Game Based On Augmented Reality

Shivam Limaye[1], Tejas Deshpande[2], Vijay Iyer[3], Professor Bushra Shaikh[4]

[1,2,3,4] Department of Information Technology Engineering, SIES Graduate School of Technology, Nerul, Maharashtra, India

---

ABSTRACT

Augmented reality (AR) is a live, direct or indirect, view of a physical, real-world environment whose elements are augmented by computer-generated sensory input such as sound, video, graphics or GPS data. It's immersion of the real environment and graphics made on the computer, in which a view of reality is modified (possibly even diminished rather than augmented) by a computer. As a result, the technology functions by enhancing one's current perception of reality. It is a new technology in the field of Computer Graphics. One can enrich a simple camera feed with 3 dimensional model mapped on it. The project is a game based on the concept of AR. It would have the real life components (Special cards for the game), mapped with 3D models rendered with high end graphic softwares.

Keywords: Augmented reality, Unity game engine, Character Modelling.

I. INTRODUCTION

Today's world is filled with all sorts of technologies. With the amount of research in the hardware, humans have reached at a point where smartphones are delivering a performance equivalent of a PC. Due to this, the power of software has increased manifold. The games available for the high end smartphones are the size of couple of GBs. Also, due to the powerful hardware, developers now have the luxury of implementing any idea they have, which, a few years ago they would've only dreamt of. The advent of latest gaming methods coupled with today's gaming experiences is what inspires the idea of this paper.

Currently, the hot topic in the gaming industry is Augmented Reality(AR). This is a concept that allows 3D/virtual objects to appear in your field of view. The AR technologies have been taken up by various tech giants into developing their products. For instance, Microsoft has successfully built the HoloLens, which is the best product out in the market suing AR. Coming back to the gaming side of it, there's the famousPokémon GO. Drawing inspiration from this game, the proposed system incorporates the concept of AR into a card-based game.

II. THE TRADITIONAL GAME

A game is structured form of play, usually undertaken for enjoyment and sometimes used as an educational tool. Games are distinct from work, which is usually carried out for remuneration, and from art, which is more often an expression of aesthetic or ideological elements. However, the distinction is not clear-cut, and many games are also considered to be work (such as professional players of spectator sports or games) or art (such as jigsaw puzzles or games involving an artistic layout such as Mahjong, solitaire).

What the proposed game plans to do is to add a whole new dimension of Augmented Graphics to the traditional trump card game. There will be various stats of cards, and the card with the lower attributes will lose the battle, in a modern way.

III. AUGMENTED REALITY

A. What Is Augmented Reality?

Augmented Reality applications combine images, [1]2-D or 3-D virtual objects with a 3-D real environment in real time. Virtual computer generated and real objects appear together in a real time system in a way that the user sees the real world and the virtual objects superimposed with the real objects. The user's perception of the real world is enhanced and the user interacts in a more natural way. The virtual objects can be used to display additional information about the real world that

are not directly perceived. Paul Milgram and Fumio Kishino introduced the concept of a Virtuality Continuum classifying the different ways that virtual and real objects can be realized. In this taxonomy scheme Augmented Reality is closer to the real world. Ronald Azuma defines augmented reality systems as those that have three characteristics: 1) combines real and virtual; 2) interactive in real time; 3) registered in 3D.

 In general, augmented reality applications fall in two categories: geo-base and computer vision based. Geo-based applications use the mobile'sGPS, accelerometer, gyroscope, and other technology to determine the location, heading, and direction of the mobile device. The user can see overlapping computer generated images onto a real world in the direction he is looking at. However, this technology has some problems. The major problem is imprecise location which makes difficult for example the creation of photo overlays. Computer vision based applications use image recognition capabilities to recognize images and overlay information on top of this image. These can be based on markers, such as QR (Quick Response), Microsoft tags or LLA that recognise an image that overlays the data.

B. Tools and Techniques:

There are many options available for Augmented Reality which can be selected as per the need of an organization: [2]

- ➢ ARPA SDK
- ➢ DROID AR
- ➢ METAIO SDK
- ➢ VUFORIA SDK
- ➢ WIKITUDE SDK

Our system mainly focuses on the Vuforia SDK, due to its immense popularity and easy integration.

IV.   VUFORIA SDK

VUFORIA SDK tool is one of the tools used for Big Data Analysis.

A. Vuforia SDK:

Vuforia is an Augmented Reality Software Development Kit (SDK), [3] 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 these are viewed through the camera of a mobile device. The virtual object then tracks the position and orientation of the image in real-time so that the viewer's perspective on the object corresponds with their perspective on the Image Target, so that it appears that the virtual object is a part of the real world scene.

The Vuforia SDK supports a variety of 2D and 3D target types including 'marker less' Image Targets, 3D Multi-Target configurations, and a form of addressable Fiduciary Marker known as a Frame Marker. Additional features of the SDK include localized Occlusion Detection using 'Virtual Buttons', runtime image target selection, and the ability to create and reconfigure target sets programmatically at runtime.

Vuforia provides Application Programming Interfaces (API) in C++, Java, Objective-C, and the .Net languages through an extension to the Unity game engine. In this way, the SDK supports both native development for iOS and Android while also enabling the development of AR applications in Unity that are easily portable to both platforms. AR applications developed using Vuforia are therefore compatible with a broad range of mobile devices including the iPhone (4/4S), iPad, and Android phones and tablets running Android version 2.2 or greater and an ARMv6 or 7 processor with FPU (Floating Point Unit) processing capabilities.

B. Why is it emerging now?

Vuforia SDK is emerging as it recognizes various things like:

- Objects: Recognize and track a broader set of objects so you can bring toys to life and add digital features to consumer products.

- Images: Images with sufficient detail including magazines, advertisements, and product packaging can be recognized. The Vuforia Target Manager helps you analyze and improve your images to optimize your app's performance.

- User Defined Images: User-defined images give users the ability to create basic AR experiences that work anywhere. It's as simple as taking a picture of an everyday object, such as a book page, poster or magazine.

- Text: Supports English word recognition from a standard database of ~100,000 words or a custom vocabulary defined by the developer.

- VuMarks: VuMarks allow the freedom for a customized and brand conscious design while simultaneously acting as an AR target. VuMark also provides a simple method for encoding data such as a URL or a product serial number.

V. ARCHITECTURE AND WORKING

The architecture of how the AR based Game will be Implemented is shown in Fig1.

Working:

The players will place one card each on a table. Then, upon opening the app in their android phones, they will hover the camera above these cards. When this happens, the objects in the playing cards will appear on top of these cards, which can be seen on the phone. Then, depending upon various attributes of the cards, the card with the better ones will knock down the other character through an animation. Augmented Reality is the technology through which all this is possible. The inclusion of AR makes the game more engaging and fun to play.

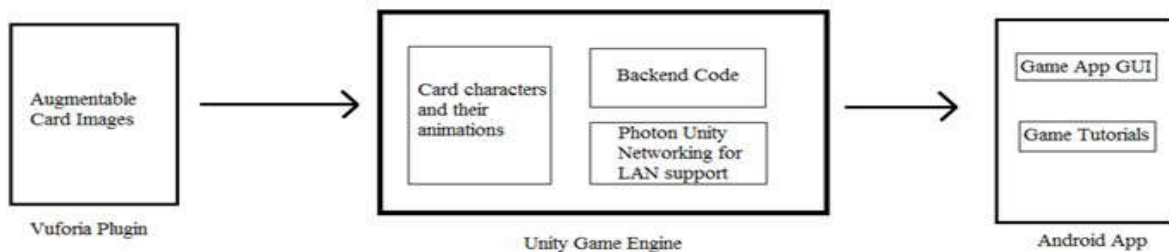Every game consists of a front end a back end. The implementation of these is described below.

Fig. 1: Architecture of proposed system

A. Front End

This comprises of the main screens and components that the user directly interacts with. As already mentioned, the characters spawn on top of the card of the user. We have modelled special characters for the purpose of this game. These characters battle using the various attributes that have been assigned to them.

The game is a turn-by-turn style of play, thus each character attacks by using various animations. The animations are smooth and engaging, thus allowing the user to enjoy the game. At the end of the game, the player whose character survives the battle is the winner.

B. Back End

To create and augment the character models on top of the card, Vuforia plugin needs an 'Image Target', which is an image of the card itself. The cards have been custom designed, which will be uploaded to the Vuforia database. Here, Vuforia converts these images into trackable targets by inserting what is called as 'features'. The more features in an image, the easier it is for Unity to track them. These targets are then downloaded and imported into Unity. The models are thus able to Augment themselves upon the cards.

Game Play Simulation: Unity requires various scripts attached to different models of the game in order to connect the back end with the Front End. We have written various C# scripts, which contain all the business logic and the data required to simulate the battle smoothly. For instance, the energy bar for the players has been constructed as two images - one placed on top of the other. Now, there are various parameters like

- CurrentHealth
- MaxHealth
- HitPoints

HitPoints is the damage that has been dealt to the character by the enemy. So, the health bar of the character has to reduced. We have used a ratio based system, which calculates the ratio as follows:

$$CurrentHealth = CurrentHealth - HitPoints$$
$$Ratio = CurrentHealth / MaxHealth$$

The image on top is then re-scaled to get the reduced health. The game consists of many such scripts, that interact with each other, thus resulting in a seamless gaming experience.

VI. UNITY PLATFORM

Unity is a cross-platform game engine developed by Unity Corp.[5] Technologies and used to develop video games for PC, consoles, mobile and websites.

Unity allows specification of texture compression and resolution settings for each platform that the game engine supports, and provides support for mapping, reflection, parallax mapping, screen space ambient occlusion (SSAO), dynamic shadows using shadow maps, render-to-texture and full-screen post-processing effects. Unity is notable for its ability to target games to multiple platforms. Within a project, developers have control over delivery to mobile devices, web browsers, desktops, and consoles. Supported platforms include Android, Apple TV, BlackBerry 10, IOS, Linux, Nintendo 3DS line, OS X, PlayStation 4, PlayStation Vita, Unity Web Player (including Facebook), Wii, Wii U, Windows Phone 8, Windows, Xbox 360, and Xbox One. It includes an asset server and NVidia's PhysX physics engine. Unity Web Player is a browser plugin that is supported in Windows and OS X only, which has been deprecated in favour of WebGL.

The reason as to why Unity has been chosen as the main component to this system is that it is the best free Game Development Engine currently. The opportunities that it offers are endless. There is a well-established community wherein game developers like ourselves will look into in case of any queries. Another reason is that since Unity is a well-established platform, there are many APIs that are available as plugins. Our game is using two of those: Vuforia and Photon Unity Network. The Photon Unity Network offers various built-in libraries that take multiplayer gaming to the next level.

VIII. CHALLENGES

There are various challenges that will be faced while creating this game. The foremost challenge is to relay data in real time to the two phones that are connected via LAN. Another challenge is to simulate the animations in a synchronized fashion so that the animated battle looks realistic.

IX. FUTURE SCOPE

The next step is incorporating the Photon Unity Network [4] which handles the LAN gaming components in Unity. Another alternative to extend the game is to add new characters having different abilities and attributes. This will cause the users to have even more fun, by trying out the best possible counter card to that of the opponent.

CONCLUSIONS

Interaction between the graphics and real life environment enhances the domain for gaming interfaces. Our system adds another dimension to the trivial gaming experience. By meshing together, the Unity Platform and the PUN, we will be able to deliver a high quality application.

ACKNOWLEDGMENT

REFERENCES

[1]. What is Augmented Reality Retrieved from:https://www.ijarcsse.com/docs/papers/Volume_3/5_May2013/V3I4-0388.pdf

[2]. Vuforia SDK. Retrieved from: https://developer.vuforia.com/downloads/sdk

[3]. Top 5 tools for augmented reality in mobile apps. Retrieved from:https://www.developereconomics.com/top-5-tools-for-augmented-reality-in-mobile-apps

[4]. Photon Unity Network. Retreived from: https://www.photonengine.com/en/PUN

[5]. What is Unity Platform. Retrieved from: https://en.wikipedia.org/wiki/Unity