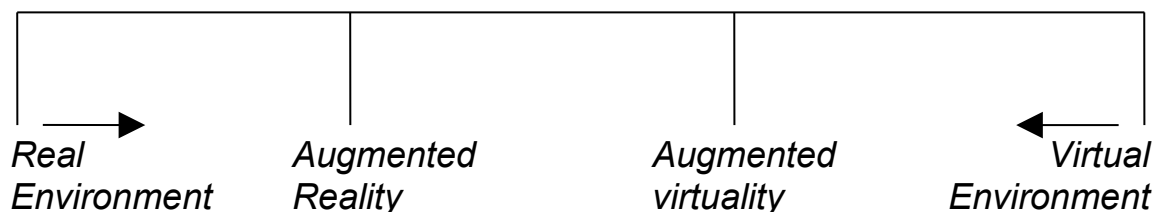


Fig: 3.1. AR Environment

Between the extremes of real life and Virtual Reality lies the spectrum of Mixed Reality, in which views of the real world are combined in some proportion with views of a virtual environment. Combining direct view, stereoscopic videos, and stereoscopic

graphics, Augmented Reality describes that class of displays that consists primarily of a real-world environment, with graphic enhancement or augmentations.

In Augmented, real objects are added to a virtual environment. In Augmented Reality, virtual objects are added to real world. An AR system supplements the real world with virtual (computer generated) objects that appear to co-exist in the same space as the real world. Virtual Reality is a synthetic environment.

Unlike billboards or hoardings, a brochure is more descriptive and hence more difficult to create. An ideal brochure design attempts to satisfy three conditions: instant visual attraction, easy readability, and interest generation. After the goal and target audience are identified, designing of pamphlets become much easier. Images are inseparable portion of a catalog. These images must be relevant and clear. The brochure design should be such that it associates with the reader's emotions.

3.1.1 Augmented Reality VS Virtual Reality

Augmented Reality

- System augments the real-world scene
- User maintains a sense of presence in real world
- Needs a mechanism to combine virtual and real worlds

Virtual Reality

- Totally immersive environment
- Visual senses are under control of system

3.1.2 Combining the real and virtual worlds

- Precise models
- Locations and optical properties of the display
- Calibrations of all devices
- To combine all local coordinate systems centered on the devices and the objects in the scene in a global coordinate system
- Register models of all 3D objects of the interest with their counterparts in the scene

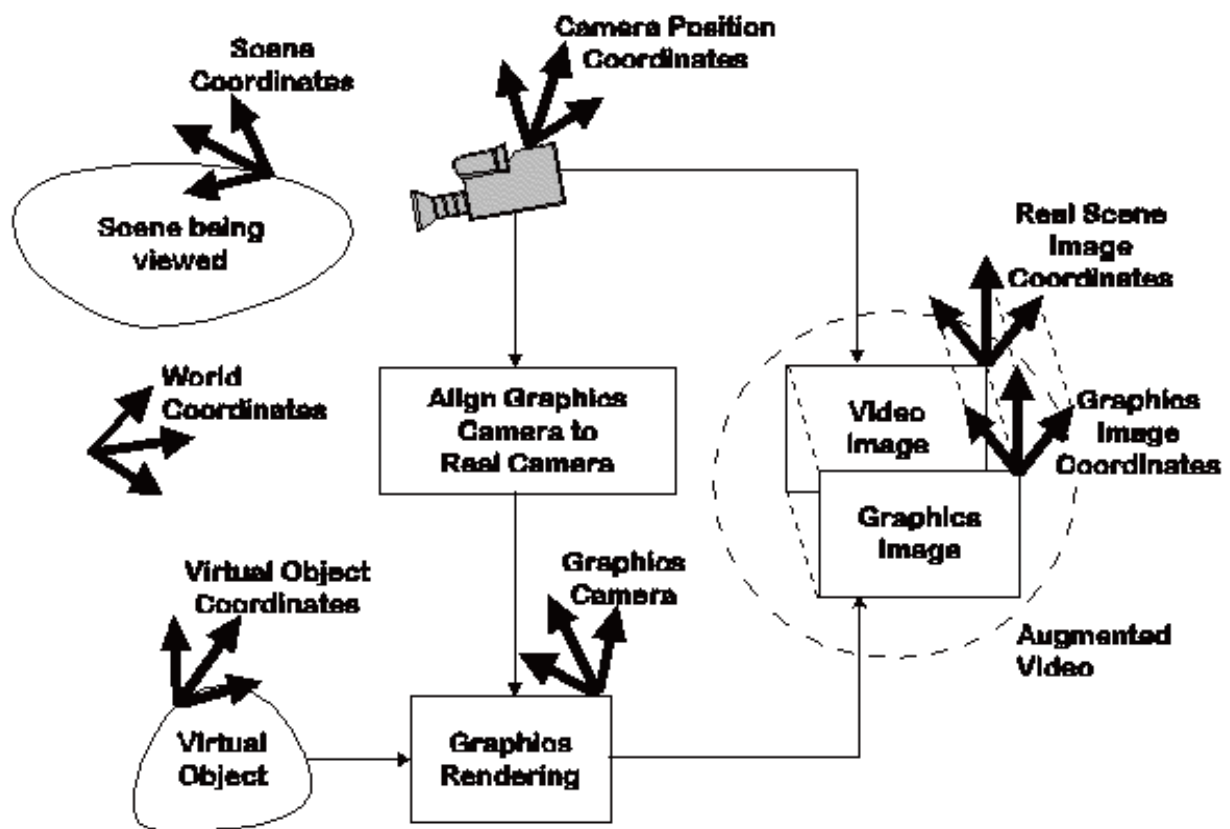


Fig: 3.2. Combining the real and virtual worlds

3.1.3 Research Activities

- Develop methods to register the two distinct sets of images and keep them registered in real-time
- New work in this area has started to use computer vision techniques
- Develop new display technologies for merging the two images

3.1.4 Working

AR system tracks the position and orientation of the user's head so that the overlaid material can be aligned with the user's view of the world. Through this process, known as registration, graphics software can place a three-dimensional image of a tea cup, for example on top of a real saucer and keep the virtual cup fixed in that position as the user moves about the room. AR systems employ some of the same hardware technologies used in virtual reality research, but there's a crucial difference: whereas virtual reality brashly aims to replace the real world, augmented reality respectfully supplement it.

Augmented Reality is still in an early stage of research and development at various universities and high-tech companies. Eventually, possible by the end of this decade, we will see first mass-marketed augmented reality system, which one researcher calls "The Walkman of the 21st century". What augmented reality attempts to do is not only super impose graphics over a real environment in real-time, but also change those graphics to accommodate a user's head- and eye- movements, so that the graphics always fit and perspective.

Here are the three components needed to make an augmented-reality system work:

- **Head-mounted display**
- **Tracking system**
- **Mobile computing power**

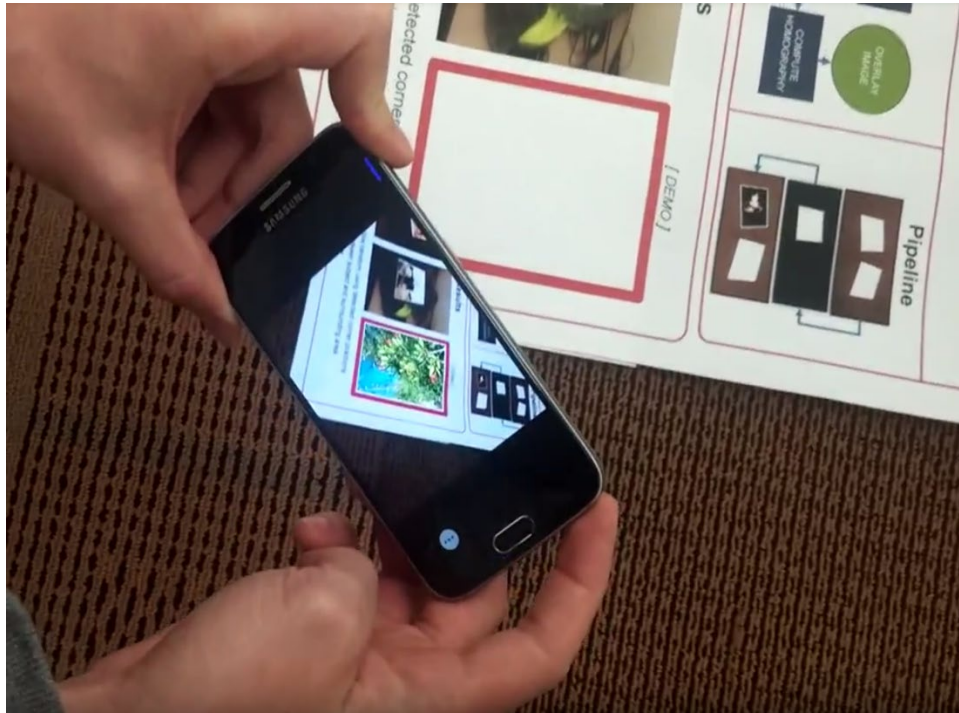


Fig: 3.3. AR Tracking

3.1.5 Performance Issues

Augmented Reality systems are expected:

- To run in real-time so that the user can move around freely in the environment
- Show a properly rendered augmented image
- Therefore, two performance criteria are places on the system:
- Update rate for generating the augmenting image
- Accuracy of the registration of the real and virtual image.

3.1.6 Limitations for Updating the Generated Images

- Must be at 10 times/second
- More photorealistic graphics rendering
- Current technology does not support fully lit, shaded and ray-traced images of complex scenes

3.1.7 AR displays

The progress in displays for AR systems in the last decade is apparent. The HMD became smaller and some of them are as large and heavy as sunglasses. The major problems with AR displays are still:

- low brightness and contrast,
- insufficient resolution of the displays (max 800x600),
- the narrow field-of-view.

➤ Display Technologies

- **Monitor Based**
- **Head Mounted Displays:**
 - Video see-through
 - Optical see-through

Monitor Based Augmented Reality

- Simplest available
- Little feeling of being immersed in environment

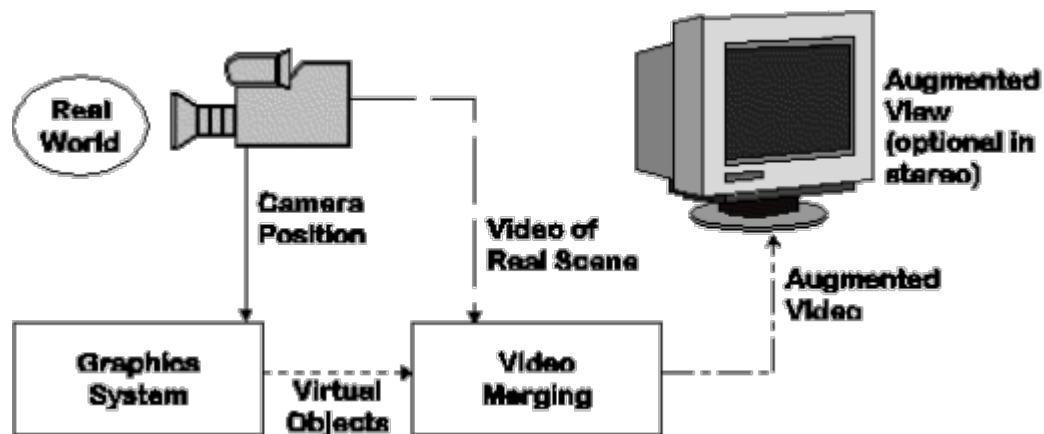


Fig: 3.4 Monitor Based AR

Head Mounted Displays

1. Video See-Through HMD

- Flexibility in composition strategies
- Wide field of view
- Real and virtual view delays can be matched

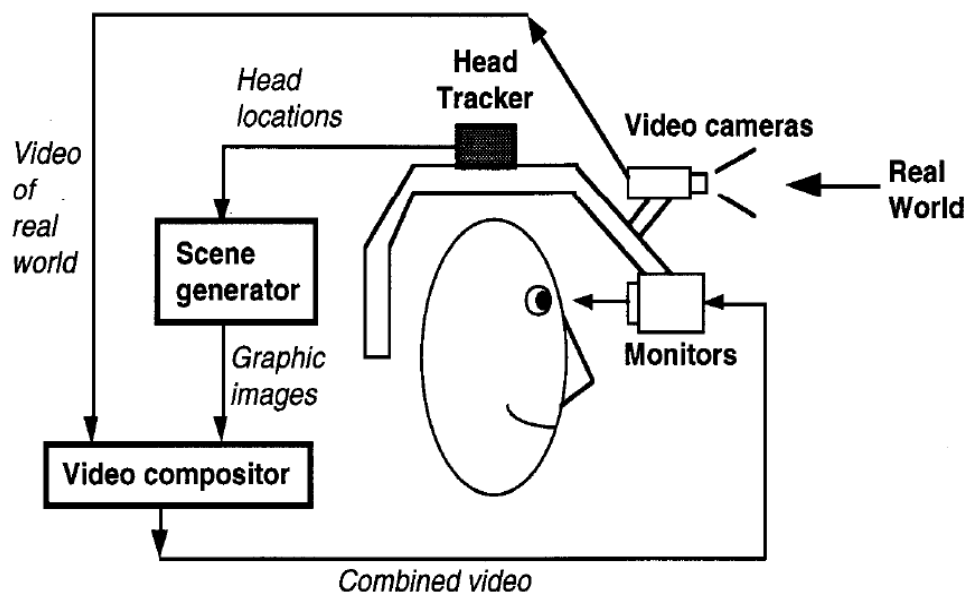


Fig: 3.5 Video See-Through HMD

2. Optical See-Through HMD

- Simplicity
- Resolution
- No eye offset

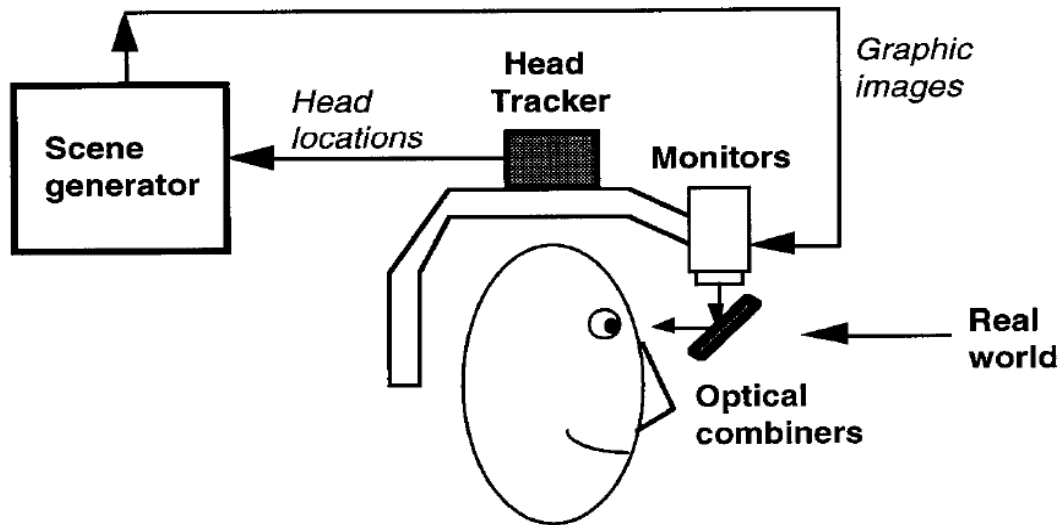


Fig: 3.6 Optical See-Through HMD

3.1.8 Range and Distance

One very important distinction between different systems has to be made with respect to the area they can operate on. The first AR systems were developed as indoor systems working in restricted areas. The registration of the real and the virtual worlds in indoor AR systems can be done in a relatively simple way. It is possible to use static markers (attached to well-visible parts), relatively small 3Dmodels, a limited number of images or predict the path of the user. Outdoor AR systems have to rely on markers that exist in the real world (often with low contrast) as the required 3D models are usually much larger. One of the biggest problems in outdoor applications are weather changes, sun shining, shadows, etc. which do not exist in indoor environments. The exact position of the user can be determined in indoor AR by a variety of tracking devices providing accuracy of a few centimetres. Outdoor AR needs to use absolute or relative positioning systems, in combination with vision systems when the accuracy is not sufficient.

3.1.9 Applications

- Medical
- Entertainment
- Military Training
- Engineering Design
- Robotics and Telerobotics
- Manufacturing Maintenance and Repair
- Consumer Design
- Hazard Detection

3.1.10 Architecture

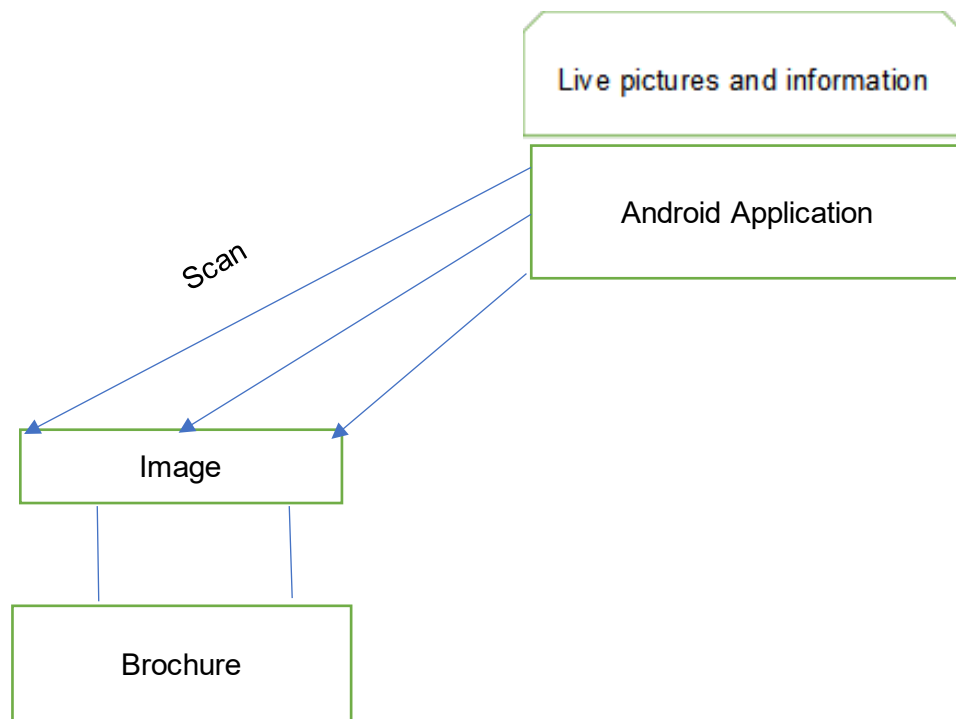


Fig: 3.7 Working architecture o brochure

3.2 PROJECT DESCRIPTION



Fig: 3.7 Main Menu

3.2.1 Brochure

This E-Brochure Application can be started by selecting “Have Brochure” in the main menu, which can take a minute or two for loading up the packages in it, depending on the hardware of your android device. At first it opens up the Camera which is Augmented Reality enabled. Now select the picture of the brochure which you wanted to know about. Scan the image with the help of the A.R camera Application. The App will Display some video walkthrough. The Working principle here is that the App, with the help of Vuforia Engine recognizes the image and then process it. After Processing the App creates an overlay in the brochure. The overlay with display live photos or videos based on the picture scanned. A picture of the brochure is given below.



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Fig: 3.8 Cover page of Brochure

3.2.2 Marker

The image that is scanned is called a marker. A marker is object that is scanned to get an overlay above it. The markers have some certain points called anchor points to recognize the area within which the overlay is included. A picture showing the Augmented reality markers and the anchor points given below and are highlighted.

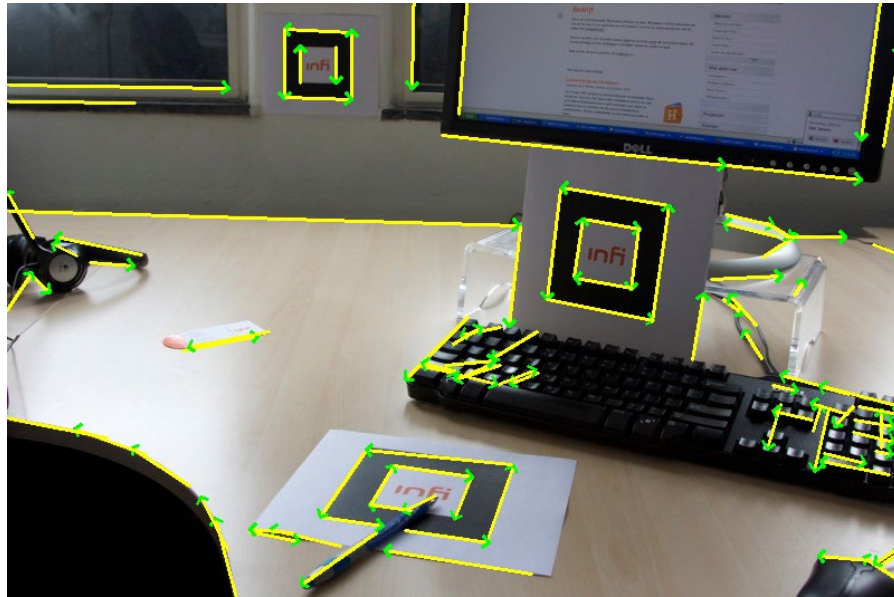


Fig: 3.9 AR markers and anchor points

- ***Failures in Registration***

Failures in registration due to

- Noise
 - Position and pose of camera with respect to the real scene
 - Fluctuations of values while the system is running
- Time delays
 - In calculating the camera position
 - In calculating the correct alignment of the graphics camera

3.3 SOFTWARES AND MATERIALS USED

3.3.1 CODE EDITORS USED

- **VISUAL STUDIO**

Microsoft Visual Studio is an integrated development environment from Microsoft. It is used to develop computer programs, as well as websites, web apps, web services and mobile apps. Visual Studio does not include any source control support built in but it defines two alternative ways for source control systems to integrate with the IDE.

3.3.2 PROGRAMMING LANGUAGES USED

- **C#**

C# is a simple, modern, general-purpose, object-oriented programming language developed by Microsoft within its .NET initiative led by Anders Hejlsberg. This tutorial will teach you basic C# programming and will also take you through various advanced concepts related to C# programming language

3.3.3 SDK USED

- **Vuforia**

Vuforia is an augmented reality software development kit (SDK) for mobile devices that enables the creation of augmented reality applications. It uses computer vision technology to recognize and track planar images (Image Targets) and simple 3D objects, such as boxes, in real time. This image registration capability enables developers to position and orient virtual objects, such as 3D models and other media, in relation to real world images when they are viewed through the camera of a mobile device

Vuforia Engine offers advanced computer vision and a wide range of functionality to help power some of the most innovative AR applications. As the expectations for AR grows, so does the demand on the technology. We strive to provide our customers and the developer community not only with new ways to create AR experiences

- Introduction of our new feature: External Camera
- Support for ARCore 1.4
- Enhanced tracking for Model Targets
- Increased ability to detect small targets
- Support for DragonBoard™ 410c

- ***Unity***

Unity is a cross-platform game engine developed by Unity Technologies, the engine can be used to create three-dimensional, two-dimensional, virtual reality, and augmented reality games, as well as simulations and other experiences. The engine has been adopted by industries outside video gaming, such as film, automotive, architecture, engineering and construction. Unity gives users the ability to create games and experiences in both 2D and 3D, and the engine offers a primary scripting API in C#, for both the Unity editor in the form of plugins, and games themselves, as well as drag and drop functionality.

- ***Supported platforms***

Unity is a cross-platform engine. The Unity editor is supported on Windows and macOS, with a version of the editor available for the Linux platform, albeit in an experimental stage, while the engine itself currently supports building games for more than 25 different platforms, including mobile, desktop, consoles, and virtual reality. Platforms include iOS, Android, Tizen, Windows,[Universal Windows Platform, Mac, Linux, WebGL, PlayStation 4,PlayStation Vita, Xbox One,3DS, Oculus Rift, Google Cardboard, Steam VR, PlayStation VR, Gear VR, Windows Mixed Reality, Daydream,

Android TV, Samsung Smart TV, tvOS, Nintendo Switch, Fire OS, Facebook Gameroom, Apple's AR Kit, Google's AR Core, Vuforia, and Magic Leap.

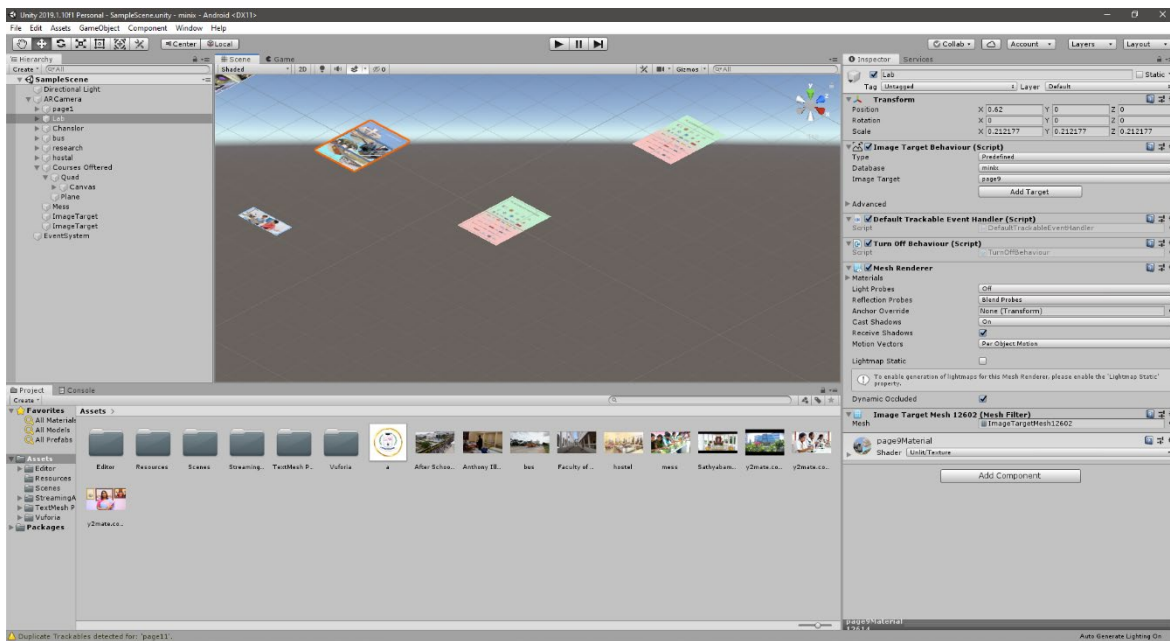


Fig: 3.10 Unity Application

3.4 METHODS

3.4.1 *Button.onClick()*

With Unity, you can create Interactive Button elements with the Button.onClick () method. In this application the Button.onClick () method are used a Button to a target object in the augmented field.

3.4.2 *menuController()*

With Unity, you can create Interactive Button elements with the Button.onClick () method. In this application the Button.onClick () method are used a Button to a target object in the augmented field.

3.4.3 *gyroCamera()*

This method is used to control the camera in the 360* Augmented Reality world using gyroscope in the mobile Phones.

3.4.4 *sphereChanger()*

For Interaction and movement in the virtual world, I have used sphere to recreate an environment, in order to move through the scenes, this method is used to navigate through places.

3.4.5 *mapurl()*

This method is used to link various events, for the application, like map linking.

CHAPTER 4

RESULTS AND DISCUSSION, PERFORMANCE ANALYSIS

4.1 WORKING MODULE

4.1.1 *Splash Screen and Main Menu*

The Android Application opens up by loading the Interface into the memory. The Unity Splash screen will Show up, and the menu is loaded on screen.

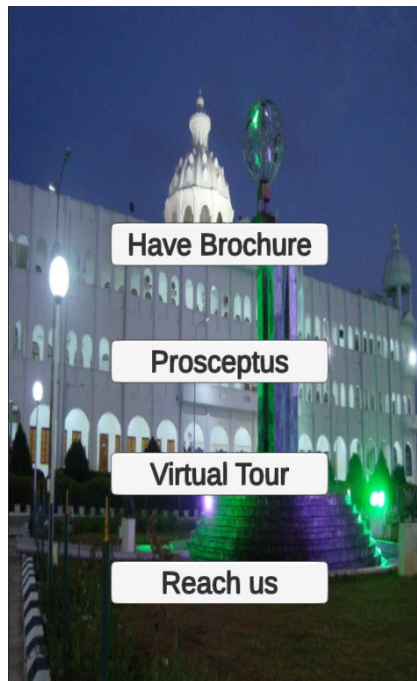


Fig: 4.1 Application Startup Menu

4.1.2 *Have Brochure screen*

The Android Application opens up by loading the Interface into the memory. The AR scanner will not open until the media files are loaded completely. After the application is fully loaded the Augmented Reality Camera opens up. It has a Vuforia logo at the bottom left corner. The screenshot of the startup screen is given below.



Fig: 4.2 Brochure Camera Screen

4.1.3 Image recognition

Move the Camera towards the brochure or the image target or the marker. If an image is recognized by the application as a marker its then creates an overlay above the image marker. There is a play button to start the media that is to display on the marker. A screen shot of the recognized marker is shown below.



Fig: 4.2 Overlay over the recognized image

4.1.4 Working

After the image scanning is successful. A play Button will appear on the screen. Select the button to start the media to play. Once the media starts to play, it will continue to play till it completes it. If there are more than one marker in an area then it will recognize the most accurate marker in the brochure. A screenshot of the application is displayed below where the marker is recognized and the media is being played.



Fig: 4.3 A video is being played over the scanned marker

4.1.5 Virtual Tour

This Application will also allow the user to get a virtual feel of the environment of the campus, when you select the Virtual tour on the main menu, You will load into the tour scene, It has a small reticle in the center, and you can move around, by moving your mobile phone and looking at the places you need to. To go to a nearby place you have to point at the bird icon, and tap the screen to go to that nearby place, Here the users can get to see the areas virtually.



Fig: 4.4 Virtual Tour Scene

4.2 RESULT

This application was tested and used on different devices like Xiaomi Redmi Note 4, The application worked fine and is stable. The application worked fine both in landscape and portrait modes

4.2.1 UNIT TESTING PHASE

Fig: 4.4 Table of Test Case Results

TEST CASE	EXPECTED RESULT	PASS/FAIL
Application start-up	Should load up the files and start the AR camera.	PASS
On scanning the Image	An overlay should appear	PASS

Marker	with a button on the marker	
On pressing the play button	The media should start playing	PASS
On completion	The media should stop playing	PASS

CHAPTER 5

CONCLUSION AND SUMMARY

5.1 SUMMARY

The application is very simple. It can be easily used by any users and does not require any prior knowledge in any language. The project can be used by any person who have no idea on the university to gain some information on it.

5.2 CONCLUSION

Augmented reality is far behind Virtual Environments in maturity. Several commercial vendors sell complete, turnkey Virtual Environment systems. However, no commercial vendor currently sells an HMD-based Augmented Reality system. A few monitor-based “virtual set” systems are available, but today AR systems are primarily found in academic and industrial research laboratories.

Augmented Reality is a relatively new field, where most of the research efforts have occurred in the past four years. Because of the numerous challenges and unexplored avenues in this area, AR will remain a vibrant area of research for at least the next several years

5.3 FUTURE SCOPE

Augmented Reality has a great future as it promises better interaction with real and virtual world. It is a breakthrough technology that could considerably ease execution of complex operations. Augmented Reality mixes Virtual and Actual Reality, making available to the user new tools to ensure efficiency in the transfer of knowledge for several processes. In this application, after being made stable can be updated with more new features and information. It can also be combined with the main application for easy access. This project is done with the help of advanced Augmented Reality technology, object recognition to provide information about the surrounding real world of the user becoming interactive and digitally manipulee

5.4 REFERENCES

- 1) <https://developer.vuforia.com/license-manager>
- 2) <https://unity.com/madewith>
- 3) <https://helpx.adobe.com/in/photoshop/using/whats-new.html>
- 4) <http://www.123seminarsonly.com/CS/Augmented-Reality.html>
- 5) https://www.researchgate.net/publication/27344741_Augmented_Reality_Technology