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INTERNSHIP REPORT

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

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(2015-2019)

PREFACE AND ACKNOWLEDGEMENT

For about one and a half month I have been working in Cairo, Mahdi, Egypt at 5D-VR as a game developer, helping and learning with the team I was assigned in. During this period, I have learnt and applied all the knowledge that I gained in due course of time and have accomplished my task with utmost sincerity and dedication without a doubt.

I am thankful to Mr.Maged Farrag the Manager of the company Mr.Wael Ragaey and my senior team members for helping me learn, grow and understand what it means to be a game developer and hopefully my work in the game has helped the company grow and achieve what was intended.

CONTENTS:

1. TECHNICAL DESCRIPTION

1.1 UNITY

Unity is an all-purpose game engine that supports 2D and 3D graphics, drag and drop functionality and scripting through C#. Two other programming languages were supported: Boo, which was deprecated with the release of Unity 5 and UnityScript which was deprecated in August 2017 after the release of Unity 2017.1. The engine targets 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. [1]

Within 2D games, Unity allows importation of sprites and an advanced 2D world renderer. For 3D games, Unity allows specification of texture compression and resolution settings for each platform that the game engine supports, and provides support for bump mapping, reflection mapping, parallax mapping, screen space ambient occlusion (SSAO), dynamic shadows using shadow maps, render-to-texture and full-screen post-processing effects. Unity also offers services to developers, these are: Unity Ads, Unity Analytics, Unity Certification, Unity Cloud Build, Unity Everyplay, Unity IAP, Unity Multiplayer, Unity Performance Reporting and Unity Collaborate. [1]

Unity is notable for its ability to target games for multiple platforms. The currently supported platforms are Android, Android TV, Facebook Gameroom, Fire OS, Gear VR, Google Cardboard, Google Daydream, HTC Vive, iOS, Linux, macOS, Microsoft HoloLens, Nintendo 3DS family, Nintendo Switch, Oculus Rift, PlayStation 4, PlayStation Vita, PlayStation VR, Samsung Smart TV, Tizen, tvOS, WebGL, Wii U, Windows, Windows Phone, Windows Store, and Xbox One. Unity formerly supported 7 other platforms including its own Unity Web Player. Unity Web Player was a browser plugin that was supported in Windows and OS X only, which has been deprecated in favour of WebGL. [1]

Unity is the default software development kit (SDK) for Nintendo's Wii U video game console platform, with a free copy included by Nintendo with each Wii U developer license. Unity Technologies calls this bundling of a third-party SDK an "industry first". [1]

1.2 VIRTUAL REALITY (VR)

Virtual reality (**VR**) is a computer technology that uses Virtual reality headsets, sometimes in combination with physical spaces or multi-projected environments, to generate realistic images, sounds and other sensations that simulate a user's physical presence in a virtual or imaginary environment. A person using virtual reality equipment is able to "look around" the artificial world, and with high quality VR move about in it and interact with virtual features or items. The effect is commonly created by VR headsets consisting of head-mounted goggles with a screen in front of the eyes, but can also through specially designed spaces with multiple large screens. [2]

VR systems that include transmission of vibrations and other sensations to the user through a game controller or other devices are known as haptic systems. This tactile information is generally known as force feedback in medical, video gaming and military training applications. Virtual reality also refers to remote communication environments which provide a virtual presence of users with through telepresence and telexistence or the use of a virtual artifact(VA). The immersive environment can be similar to the real world in order to create a lifelike experience grounded in reality or sci-fi. Augmented reality systems may also be considered a form of VR that layers virtual information over a live camera feed into a headset, or through a smartphone or tablet device. [2]

1.3 SCRIPTING

A scripting or script language is a programming language that supports scripts: programs written for a special run-time environment that automate the execution of tasks that could alternatively be executed one-by-one by a human operator. Scripting languages are often interpreted (rather than compiled). Primitives are usually the elementary tasks or API calls, and the language allows them to be combined into more complex programs. Environments that can be automated through scripting include software applications, web pages within a web browser, the shells of operating systems (OS), embedded systems, as well as numerous games. A scripting language can be viewed as a domain-specific language for a particular environment; in the case of scripting an application, this is also known as an extension language. Scripting languages are also sometimes referred to as very high-level programming languages, as they operate at a high level of abstraction, or as control languages, particularly for job control languages on mainframes. [3]

1.4 GAMEOBJECT

The GameObject is the most important concept in the Unity Editor. Every object in your game is a GameObject, from characters and collectible items to lights, cameras and special effects. However, a GameObject can't do anything on its own; you need to give it properties before it can become a character, an environment, or a special effect. Four different types of GameObject: an animated character, a light, a tree, and an audio source. Four different types of GameObject: an animated character, a light, a tree, and an audio source To give a GameObject the properties it needs to become a light, or a tree, or a camera, you need to add components to it. Depending on what kind of object you want to create, you add different combinations of components to a GameObject. [4]

You can think of a GameObject as an empty cooking pot, and components as different ingredients that make up the recipe of your game. Unity has lots of different built-in component types, and you can also make your own components using the Unity Scripting API**.** [4]

1.5 PREFAB

It is convenient to build a GameObject in the scene by adding components and setting their properties to the appropriate values. This can create problems, however, when you have an object like an NPC, prop or piece of scenery that is reused in the scene several times. Simply copying the object will certainly produce duplicates but they will all be independently editable. Generally, you want all instances of a particular object to have the same properties, so when you edit one object in the scene, you would prefer not to have to make the same edit repeatedly to all the copies. [5]

Fortunately, Unity has a Prefab asset type that allows you to store a GameObject object complete with components and properties. The prefab acts as a template from which you can create new object instances in the scene. Any edits made to a prefab asset are immediately reflected in all instances produced from it but you can also override components and settings for each instance individually. [5]

2. INTRODUCTION

2.1 ABOUT THE COMPANY

5D-VR is a digital studio based in Cairo, pioneering the creation of absorbing VR/AR experiences. The company delivers immersive digital realities that result in total emotional engagement. That is the value of this technology. The platforms and creative content the company provides deliver total immersion and an unforgettable experience. [6]

The company has been creating AR solutions since 2011, and introduced VR into the regional market in 2014. The company is fanatical about digital reality. The name, the Fifth Dimension, comes from our belief that VR is such a disruptive technology it's in fact a new dimension for human experience. Space and time have become variables at our command. [6]

The company is always looking for the best hardware, research and development partnerships to mutually expand our technology access, knowledge and skillset. [6]

Currently partner with:
Infinitus PRIME, Violla Communication UAE, ACE 3D Ukraine, Austella, Lincoln University, The American University in Cairo, Surrey University, CULTNAT and Cairo University.

2.1.1 FOCUS

The Company delivers on the following use cases that give the biggest return on investment: [6]

2.1.1.1 Entertainment

The two biggest industries, games and films, are already starting to see the rewards of this new technology. Nintendo's stock price doubled after Pokémon Go was released. Hollywood's leading directors are experimenting with this new form of filmmaking as well. [6]

2.1.1.2 Education

The best way to learn anything is simply to do it. VR gives you the ability to try any task in a controlled and safe environment.
The beauty of digital reality is that it's real, there's no need to learn an additional control system other than the one naturally used in the task. So VR learning is instantly understandable to all ages, regardless of how tech-savvy they are.[6]

2.1.1.3 Marketing

The holy grail of any marketing effort is brand engagement. A business that consistently engages its customers retains them.
Cleverly utilizing the entertainment and educational qualities of VR to promote a product or service is bound to be attractive. VR creates an emotional reaction that goes beyond anything seen before.
The end result for the business is customers that are absorbed in the experience. This leads to customer loyalty and profitability. It also creates power customers, people who will vocally advocate for your brand. This social proof helps attracts more prospects and shorten the sales cycle. [6]

2.2 OBJECTIVE

My task in the company was to provide support to the ongoing project for the game known as Dark Flames as well as provide solutions for the weekly challenges which will be discussed later.

SUPPORT FOR DARK FLAMES:

Objective 1: To find appropriate sound files for the game components such as environment, arrow, burning, winning music, losing music, dragon roar, dragon flying, bridge creaking, changing menu sounds, general game sounds etc.

Objective 2: To make functions using scripts for these game sound files so that they can be called independently whenever the team members required so that they can integrate them nicely and crisply when the game mechanic section was implemented.

Objective 3: To make Sound objects with sound manger script which would allow me to export them as prefab, which then can be exported from my system and be imported in different systems to manage sound.

CHALLENGES TO MASTER:

Challenge 1: To make a Car racing game by the end of the week using resources and assets provided by the company with appropriate level design, car physics and check points.

Challenge 2: To incorporate a steering wheel, accelerator, break, and a gear system using a USB connection to the computer for a virtual reality experience and making an artificial intelligence to race against.

Challenge 3: To make a top down survival shooter with give assets and resources provided. The shooter should include the main character shooting many mindless beings that are hunting to kill you.

3. WEEKLY REPORT

NOTE: Since I was working in Egypt, Friday and Saturday were Holidays instead of Saturday and Sunday and Ramadan was also going on during this time of the month so had unexpected holidays.

28th May 2017 – 1st June 2017

28th May: Went and met the Company Manager Mr. Maged Farrag who handed me over to Mr. Wael Ragaey who introduced me to the team.

29th May: Today one of the team members asked me to show some samples of my work so that they can evaluate and assign the work that I can do. I was assigned the work of Sound engineering.

30th May: Today I spent the day searching for sounds from various sources for integration into the VR game Dark Flames.

31st May: Made functions for each and every sound that was found and added them to script.

1st June: Used the script to test the sound and debugged it to fix errors. The sounds were done and prefab was exported for the senior members to use.

2nd July: Holiday (Friday)

3rd July: Holiday (Saturday)

4th June 2017 – 8th June 2017

4th June: Challenge 1 was given where I was asked to create a car game with assets provided.

5th June: Started working on the level design of the game including terrain forming and making roads for the race track.

6th June: Finished the touch up on the level design and started working on the Car design and physics. We had an office party today so all the inters had to stay late.

7th June: Scripts and 3-D design of car was done today along with proper functioning of the car.

8th June: Collision system for the car along with checkpoint system was worked on today with appropriate scripts. The car game was shown to the senior team members for evaluation.

9th June: Holiday (Friday)

10th June: Holiday (Saturday)

11th June 2017 – 15th June 2017

11th June: Was given Challenge 2 incorporating a steering wheel, accelerator, break, and a gear system using a USB connection to the computer.

12th June: worked on the integration of the USB device along with identification of drivers.

13th June: Bug fixes and running the system correctly.

14th June: worked on car game a little today but changed focus to VR game Dark Flames as the phase I of project was complete and more game sounds were required for the game, scripting was done.

15th June: Still working on Sounds and scripting of the sound with testing in real world scenario, finally the work was complete bugs were resolved and prefabs were exported for the senior members to use.

16th June: Holiday (Friday)

17th June: Holiday (Saturday)

18th June 2017 – 22nd June 2017

18th June: Dark flames project is in its last stages of development and therefore the main team is working on the finishing of the game. I am asked for suggestions and improvements.

19th June: Helped in debugging very minor bugs for the game and was assigned to develop AI for the car racing game.

20th June: Working on the Car racing game's AI for the rival cars

21st June Working on the Car racing game's AI for the rival car path movement

22nd June: Working on the Car racing game's AI for the rival car path movement

23rd June: Holiday (Friday)

24th June: Holiday (Saturday)

25th June: Holiday (Ramadan)

26th June: Holiday (Ramadan)

27th June: Working on the Car racing game's AI for the rival car path movement

28th June 2017 - 29th June 2017

28th June: Challenge 3 was given where I have to make top down shooter with given assets.

29th June: worked on the level design and collisions.

30th June: Holiday (Friday)

1st July: Holiday (Saturday)

2nd July 2017 – 4th July 2017

2nd July: worked on the Character Modal, enemy character modal and working of their animation. Combat system and movement of both enemy and player were also implemented.

3rd July: Worked on AI fixing bugs for the game and giving finishing touch ups and showed the game for evaluation.

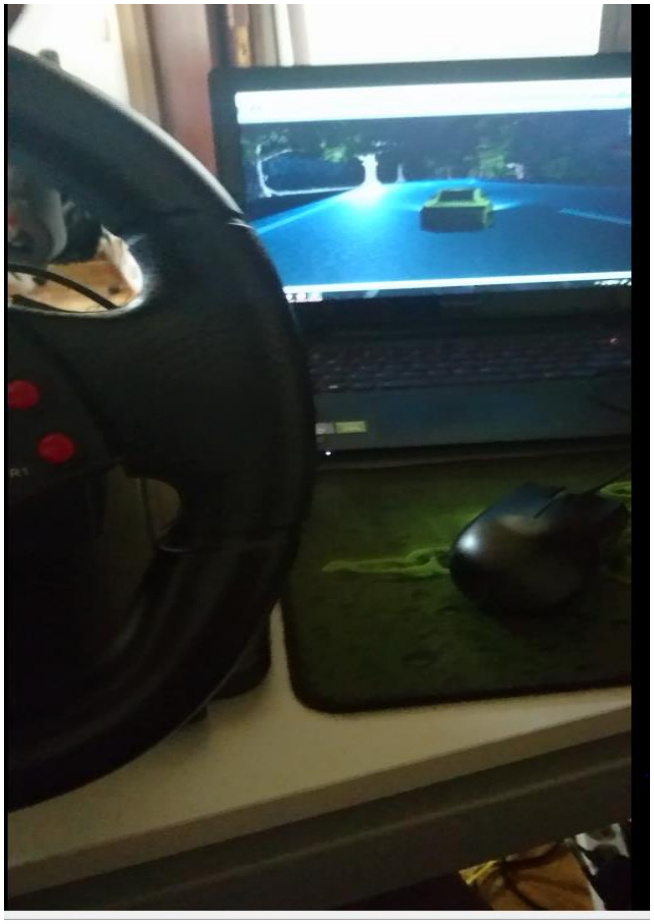
4th July: last working day nothing was done today and certificate was given to me for working with the company.

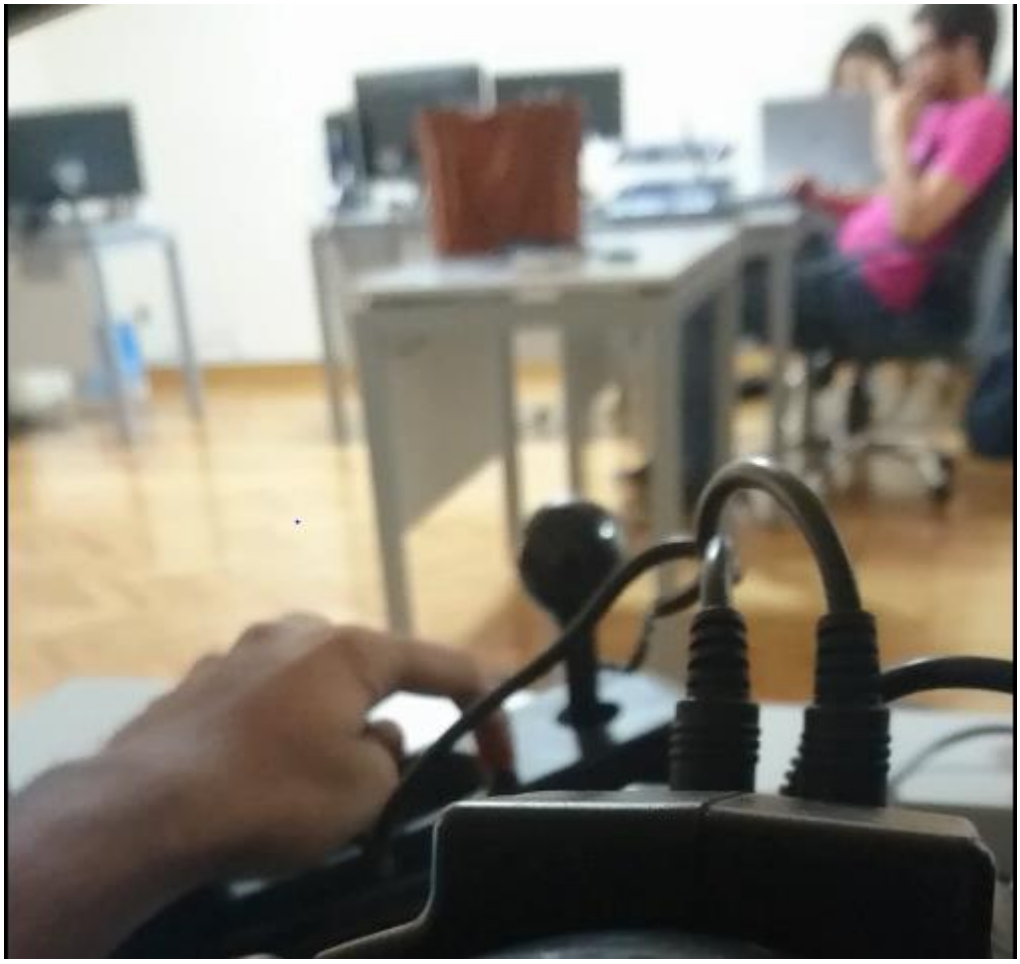
4. PROOF OF WORK

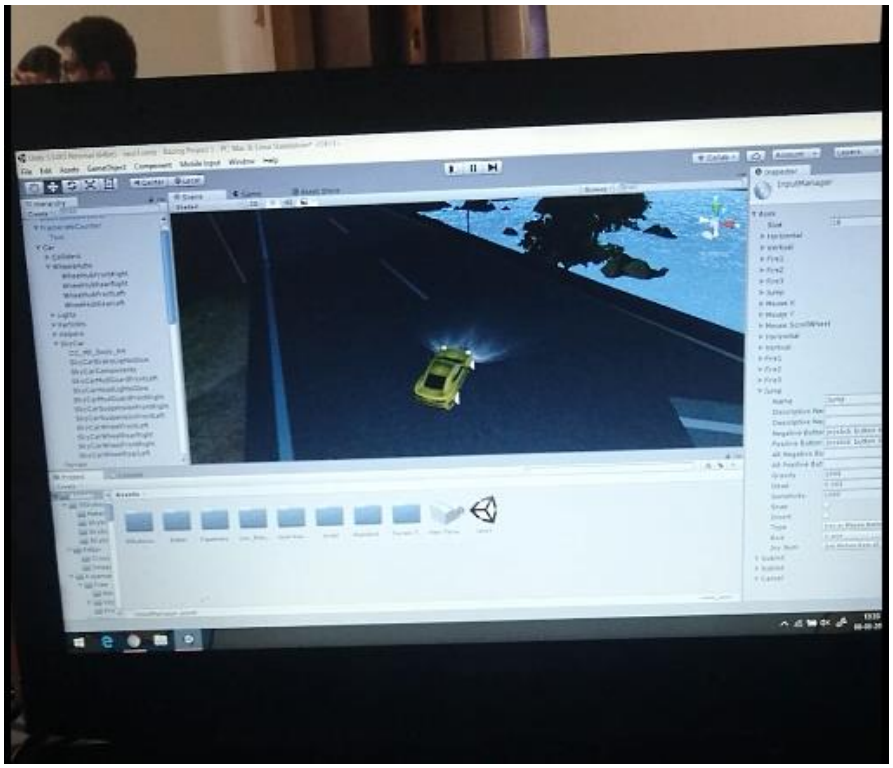
4.1 6th June office Iftar party:


IT'S NOT
SCIENCE
FICTION,
REALITY!
5D
THE STUDIO
CREATION OF
ABSORBING
COMPELLING
VR/AR

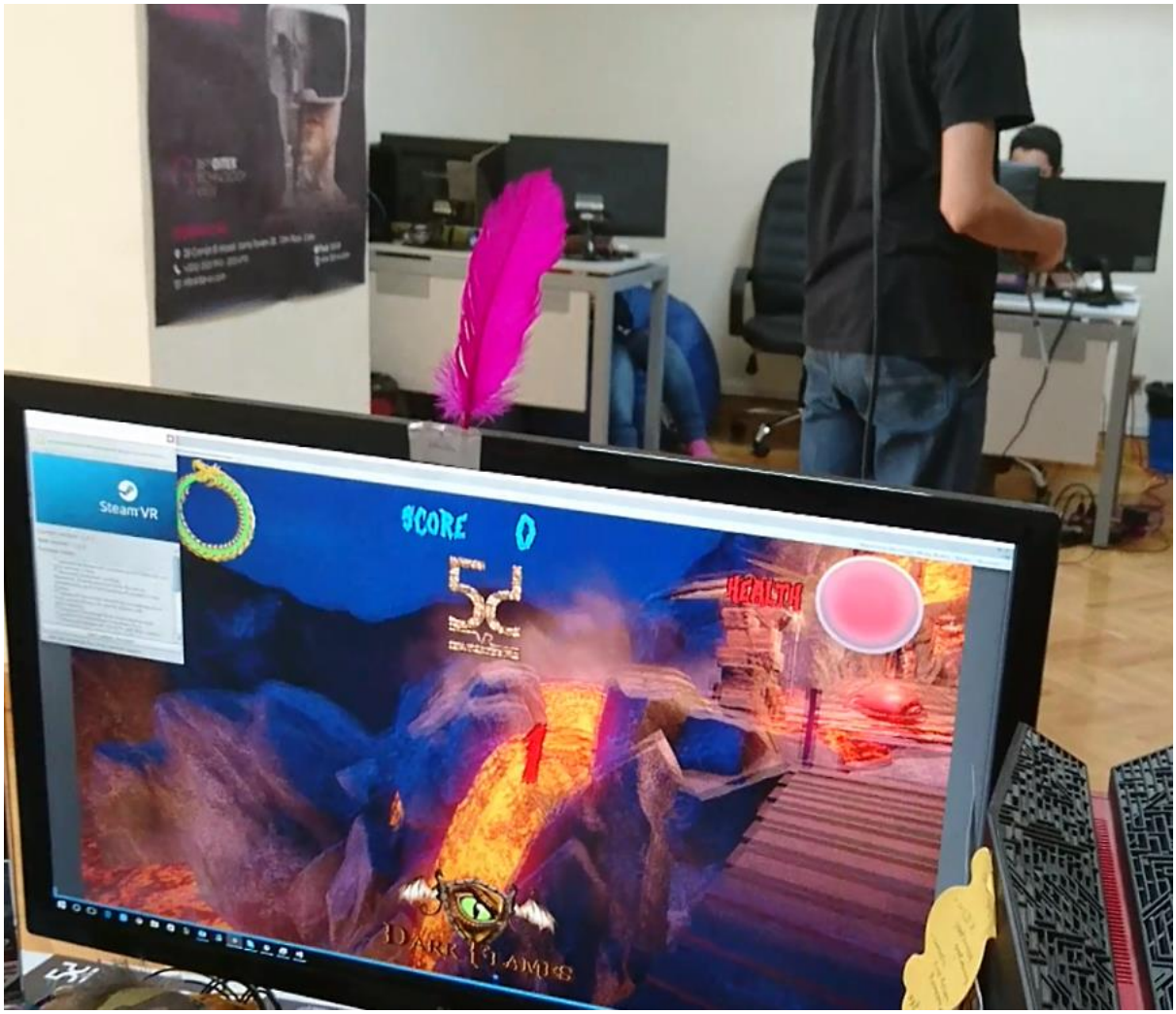
4.2 Car game implementation:

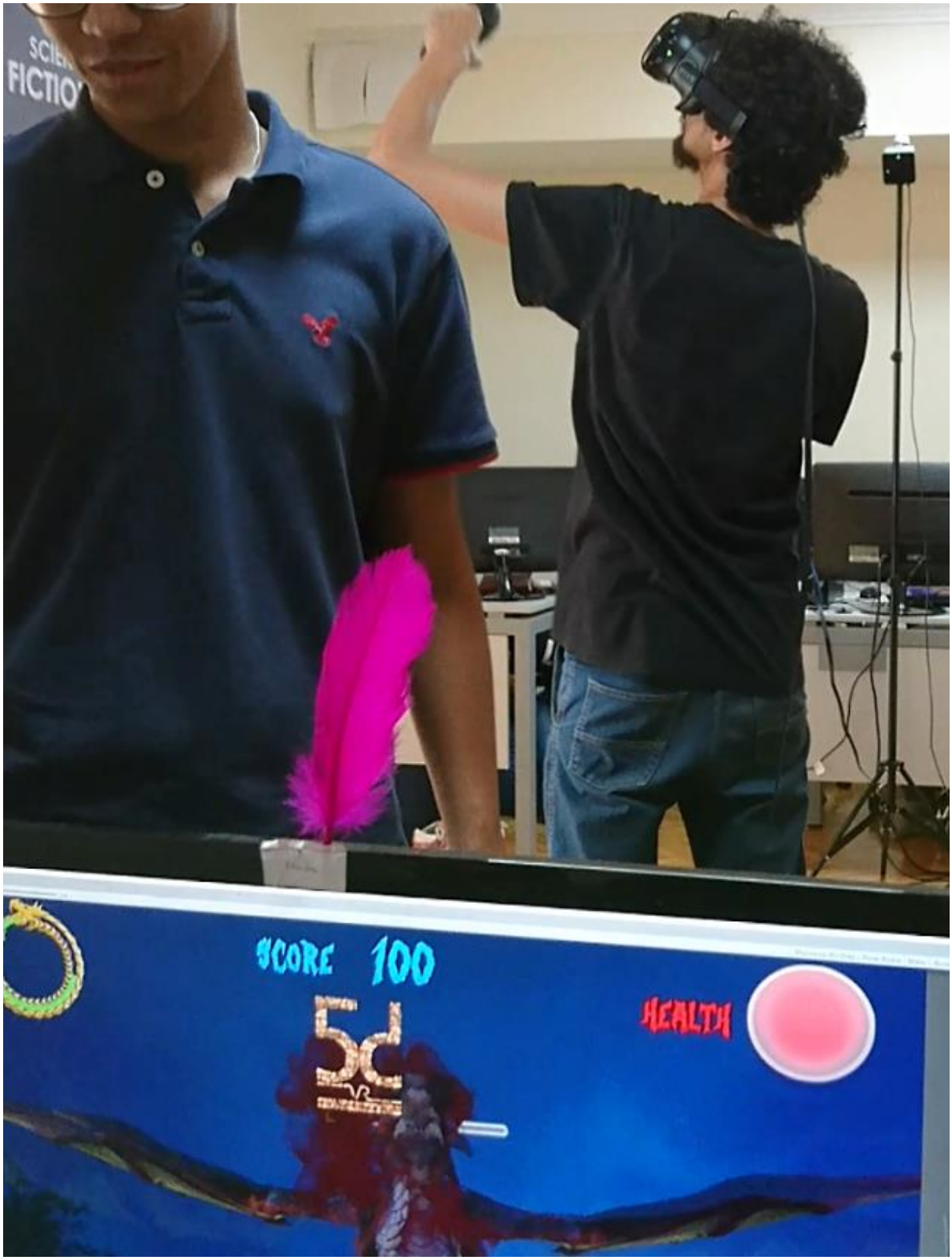






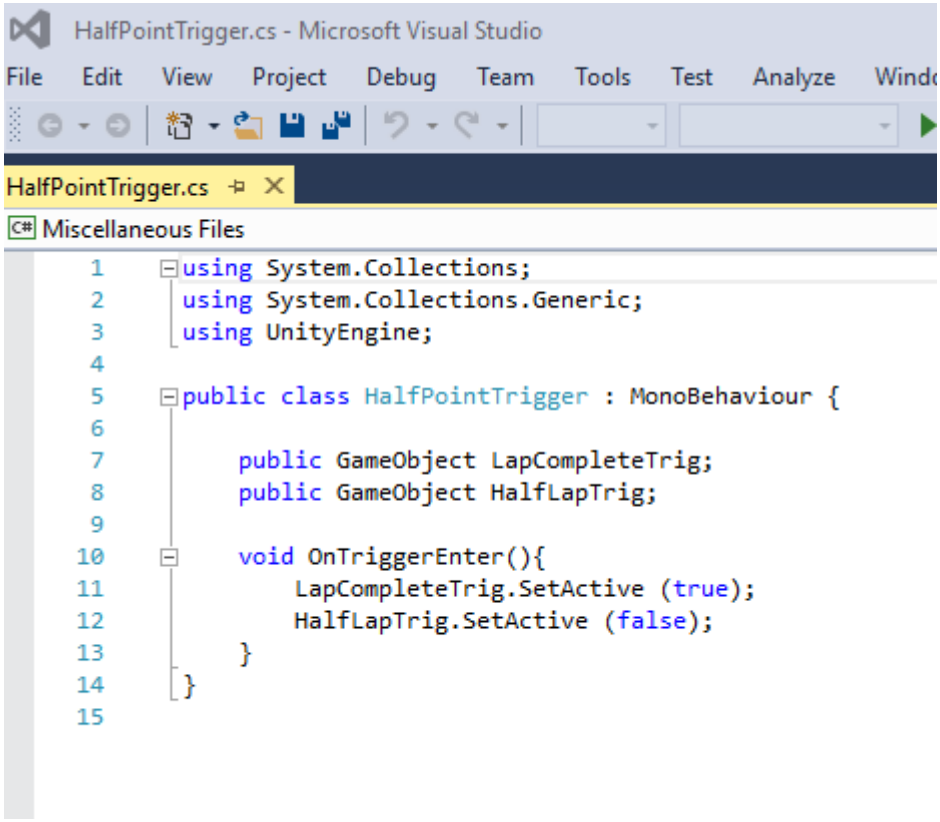
4.3 Dark flames game:



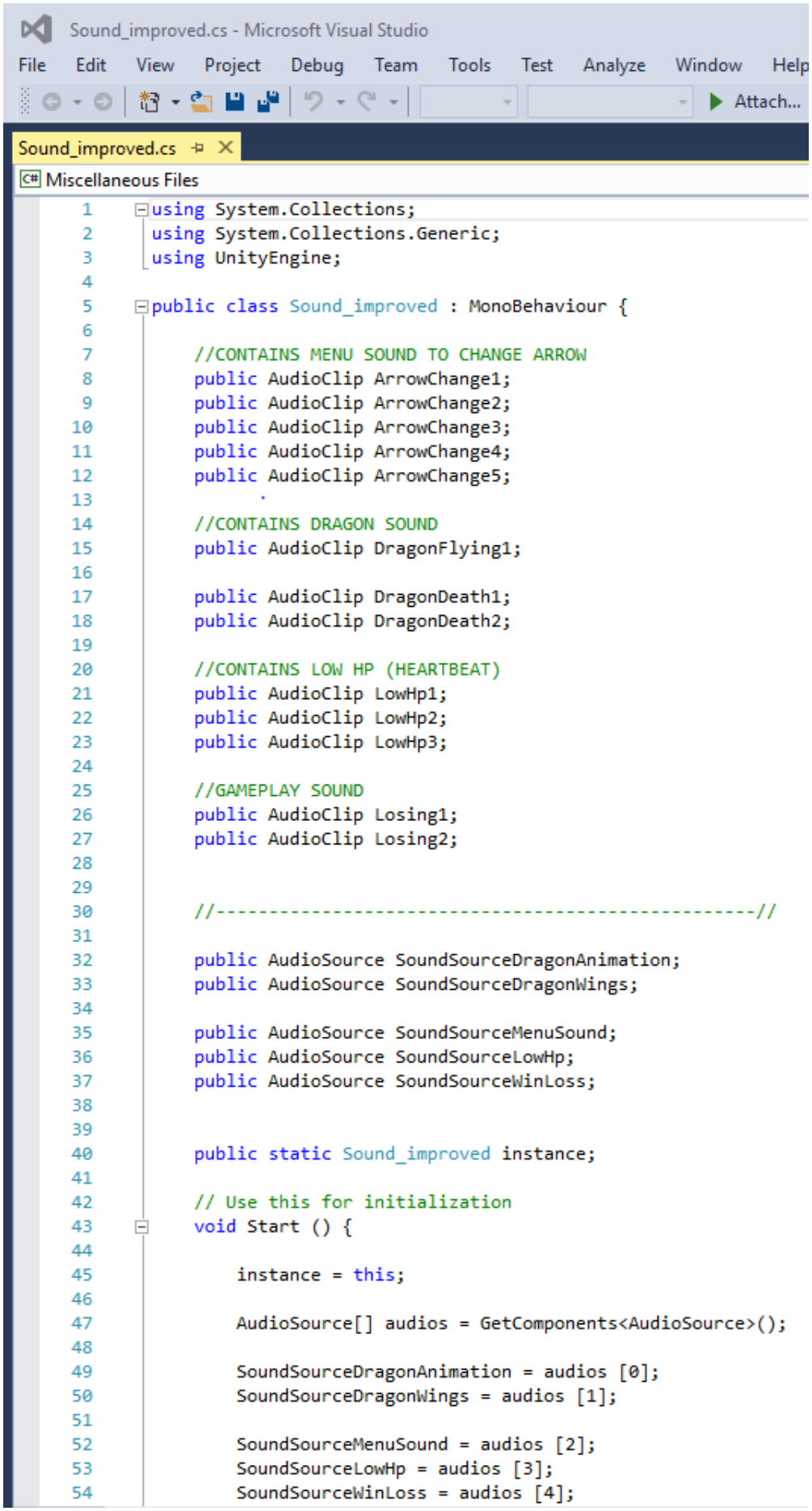

SCORE 100
HEALTH


THE STUDIO
PIONEERING THE
CREATION OF
ABSORBING
COMPELLING
VR/AR
TIME
SCORE 300
HEALTH

4.4 Sample scripts used:




```
1   using System.Collections;
2   using System.Collections.Generic;
3   using UnityEngine;
4
5   public class HalfPointTrigger : MonoBehaviour {
6
7       public GameObject LapCompleteTrig;
8       public GameObject HalfLapTrig;
9
10      void OnTriggerEnter(){
11          LapCompleteTrig.SetActive (true);
12          HalfLapTrig.SetActive (false);
13      }
14  }
15
```




```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class Sound_improved : MonoBehaviour {

    //CONTAINS MENU SOUND TO CHANGE ARROW
    public AudioClip ArrowChange1;
    public AudioClip ArrowChange2;
    public AudioClip ArrowChange3;
    public AudioClip ArrowChange4;
    public AudioClip ArrowChange5;
          .
    //CONTAINS DRAGON SOUND
    public AudioClip DragonFlying1;

    public AudioClip DragonDeath1;
    public AudioClip DragonDeath2;

    //CONTAINS LOW HP (HEARTBEAT)
    public AudioClip LowHp1;
    public AudioClip LowHp2;
    public AudioClip LowHp3;

    //GAMEPLAY SOUND
    public AudioClip Losing1;
    public AudioClip Losing2;


    //-------------------------------------------------//

    public AudioSource SoundSourceDragonAnimation;
    public AudioSource SoundSourceDragonWings;

    public AudioSource SoundSourceMenuSound;
    public AudioSource SoundSourceLowHp;
    public AudioSource SoundSourceWinLoss;


    public static Sound_improved instance;

    // Use this for initialization
    void Start () {

        instance = this;

        AudioSource[] audios = GetComponents<AudioSource>();

        SoundSourceDragonAnimation = audios [0];
        SoundSourceDragonWings = audios [1];

        SoundSourceMenuSound = audios [2];
        SoundSourceLowHp = audios [3];
        SoundSourceWinLoss = audios [4];
```

CONCLUSION

The final product Dark Flames has been released and is one of the successful games made by the company and my work and involvement was fruitful.

I learnt about game development by both working in the team as well as from the challenges that they gave me to rise above. The result was that the project was an astounding success and the internship that I had for these 4 weeks have increased my knowledge in both game programming and design by a considerable amount.

6. REFERENCES

[1] https://en.wikipedia.org/wiki/Unity_(game_engine)

[2] https://en.wikipedia.org/wiki/Virtual_reality

[3] https://en.wikipedia.org/wiki/Scripting_language

[4] https://docs.unity3d.com/Manual/GameObjects.html

[5] https://docs.unity3d.com/Manual/Prefabs.html

[6] http://www.5d-vr.com/