

MARKER BASED AUGUMENTING SYSTEM

J Component Project Report for
ITE1014 – Human Computer Interaction
(B1+TB1)

Bachelor of Technology **In** **ECE with Specialization in Internet of Things and Sensors**

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INTRODUCTION

Motivation

Augmented reality, that was once a thing of future is now here. We are on the cusp of revolution that will soon change the way we work, play and live. It will affect all the aspects of our life, including industries ranging from education and healthcare, to commerce and entertainment. Augmented Reality India has shown that AR has a multitude of applications. Augmented Reality integrates the virtual and the real world, to show virtual things in real-time and in real environment. Building games for mobile devices is becoming normal, whereas building mobile games with a 3D depth and immersive experience is perfectly done with AR and Unity 3D.

Background

- Somesh K S (16BIS0091) – Strong in designing 3D models, programming and Vuforia API
- Arun Kumar Verma (16BIS0096) – Strong in designing 3D models (Unity3D), Vuforia API, Programming, Requirement analysis and giving out the value points for project building and Unity 3D integration

Objective

1. Build an fully immersive gaming experience using Augmented Reality
2. Build a platform for next level game development
3. Build a game which is highly compatible with latest technology hardware and inculcate a new way of gaming and learning
4. Make people aware of Augmented Reality and use this technology in other domains

Organization of the report

Project description and Goals – Precise and brief description of the project and the goals achieved with this project.

Technical specification – List of all the components used for this project and the pictures of the products used for a better reference.

Design approach and details – Detailed block diagram of the project and the codes and standards followed in this project.

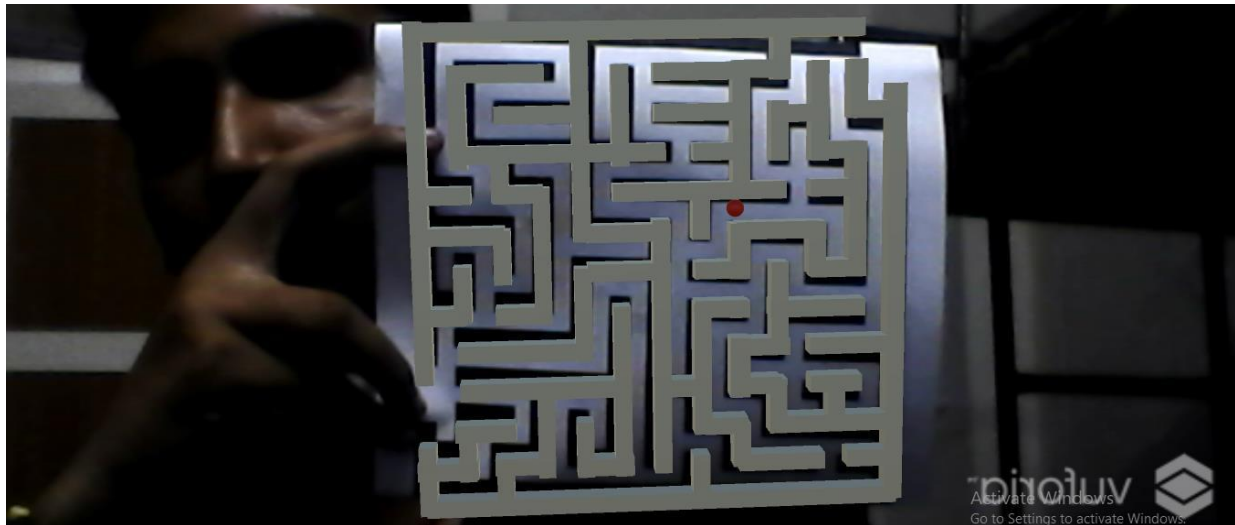
Pictures of setup – Visual presentation of the project along with the components

Reference – Inspiration and ideation web URL's for this project

PROJECT DESCRIPTION

This project will describe about an Augmented reality mobile application made with Unity 3D and Vuforia. This game is an interactive ball maze that can be built for Android as well as iOS platforms. It uses the front camera of the mobile device to track the image target which will be printed or a digital version will do. This application can also be used with Google cardboard, for complete VR/AR experience. The application uses pre-trained image recognition model for image target detection, later the model is being downloaded and made offline during the export of Android application.

Note - Print the picture of the maze above, that will be the image target that your camera is going to track for better accuracy.



GOALS

The goal of the project is to build an independent Augmented reality application which is in gaming field for mobile devices. This is an immersive gaming experience platform which can be used for future development of next generation games.

SOFTWARE SPECIFICATIONS

1. Unity 3D -

Unity is a cross-platform game engine developed by Unity Technologies, first announced and released in June 2005 at Apple Inc.'s Worldwide Developers Conference as an OS X-exclusive game engine. As of 2018, the engine has been extended to support 27 platforms. The engine can be used to create both three-dimensional and two-dimensional games as well as simulations for its many platforms.

Unity gives users the ability to create games 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.



The engine has support for the following graphics APIs: Direct3D on Windows and Xbox One; OpenGL on Linux, macOS, and Windows; OpenGL ES on Android and iOS; WebGL on the web; and proprietary APIs on the video game consoles. Additionally, Unity supports the low-level APIs Metal on iOS and macOS and Vulkan on Android, Linux, and Windows, as well as Direct3D 12 on Windows and Xbox One.

2. Vuforia Augmented Reality SDK:

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. 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 the perspective on the Image Target. It thus appears that the virtual object is a part of the real-world scene.



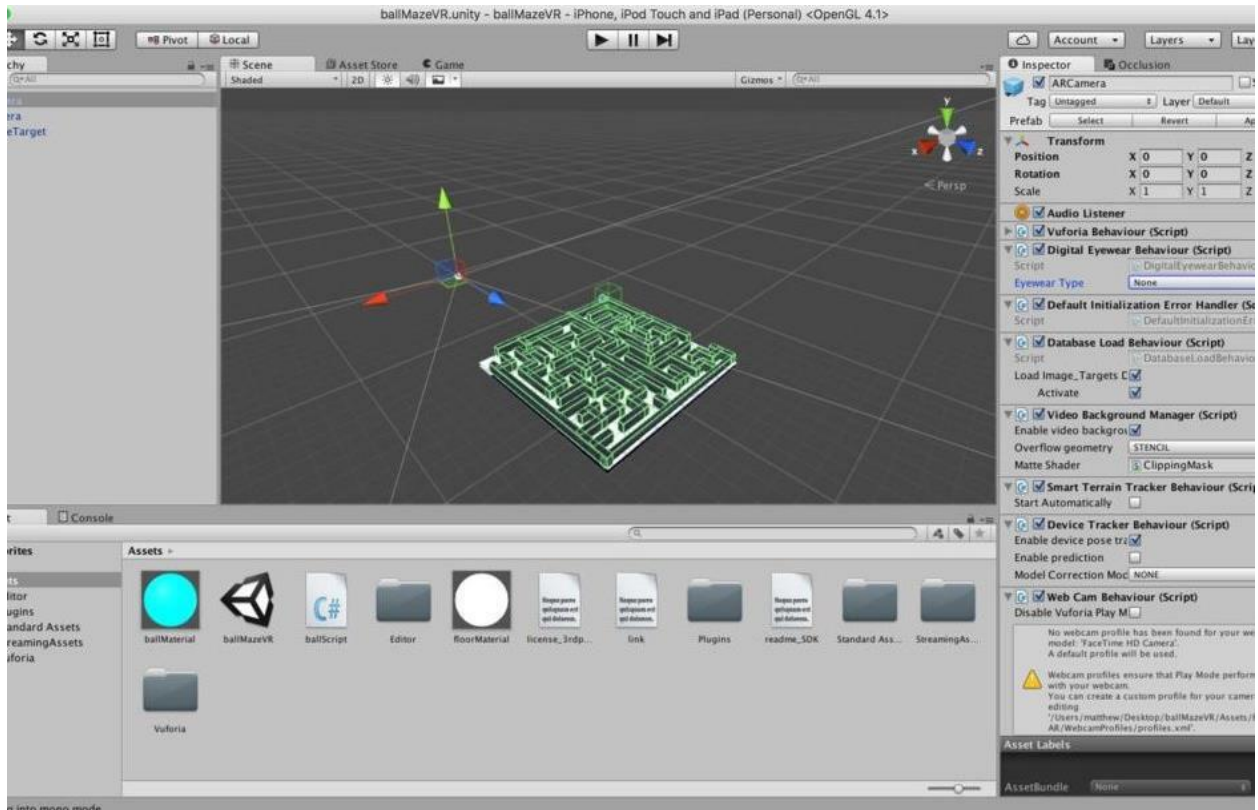
DESIGN APPROACH AND DETAILS



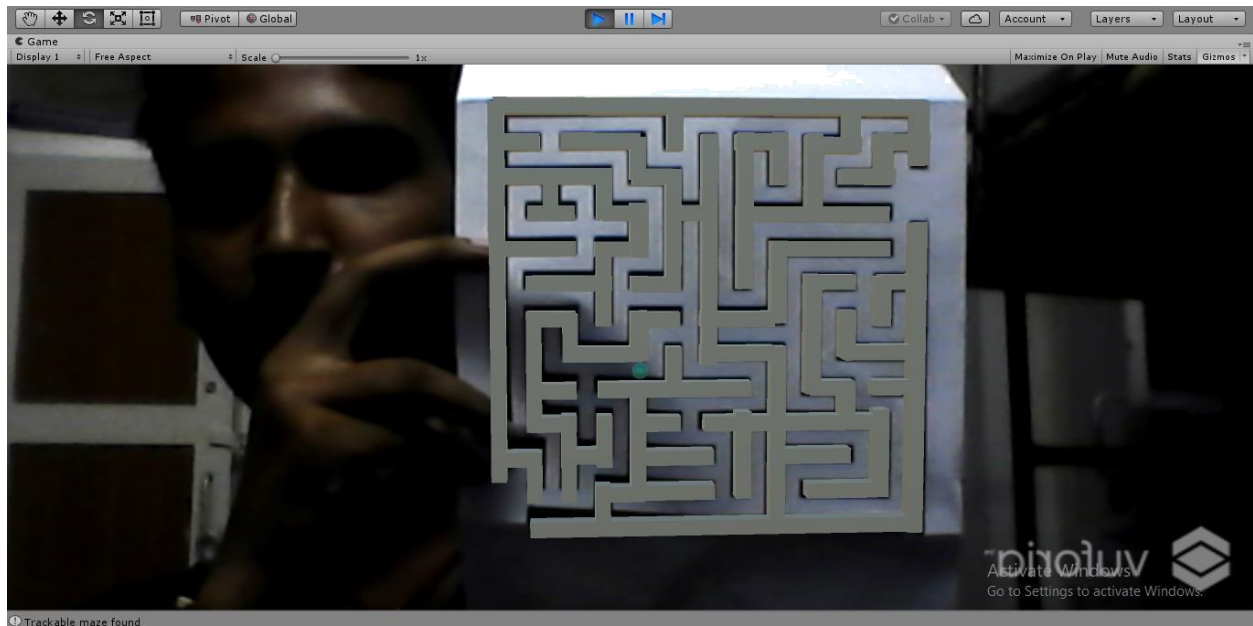
- Create a developer account on Vuforia and add the below picture to your image target database. Download a copy of the database for Unity 3D as well as the Vuforia plugin for Unity. (www.Vuforia.com)
- Download Unity3D if you don't already have it and make sure to add the modules for Android or IOS depending on what you want to build. (www.Unity3D.com)
- Install Android SDK and other supporting dependencies or iOS dependencies for exporting the respective mobile application.
 - Import the Vuforia plugin and your image database into Unity.
 - In the Vuforia folder, click and drag the ARCamera prefab into the hierarchy.
 - Find the imageTarget prefab in the same folder and drag it into the hierarchy as well.
 - In the scene, move the imageTarget prefab away from the camera by a few units.
 - Drag it onto the ARCamera prefab (making it a child).
 - Using cubes create a 3D copy of the maze on top of the image target.

- Make a small sphere and create a new material.
- Drag the new material onto the sphere and make it a bright color.

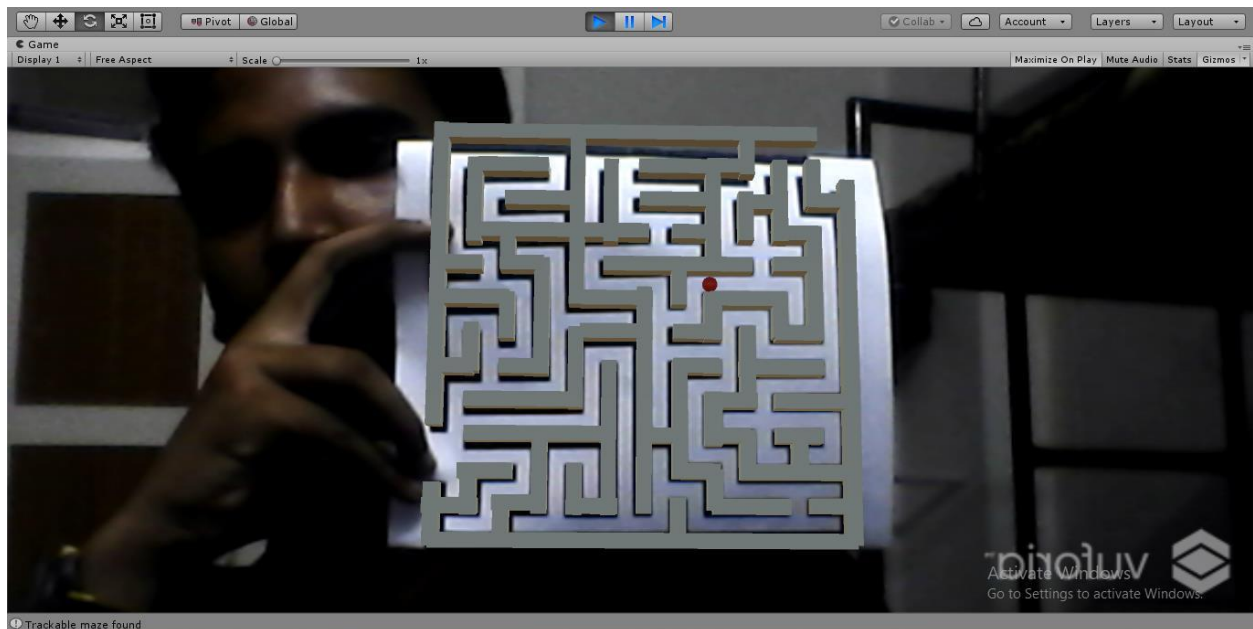
PICTURES OF THE SETUP



This is the overall setup after modelling the maze and importing the c# script within the Unity setup



Vuforia plugin detecting the maze and drawing the 3D model over it



Unenrolled people are detected in such manner

Unity C# Ball script

```
using UnityEngine;
using System.Collections;

public class ballScript : MonoBehaviour {

    public GameObject plane;

    public GameObject spawnPoint;

    // Use this for initialization
    void Start () {

    }

    // Update is called once per frame
    void Update () {

        if (transform.position.y < plane.transform.position.y - 10) {

            transform.position = spawnPoint.transform.position;

        }

    }

}
```

REFERENCES

- [1] Vuforia Official, **"Getting started with Vuforia on Unity 3D"**,
<https://library.vuforia.com/articles/Training/getting-started-with-vuforia-in-unity.html>
- [2] Blender 3D modelling , **"Fundamentals of 3D modelling using blender"**,
<https://www.blender.org/support/tutorials/>
- [3] Android Environment setup, **"Setting up Android environment for Unity3D for applications"**, <https://docs.unity3d.com/Manual/android-sdksetup.html>