GAME DEVELOPMENT IN UNITY 3D USING C#

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BTech Project Report

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by

Debashis Pradhan **Roll No. CSE201210268**

Ankur Upadhyay **Roll No. CSE201216265**

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Under the guidance of

Mr. Debanand Kanhar

NATIONAL INSTITUTE OF SCIENCE & TECHNOLOGY

Palur Hills, Berhampur- 761008, Odisha, India

ABSTRACT

The only thing more interesting than playing games is designing games. The goal of this project is to examine how video games are designed and to see how different game mechanics work and how to use them in the development of a game. We are concerned in general with development inside Unity, a 3D game engine which has become not only popular but a standard in the gaming industry. The project describes how the interface of Unity can be used with ease to quickly generate game environments and script game logic, interaction and mechanics.

A game concerned with the Operation Neptune Spear, executed by the highly decorated Navy Seal Commandos of the US army to capture and execute Osama Bin Laden. The game has been built up from concept to art design to implementation to publishing. The Player will be presented with a chopper to execute the mission organized into four levels as per the storyline. The game components were built in Unity, using C#. Blender and Photoshop were also used as per requirement. The final project was built onto the android Platform.

ACKNOWLEDGEMENT

We would like to take this opportunity to thank all those individuals whose invaluable contribution in a direct or indirect manner has gone into the making of this project a tremendous learning experience for us.

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Debashis Pradhan

Ankur Upadhyay

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER 1
PROJECT OVERVIEW

1.1 Game Development in Unity

Unity is a cross-platform game engine developed by Unity Technologies and used to develop video games for PC, consoles, mobile devices and websites. First announced only for OS X, at Apple's Worldwide Developers Conference in 2005, it has since been extended to target more than fifteen platforms. It is now the default software development kit (SDK) for the Wii U.

Videogames are complex structures. Unity provides a complete workflow and a lot of help along the line, and a large set of features come in Unity's free version. Working with Unity can greatly facilitate making people with different skills work together and at different times, without interfering with each other's work.

Popularity of videos games is increasing exponentially these days .Gaming industry is attracting people of all age group .Some play it for fun and some are seriously involved in it, they are known as professional gamers. As video games become more social with multiplayer and online capability, gamers find themselves in growing social networks. Gaming can both be entertainment as well as competition, as a new trend known as electronic sports is becoming more widely accepted. Today, the impact of computer and video games can be seen in social media, television, films.

Why Unity?

i. The Power of Scripting

There are a great many game engines in existence that have a visual editor. Many of these engines lack the power required to build significant or complex games due to their canned approach to behaviours. With Unity, object behaviours aren't limited to built-in modules that come packaged with the engine. Instead, Unity allows for powerful behaviours written in any of three robust languages: JavaScript, C#, and Boo. Furthermore, all three languages can be used at the same time within a project to allow people of different

technology backgrounds to contribute to a project at the same time. The fact that the languages are used as scripts allows for fast compilation times, quick iterations, and flexibility of design. This common language approach to game development ensures that you can begin making games quickly using knowledge you already have (or is easily attained).

ii. One Source for all.

Probably the most impressive feature of the Unity engine is the ability to build your projects for multiple platforms with incredible ease. With just the simple selection of a drop down menu, Unity can build for Windows PC, Linux (new with version 4), iOS (with plugin), Mac, Android (with plugin), Web Browser, Flash (with plugin), PS3, Xbox, and Wii U.

1.2. Scope

Everyone knows that games are designed to help develop practical skills, serve as a form of exercise, or otherwise perform an educational, simulation, or psychological role. We can say that, in this fast growing world, people have very less time for refreshment, and these games will certainly will be the one of the best option. Plus, games add to the knowledge about a domain. Students have often admitted to have learnt history more from playing World War II games than from any book. A game developer who is working on a game on bees, will find that after completing his game, he has much more knowledge on bees than he could ever imagine. There are many things which are to be learnt and after applying all those things a game can be converted in to a lot more exciting, better looking, and more playable game.

1.3. Objective

1.3.1. Goal

The project concerns the development of a project from ideation to designing, coding and publishing. In this game we are using a player(helicopter) to destroy enemies. There are different controls for the player to achieve the same.

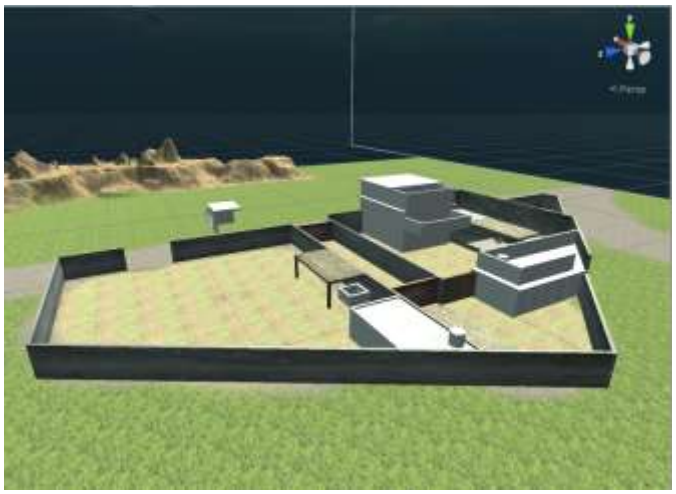
1.5.2. Core Mechanics

The player will be given the controls of a MI28 stealth helicopter. The player has to maneuver the helicopter across the various levels destroying targets and completing missions.

1.6. Unique Selling Point

The Progression and Flow of the game is unique and attention grabbing. Different levels are designed which depicts different scenarios (hills, deserts, caves). After completing all the levels player advance to the final scene to kill the High Value Target which is the main motive of the game.

Every Level is the game introduces a unique game concept. The first level deals with a desert area with a hot and humid ambience. The second level takes the player to Afghanistan. This level includes a night-vision camera on the helicopter. The third mission, set in Tora Bora caves introduces a watery terrain. The fourth mission is a proportionate model of the Abottabad compound.



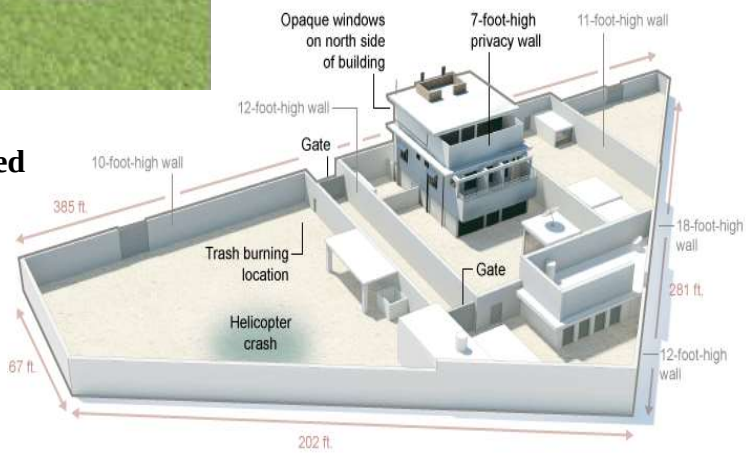


Fig 1.1 Abbottabad Scene modelled In Unity 3D

CHAPTER 2
IDEATION

2.1 Player Action

Player action revolves around the movement of player (helicopter) and shooting enemies for which buttons are provided. Player also need to keep eye on his health bar which keep on decreasing on every hit by enemies. The player can move horizontally and vertically using the D-pad controls. Tilt controls are also supported using the *Input.Accelaration* class. Tilt allows the player to rotate the helicopter.

2.2. Game World

Storyline revolves around the death of Osama bin laden, the Al-Qaeda leader. Osama was attacked several times by US armed Special Forces. In August 20, 1998 US troops attacked desert in Syria where several training camps were run by Al-Qaeda. Camps were destroyed but there was no news regarding the Al-Qaeda leader. Two years later in 2000, US planned to attack camps residing in the mountains of Afghanistan .But again Bin laden managed to escape. It was in December 2001 when confirm news of Bin Laden came about being hidden in caves of Torabora along with his troops, even this time no conformity of his death was given. Meanwhile several videos of Bin Laden came, hitting back to US about their failed attacks, thereby confirming he is still on the run. After eleven years, this time it was Abbottabad a small town in Pakistan where US intelligence agency tracked him. It was Laden's courier guy who made it happen. On May 2,2011 operation named Neptune Spear was carried out by Navy Seal team . The raid on bin Laden's compound in Abbottabad was launched from Afghanistan where he was killed in action.

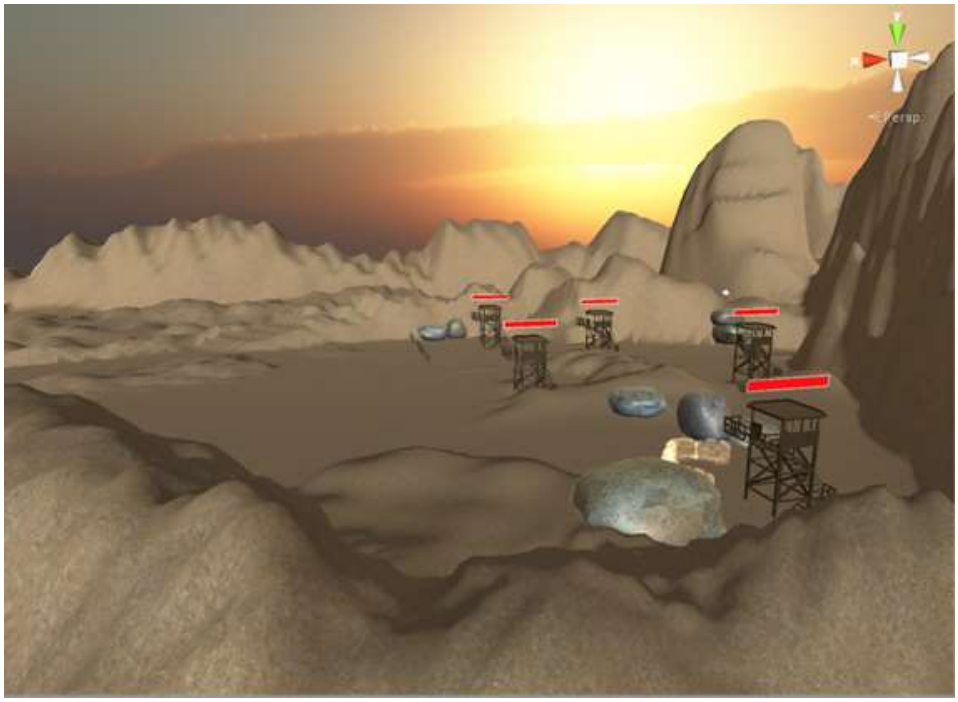


Fig 2.1 Desert Scene (Syria)

In desert Scene camps need to be destroyed.Controlling the movement of the character (helicopter) ,player need to ensure to kill all the enemies present in the scene in order to advance to the next level.

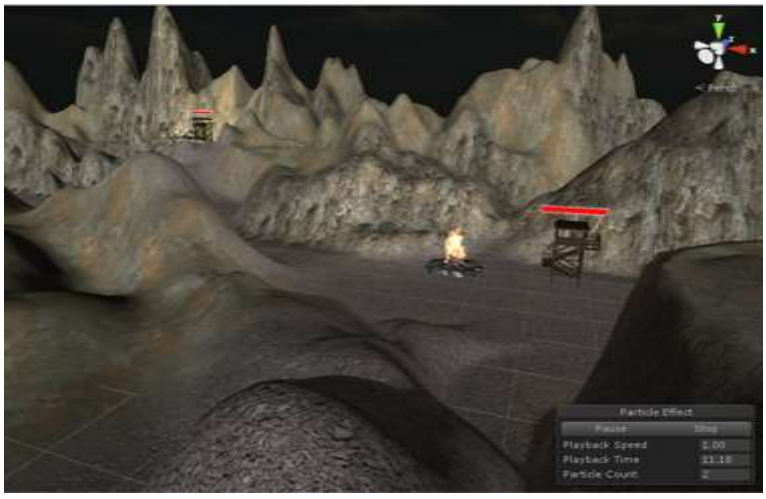


Fig 2.2 Mountain Scene (Afghanistan)

In mountain scene game is displaying the concept of night vision mode.Attack is carried out during the night.One need to destroy enemies in order to advance to the next level.

Fig 2.3 Cave Scene (ToraBora)

Above scene displays torabora caves with half of the scene covering water area. Enemies are placed in different areas of the complex cave scenerio.Scene contains look and feel of the region by displaying shrubs ,trees exactly same which can be found in the region of torabora.

Abbottabad scene, place where Bin laden was hiding from US for almost 5 years along with his family members. The main building in the compound lay on a 38,000-square-foot. Abbottabad level in the game is the last level.

2.3. Game Implementation

The Project folder has been organized into properly managed folder hierarchies. The folders contain the raw files, 3D objects, pictures, textures, imports and standard assets provided by Unity as well.

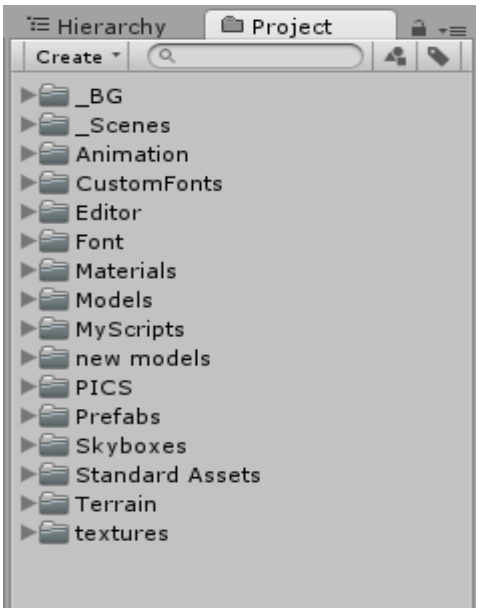


Fig 2.4. Project Folder

i. Scenes

There are a total of 11 scenes in the entire project excluding the Credits page. These are namely, TitlePage, DesertLoading, Desert, MountainLoading, Mountain, CaveLoading, Cave, AbottabadLoading,

Abottabad, TestLoading and Test.

ii. Animation

The rotating fans of the helicopter has been given a rotation animation using the Unity inbuilt animator. The animation assets are stored in this folder.

iii. Materials

Unity uses material objects to load textures onto gameObjects. These materials are automatically created or can be created inside unity while attaching texture.

iv. Models

The models folder is the collection of all the 3D objects imported from Unity, Standard Assets, Blender or other sources all in one place. 3D objects like .fbx, .blend, .3ds, .obj and .dae are supported in Unity.

v. Scripts

All the Scripts attached throughout the project are collectively contained in this folder.

vi. Prefabs

GameObjects once created in a scene can be dragged into the project folder to create a prefab. Prefabs can then be used to access the gameObjects via script, create multiple copies, access in other scenes and various other functionalities. Some of the Prefabs created are Helicopter, HeliUI, WatchTower, Missile, Bullet, LaserSight, PauseMenu etc.

Assets are downloaded from different websites like maxgames.com, canopian.com, tf3dm.com. However some of the work has been done in Blender. Standard assets are also used for textures to every scene. Some of the textures have been made in photoshop. Trees and rocks are downloaded from standard asset store of Unity.

CHAPTER 3
GAME DESIGN PROCESS

Energy detector is the most popular way of spectrum sensing because of its low computational and implementation complexities. The receivers do not need any knowledge about the primary users. An energy detector (ED) simply treats the primary signal as noise and decides on the presence or absence of the primary signal based on the energy of the observed signal.

3.1 Gameplay Level and Balance

Game play has been designed such that user find it interesting and enjoy real world experience. Player (helicopter) and enemy has been assigned health bar along with the damage capacity.

Damage capacity of bullets which is used are ten and capacity to withstand hit by a bullet is hundred. Therefore after being hit by ten bullets character is destroyed. Script to chase target is assigned to watchtowers, so when player comes within the range of watchtowers, bullet is fired towards the target object.

Every level of the game is different. In first scene action takes place in the desert region of Syria.

In the second level specially designed night vision effect is introduced in the scenes of mountains in Afghanistan.

Third level depicts the torabora caves known locally as spin ghar , is a cave complex, part of the White Mountains of eastern Afghanistan.

Abbottabad scene is the last scene in which compound of Bin laden is shown where he used to live with his family. The scene depicts the clear picture of compound including farms, garage, residential area etc.

3.2 Game GUI

Fig 3.1 In-Game GUI

As gamers and game developers we know that immersion is everything. When you're immersed you lose track of time and become involved in what the game is presenting. A major factor in what makes or breaks immersion is how easy it is for your player to convert an idea into an in-game action -- that is, how fluid your game's User Experience (UX) is and how well-designed its User Interface (UI) is. A game hurts itself by providing too little information or too much, requiring too many inputs, confusing the player with unhelpful prompts or making it hard for a new player to interact. Poor UI design can even break the game completely.

Fig 3.2. Title Menu

As far as the users are concerned user interface plays a prominent role in adapting game's environment and features. Navigation bar is provided for the movement of player .Center round button is used for the movement around 360 degrees .Rightmost bar is used for firing bullets. UI also depicts the movement bar which gets the user to know about movement in different directions. Health bar depicts the life of player which keeps on decreasing on being hit by the bullet. Health bar has total damage point of hundred after which player is destroyed.

3.3 Level Hierarchy

i. Camera Setup

Virtual camera system set up is used which aims at controlling a camera to display a view of a 3D virtual world. Interactive system is designed which allows the player to directly change the view. It is a third person view which refers to a graphical perspective rendered from a fixed distance behind and slightly above the player character.

Fig 3.3 Camera Setup

Fig 3.4. Night Vision Camera

ii. Player Setup

Player (helicopter) is capable of moving in all directions which can be controlled using the navigation bar. Up and down movements can be controlled by tilting mobile screen. Collider is attached so as not to collide with different objects in the scene.

The Helicopter is a physics rigid body in the scene. It has a rigid body component attached which allows it to have mass, drag, angular drag, gravity and kinematic controls. The helicopter object is further composed of child objects - MI28Model, bulletspawn, and front. The model consists of the blender 3D object and its meshes and textures. The front is a point in front of the helicopter which is the target to look at. The bullet spawn is the point from which the bullets are instantiated.

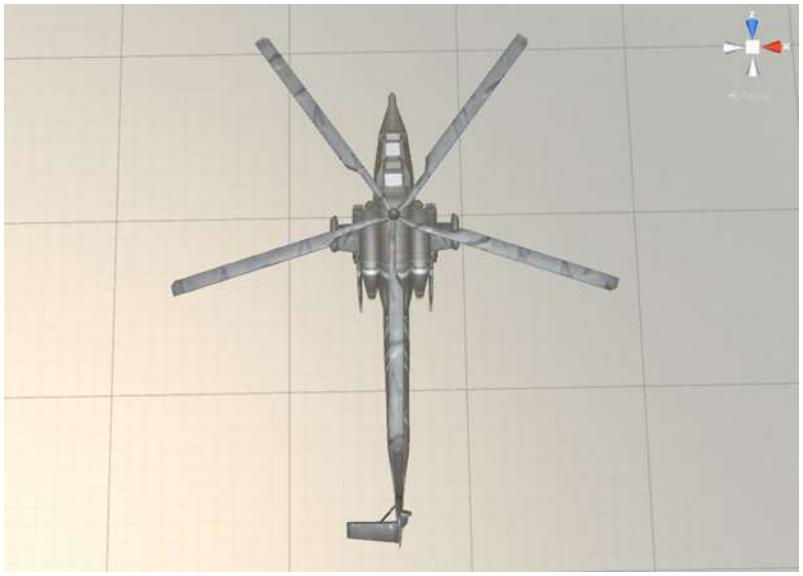


Fig 3.5. Helicopter Model (MI28)

iii. Enemy Setup

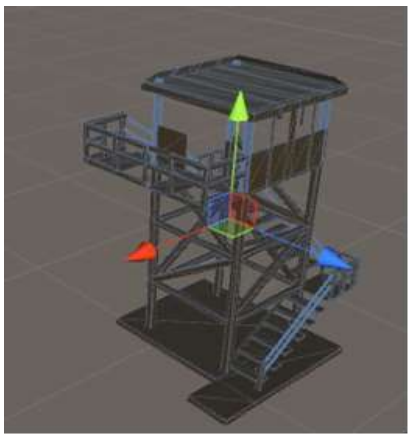
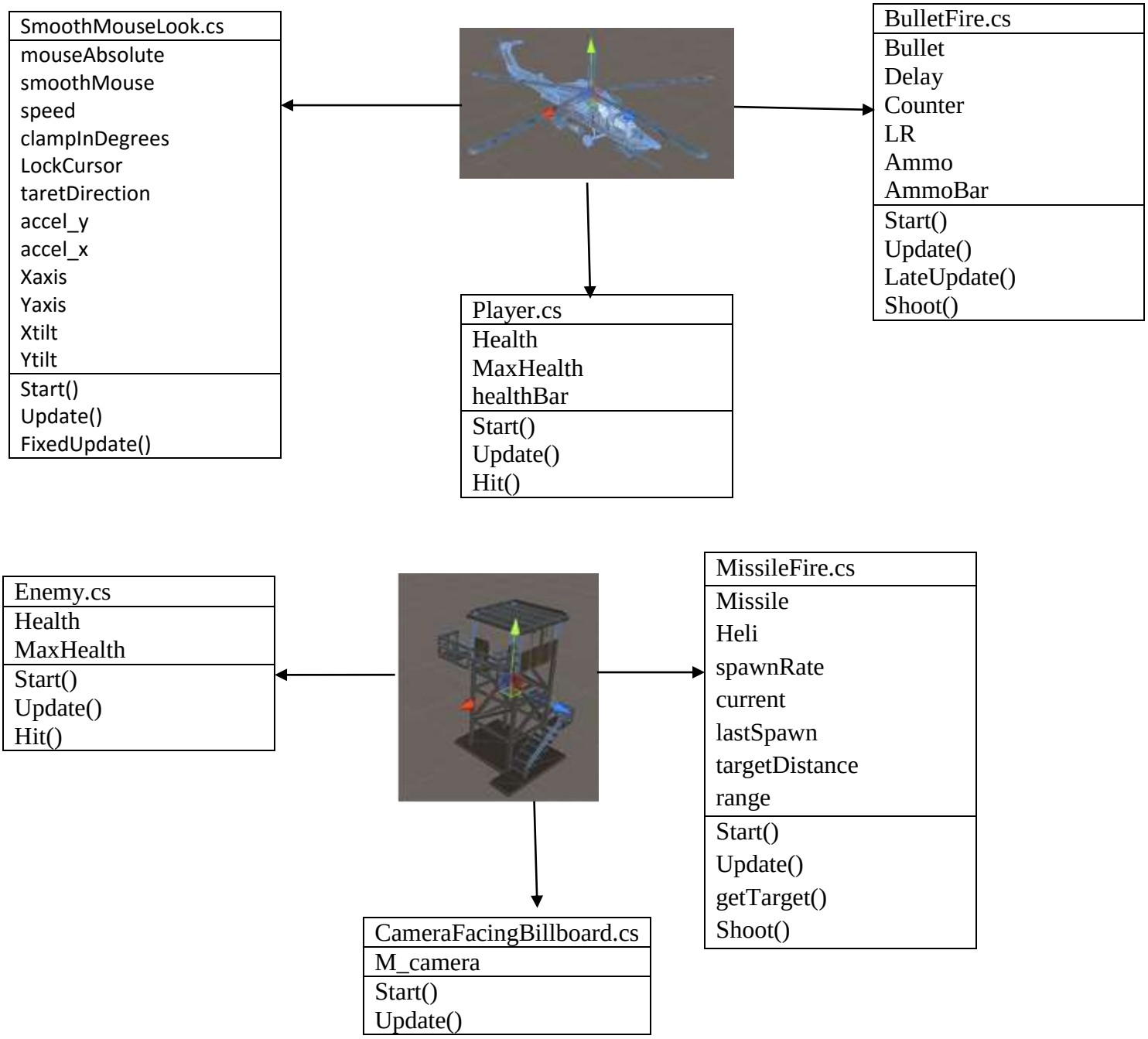
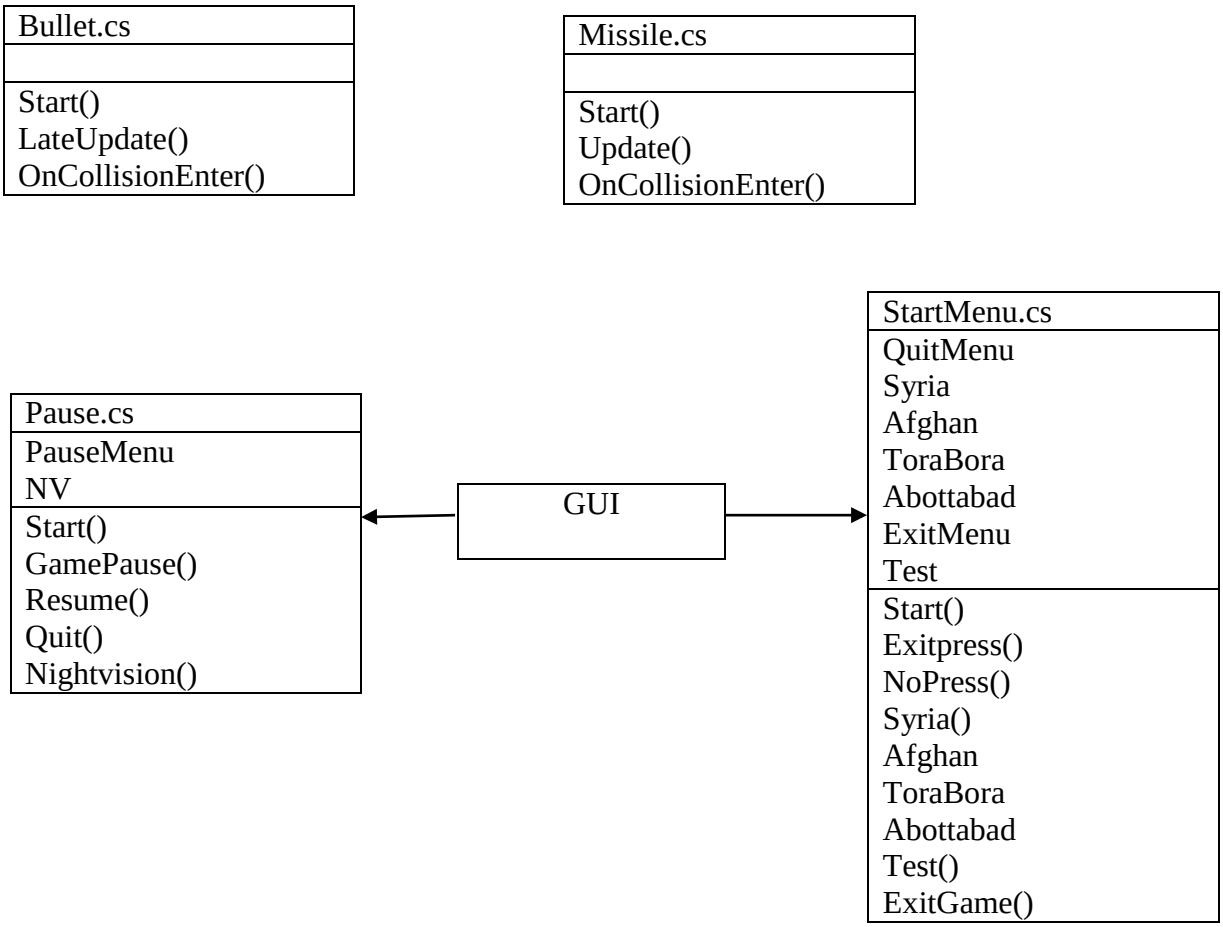


Fig 3.6. Watch Tower Model

The enemies are basically watch tower 3D models created and imported from Blender. Watchtowers shoot the helicopter when it is in the range of 150 units. The watchtower gameObject consists of three child objects, namely – Model and shooting point. The shooting point is the location which scans the helicopter. And if it is within range, then it fires the missiles.

3.4 Game Programming





File->Build Settings… is the menu item to access the Build Settings window. It pops up an editable list of the scenes that will be included in the game.

The building process will place a blank copy of the built game application wherever you specify. Then it will work through the scene list in the build settings, open them in the editor one at a time, optimize them, and integrate them into the application package. It will also calculate all the assets that are required by the included scenes and store that data in a separate file within the application package.

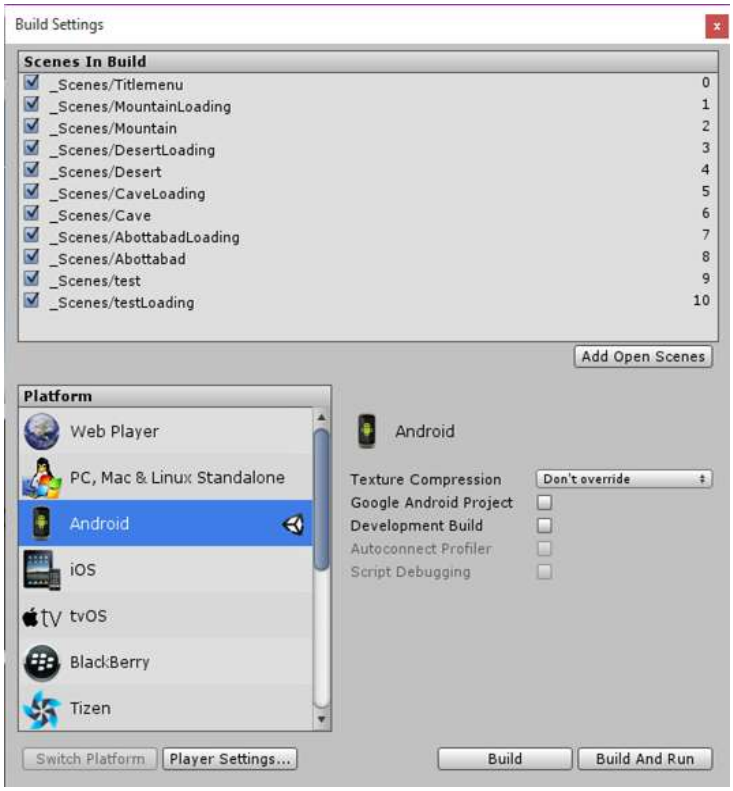


Fig 3.7. Build and Deploy Settings

- Any GameObject in a scene that is tagged with 'EditorOnly' will not be included in the published build. This is useful for debugging scripts that don't need to be included in the final game.
- When a new level loads, all the objects in the previous level are destroyed. To prevent this, use DontDestroyOnLoad() on any objects you don't want destroyed. This is most commonly used for keeping music playing while loading a level, or for game controller scripts which keep game state and progress.
- After the loading of a new level is finished, the message: OnLevelWasLoaded() will be sent to all active game objects.

CHAPTER 4
CONCLUSION

Using the Unity3D Physics engine, it is easy to create a simple helicopter script based largely off of real life helicopters.

The project was successful in that a fun and exciting game has been produced. There are plenty of possibilities for improvements and expansions and there are a few areas for improvement. Optimization is required to increase frame rates for playing on a variety of platforms. The first time experience of a being a game developer has been thoroughly rewarding and at the end of the project, a playable and functioning Game has been created, with interesting story line and well built environment.

8.1 Future Scope

i. A fully functional real time flight simulator can be developed along the lines of this project. A real time simulator will contain a larger number of Chopper controls and equipment.

ii. A number of different chopper models can be introduced with varied weaponry and hit points. Advanced choppers can be unlockable or payable content. Apart from the simple shooting mechanisms, a number of missile launchers and other weapons can be introduced.

iii. The original Operation Neptune Spear can be simulated in a more detailed structure. Ground Units and first person combat can be introduced, especially in the Abottabad mission.

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