

A

Major project

On

Designing an Intellective Gaming Using Unity User Interface

(Submitted in partial fulfillment of requirements for reward of Degree)

BACHELOR OF TECHNOLOGY

In

COMPUTER SCIENCE AND ENGINEERING

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CMR TECHNICAL CAMPUS

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING



CERTIFICATE

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ABSTRACT

The word cognition comes from the Latin root *cognoscere*, which means “to know”. By cognition, we are usually referring to everything that is related to knowledge. In other words, the accumulation of information that we have acquired through learning or experience.

The most accepted definition is the ability to process information through perception (stimuli that we receive through our different senses), knowledge acquired through experience, and our personal characteristics that allow us to integrate all of this information to evaluate and interpret our world. It is the ability that we have to assimilate and process the information that we receive from different sources (perception, experience, beliefs, etc.) and convert them into knowledge. It includes different cognitive processes, like learning, attention, memory, language, reasoning, decision making, etc., which are part of our intellectual development and experience.

This project focuses on three core cognitive abilities. We used unity game engine to create a game to improve cognitive skills of the players without any special immersive techniques.

Unity is a game engine created by unity technologies. It is ranked in the top three game engines of the decade. Unity is popular for 2d graphics. We used unity's 2d system to create this project.

LIST OF FIGURES

FIGURE NO	FIGURE NAME	PAGE NO
Figure 3.1	Project Architecture	21
Figure 3.2	Use case Diagram	23
Figure 3.3	Class Diagram	24
Figure 3.4	Sequence Diagram	25
Figure 3.5	Activity Diagram	26

LIST OF SCREENSHOTS

SCREENSHOTS NO.	SCREENSHOT NAME	PAGE NO.
Screenshots 5.1	Home Screen initial	35
Screenshots 5.2	Main home Scene	35
Screenshots 5.3	ReflexioneOne initial	36
Screenshots 5.4	ReflexioneOne main	36
Screenshots 5.5	Reflexione Two initial	37
Screenshots 5.6	Reflexione Two Main	37
Screenshots 5.7	Words Wizard Initial	38
Screenshots 5.8	Words Wizard Main	38

TABLE OF CONTENTS

	PAGE NO'S
ABSTRACT	i
LIST OF FIGURES	ii
LIST OF SCREENS	iii

1. INTRODUCTION	1
1.1. PROJECT SCOPE	2
1.2. PROJECT PURPOSE	2
1.3. PROJECT FEATURES	2
2. SYSTEM ANALYSIS	3
2.1. PROBLEM STATEMENT	4
2.2. EXISTING SYSTEM	4
2.2.1. LIMITATIONS	6
2.3. PROPOSED SYSTEM	6
2.3.1. ADVANTAGES OF PROPOSED SYSTEM	7
2.4. FEASIBILITY STUDY	9
2.4.1. ECONOMIC FEASIBILITY	10
2.4.2. TECHNICAL FEASIBILITY	10
2.4.3. BEHAVIOURAL FEASIBILITY	10
2.5. HARDWARE AND SOFTWARE REQUIREMENTS	1
2.5.1. HARDWARE REQUIREMENTS	11
2.5.2. SOFTWARE REQUIREMENTS	11
3. ARCHITECTURE	12
3.1. PROJECT ARCHITECTURE	13
3.2. DESCRIPTION	13
3.3. USE CASE DIAGRAM	15
3.4. CLASS DIAGRAM	16
3.5. SEQUENCE DIAGRAM	17
3.6. ACTIVITY DIAGRAM	18
4. IMPLEMENTATION	19

5.	RESULTS	32
6.	TESTING	36
7.	CONCLUSION	40
8.	BIBLIOGRAPHY	41
	8.1 GITHUE REPOSITORY LINK	42
	8.2 REFERENCES	42
	8.3 WEBSITES	42
9.	JOURNAL	

INTRODUCTION

1. INTRODUCTION

1.1. PROJECT SCOPE

This project is titled as "Cognitive game using unity". This application provides interactive entertainment based cognitive ability training to the users. This project is developed using the Unity game engine. There are 3 different types of brain areas we focus on, they are memory, reflex and language.

1.2. PROJECT PURPOSE

This application(interactive entertainment application) has been developed to improve the brain functionality of the users by playing cognitive games. Developed in unity, a top game engine for 2d graphics.

1.3. PROJECT FEATURES

Cognition is the ability to process information through perception (stimuli that we receive through our different senses), knowledge acquired through experience, and our personal characteristics that allow us to integrate all of this information to evaluate and interpret our world. In the Interactive application we focused on and developed Interactive application for three core cognitive abilities

Memory improvement is part of this memory game, the process can be done with a few steps that can be easy and performed effortlessly.

Brain reflection improves the reaction time of the user.

Language : A language-game (German: *Sprachspiel*) is a philosophical concept developed by Ludwig Wittgenstein, referring to simple examples of language use and the actions into which the language is woven.

SYSTEM ANALYSIS

SYSTEM ANALYSIS

System Analysis is the important phase in the system development process. The System is studied to the minute details and analysed. The system analyst plays an important role of an interrogator and dwells deep into the working of the present system. In analysis, a detailed study of these operations performed by the system and their relationships within and outside the system is done. A key question considered here is, "what must be done to solve the problem?" The system is viewed as a whole and the inputs to the system are identified. Once analysis is completed the analyst has a firm understanding of what is to be done.

2.1. PROBLEM STATEMENT

The gaming industry is one of the branches of the entertainment industry, which generates a lot of revenue. Games use some techniques to make players feel more immersive, these techniques are also being used in cognitive games lately. For example by using music developers make players more manipulatable and feel immersive. But the use of these kinds of techniques in cognitive games makes the whole cognition's purpose different. Cognitive games are meant to evolve brain activities. So we developed a game using unity engine without any special immersive techniques to create a true cognitive Interaction.

2.2. EXISTING SYSTEM

There are many cognitive games in the play store and online. Some of them focus on all around cognitive skill sets. While others focus on some particular skills that are required for some selected audience(players). Some of the services focusing on them are:

LUMINOSITY

Lumosity is a leading brain training program, brought to you by Lumos Labs, Inc. Lumosity's web and mobile games are designed by scientists to challenge core cognitive abilities.

Lumosity's scientists take neuropsychological and cognitive research tasks, or design new ones, and work with game designers to transform them into 50+ cognitive games. Designed to be both fun and adaptively challenging, Lumosity's training program is accessible to people of all ages — helping them stay challenged to the full extent of their abilities.

Lumos Labs also has a collaborative research initiative, the Human Cognition Project, which currently partners with over 90 university collaborators. Through the HCP, we grant qualified researchers free access to Lumosity's cognitive training tasks, assessments, research tools, and, in some cases, limited access to data on cognitive task performance — helping them conduct larger, faster, and more efficient studies. For more information, please visit lumosity.com/hcp

ELEVATE

Elevate Labs is on a mission to improve people's minds. Since 2014, they've helped over 40 million people improve their communication and math skills with Elevate, which won Apple's App of Year award. With Balance, they've created an innovative, personalized meditation experience that helps people improve their stress, sleep, and more.

They're a fully distributed company of voracious learners and passionate doers, driven by our vision to help billions of people lead healthy, joyful, and productive lives.

BRAINGLE

Braingle is a place to solve puzzles, brush up on your trivia, play games and give your brain a workout. Get ready to have your brain tangled.

Braingle at a glance have brain teasers, optical illusion, puzzle experiences, codes & ciphers, puzzlepedia...and many other different types of games.

2.2.1. LIMITATIONS

- We know video games can generate addiction issues. With cognitive games the chances of addiction are more than any normal games.
- The excessive use of video games can cause rejection towards other didactic means such as books, CD's, etc.
- It can cause violent behaviour if the resource used is based on this type of behaviour.
- It can be expensive for the educational center, not only the acquisition of video games, but also the equipment necessary to execute them.
- Video games often act as a replacement for real-time human connections. People who find themselves playing hours upon hours of video games may find themselves losing touch with the relationships they've built with other people. People argue that with internet-connected games, they can easily hang out with friends and families without ever leaving home, but this type of virtual get together is no replacement for actual face-to-face interaction.
- New studies show that the risk of being overweight increases with every hour people spend on virtual play. Lack of motion and overplaying lead to muscle pain as well. Moreover, the addiction to these games leads to sleep deprivation which contributes to obesity

2.3. PROPOSED SYSTEM

We divide our games and activities into 3 critical brain areas: Memory, attention, language. We keep track of your progress and the games are based on scientific research.

Memory improvement is part of this memory game, the process can be done with a few steps that can be easy and performed effortlessly. Many people have trouble remembering faces or names. How to remember things is only a technique that you need to utilize, for example to **remember a face** you just need to examine a person's face discretely when you are introduced.

Try to find an unusual feature, ears, hairline, forehead, eyebrows, eyes, nose, mouth, chin, complexion, etc . This memory game is going to activate some areas of your brain responsible for memory acquisition which therefore can help your **memory improve**. Enjoy it and try to finish before 1:30 min.

Brain reflection This is a simple exercise to test the reflection of your brain, the faster the better, try to get a score of 0.20 in this reflex test. When you manage to reach that score then that means you're very fast, if you can't achieve that score then keep practicing. Practice makes perfect. Human reflection is the capacity of humans to exercise a willingness to learn more about our fundamental nature, purpose and essence. Brain reflection invariably leads to inquiry into the human condition and the essence of humankind as a whole. Humans often consider themselves to be the dominant species on Earth, and the most advanced in intelligence and ability to manage their environment, thanks to the mind reflection.

Language : A language-game (German: *Sprachspiel*) is a philosophical concept developed by Ludwig Wittgenstein, referring to simple examples of language use and the actions into which the language is woven. Wittgenstein argued that a word or even a sentence has meaning only as a result of the "rule" of the "game" being played. Depending on the context, for example, the utterance "Water!" could be an order, the answer to a question, or some other form of communication.

2.3.1. **ADVANTAGES**

Improves critical thinking skills :

Sharpening a child's thinking skills means that he or she will have the mental aptitude to process information, make decisions, create new ideas, ask questions, try to make sense of things, organize information and so forth. Memory games are also good for visual memory aid. A child's ability to store and retrieve memories, when the stimuli that first evoked them no longer exists, and without help is a critical aspect of reading, writing, spelling, including developing mathematical skills. Kid's whose visual memory hasn't fully developed can be trained with various interactive memory games.

Exercise for the brain:

Fun android and iPhone games are like having a personal trainer for a child's mind that is developing at a rapid rate. They can help strengthen individual skills like communication, good eye contact, social skills, reaction time, pattern recognition, and much more. Cognitive skill development is critical as a child matures, because he or she is able to not only learn new information, but to also remember, think more critically, and process what they learn and apply it in a progressive manner. But since all kids are different, some may fail to hit age-appropriate cognitive skill milestones, and this is where memory building activities come in handy because a child needs a stimulating environment that can help develop their brain, boost their confidence, focus and attention.

Playing online games can make learning easier, however, there are specific fun online games for adults and kids where parents can play with their children to promote active learning and encourage their cognitive development in the areas of attention, memory, concentration, visualization, and perception.

Sharpen problem-solving skills:

Memory matching games that involve strategy help sharpen a child's problem-solving skills, memory, analytical thinking skills, communication, general knowledge, concentration, social skills, even patience. Imagine you as an adult trying to solve the Rubik's cube or a Tangram puzzle, or assemble flat-pack furniture in a matter of minutes without losing your top? With the right memory game, children can significantly improve their problem-solving skills, consequently enhancing their brain power, concentration, communication, and social skills, even strengthening their numeric skills, as well as visual skills.

Improve spatial skills:

Excellent spatial reasoning skills in children are directly linked to great mathematical skills; in fact, such kids are more likely to pursue careers in fields such as engineering and architectural designs. But the good news is that even those without these skills can gain them through playing structured online games that involve a whole lot of rotating, moving, and positioning pieces.

Enhance visual perception:

Visual acuity plays a vital role in a child's ability to identify, understand, assess, and interpret one set of different objects from others including symbols, letters, colors, forms, shapes, patterns, size, etc. Memorization games can help improve visual perceptual skills in a child, to a point where they are able to mentally visualize outcomes with little to no trial and error. Such games can also help improve language and vocabulary.

Even where English is the first language, some kids do struggle with mastering it, and while strong vocabulary skills can be developed and polished through consistent reading and writing, children often get bored with books. There are fantastic interactive memory games that can help a child improve both their language and word association, and unlike homework sheets, fun games can keep a child focused for extended periods, and have tons of fun while at it.

2.4. FEASIBILITY STUDY

The feasibility of the project is analysed in this phase and the business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. Three key considerations involved in the feasibility analysis are

- Economic Feasibility
- Technical Feasibility
- Social Feasibility

2.4.1. ECONOMIC FEASIBILITY

The developing system must be justified by cost and benefit. Criteria to ensure that effort is concentrated on a project, which will give best, return at the earliest. One of the factors, which affect the development of a new system, is the cost it would require.

The following are some of the important financial questions asked during preliminary investigation:

- The costs conduct a full system investigation
- The cost of the hardware and software.
- The benefits in the form of reduced costs or fewer costly errors.

Since the system is developed as part of project work, there is no manual cost to spend for the proposed system. Also, all the resources are already available, it gives an indication that the system is economically possible for development.

2.4.2. TECHNICAL FEASIBILITY

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

2.4.3. BEHAVIOURAL FEASIBILITY

This includes the following questions: • Is there sufficient support for the users? • Will the proposed system cause harm? The project would be beneficial because it satisfies the objectives when developed and installed. All behavioural aspects are considered carefully and conclude that the project is behaviourally feasible.

2.5. HARDWARE AND SOFTWARE REQUIREMENTS

2.5.1. HARDWARE REQUIREMENTS

Hardware interfaces specifies the logical characteristics of each interface between the software product and the hardware components of the system, the following are some hardware requirements

- Processor Intel i5 core @ CPU 2.4GHz
- RAM 8GB or More
- Storage 25GB or More
- GPU Nvidia geforce 970 or Above

2.5.2. SOFTWARE REQUIREMENTS

Software requirements specifies the legal characteristics of each interface and software components of the system. The following are some software requirements

- Operating System Windows 10
- Languages C#
- Engine Unity
- IDE Visual studio community 2019
- Browser Google Chrome, Edge

ARCHITECTURE

3. ARCHITECTURE

3.1. SYSTEM ARCHITECTURE

This project architecture shows the procedure followed in the Unity Engine to make this IE Application

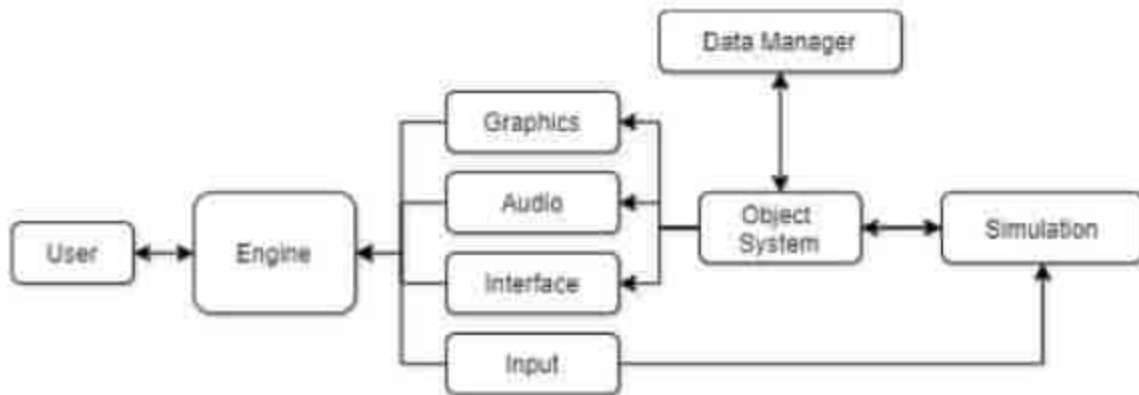


Figure 3.1 System architecture

3.2. DESCRIPTION

Engine : The game engine used in this project is Unity 5 v2019.04 . 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 a Mac OS X-exclusive game engine. The engine has since been gradually extended to support a variety of desktop, mobile, console and virtual reality platforms.

Graphics:A variety of computer graphic techniques have been used to display video game content throughout the history of video games. The predominance of individual techniques have evolved over time, primarily due to hardware advances and restrictions such as the processing power of central or graphics processing units.

Audio: In video games, music can be streamed, where the audio is pre-recorded and played back when required. While early video games were restricted to sequenced music, streaming music has become a more viable option as technology has improved.

Interface: a user interface (UI) is the space where interactions between humans and machines occur. The goal of this interaction is to allow effective operation and control of the machine from the human end, whilst the machine simultaneously feeds back information that aids the operators' decision-making process.

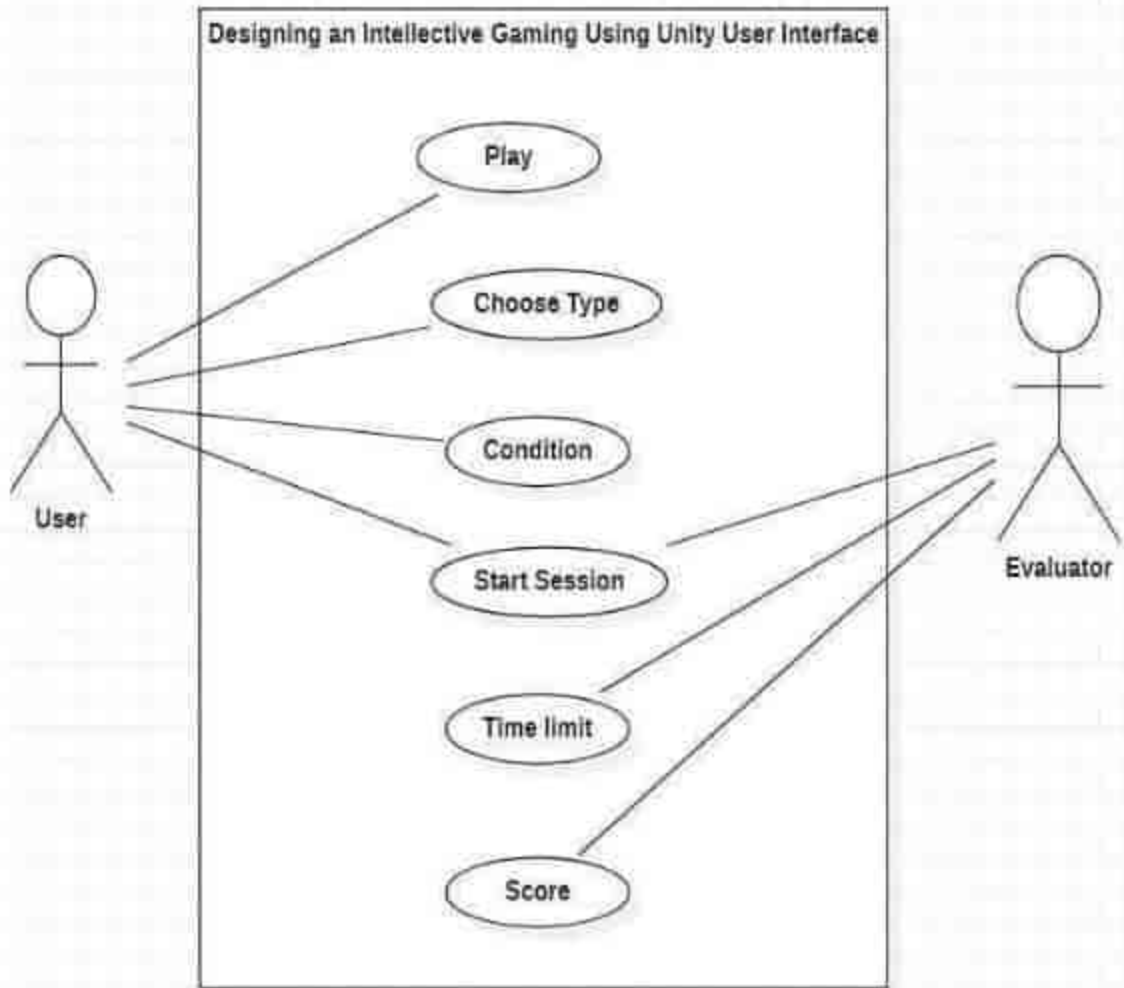
Input: Pointer events and buttons are created on the Input window, and end users can configure Keyboard input in a nice screen configuration dialog.

Data Manager: comprises all disciplines related to managing data as a valuable resource.

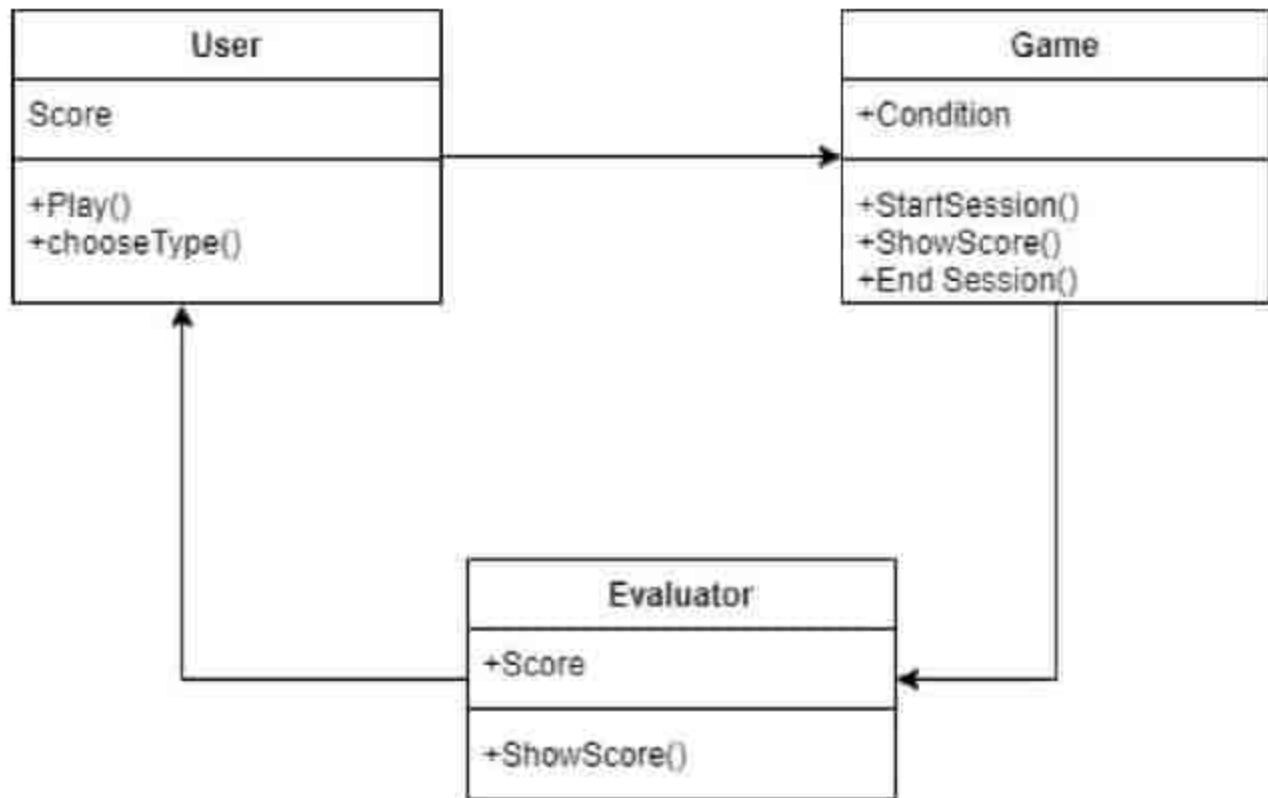
Object System: Unity engine's core object system and C#'s object system is used in the project

Simulation: A simulation is the imitation of the operation of a real-world process or system over time.⁽¹⁾ Simulations require the use of models; the model represents the key characteristics or behaviors of the selected system or process, whereas the simulation represents the evolution of the model over time. Often, computers are used to execute the simulation.

3.3. USE CASE DIAGRAM

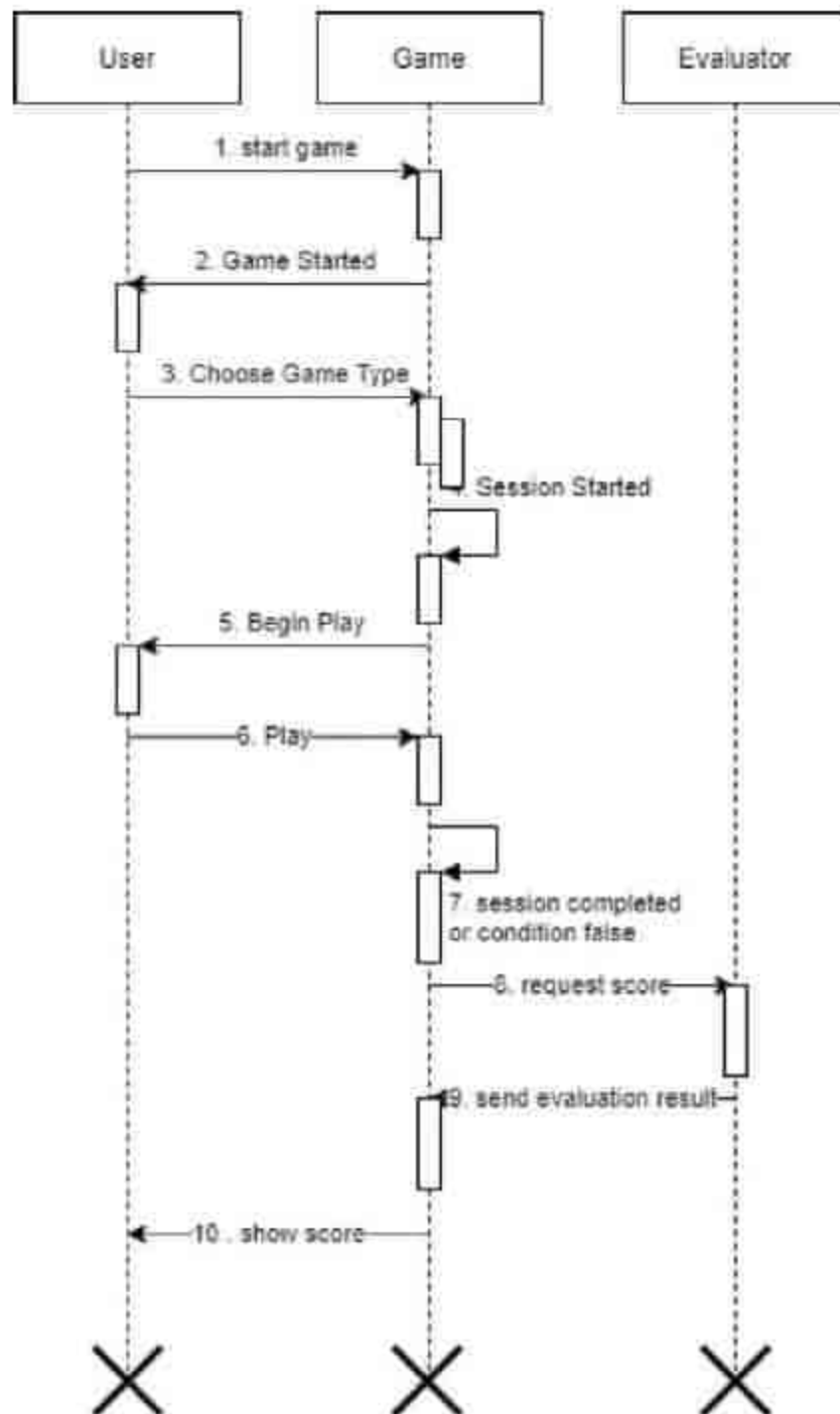


3.4. CLASS DIAGRAM



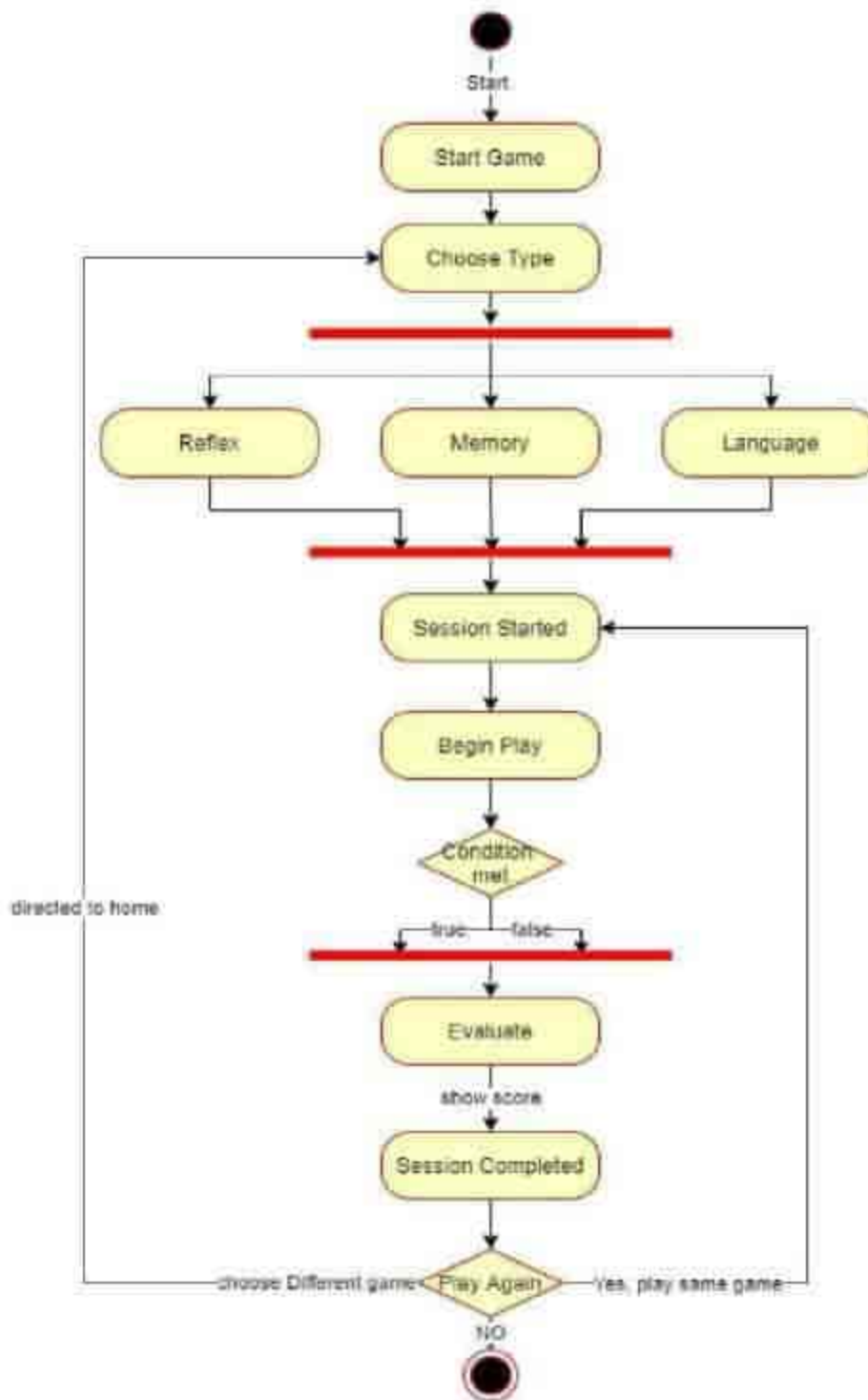
3.5

Figure 3.4 Class Diagram
SEQUENCE DIAGRAM



3.6

ACTIVITY DIAGRAM
Figure 3.5 Sequence Diagram



3. .

Figure 3.6 Activity Diagram

IMPLEMENTATION

4. IMPLEMENTATION

4.1. SAMPLE CODE

HomeScreen_Manager.cs

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

public class HomeScreen_GameManager : MonoBehaviour
{
    public GameObject homeScreenTopPart;
    public Text t;
    public Animator[] anims;

    public void slide()
    {
        homeScreenTopPart.GetComponent<Image>().enabled = false;
        homeScreenTopPart.GetComponent<Button>().enabled = false;
        anims[0].SetTrigger("EntryButtonClicked");
        anims[1].SetTrigger("one");
        anims[2].SetTrigger("two");
        anims[3].SetTrigger("three");
        anims[4].SetTrigger("four");
    }
    t.enabled = (false);
}
```

```

    }

    public void loadScene(int sceneIndex)
    {
        SceneManager.LoadScene(sceneIndex);
    }

    public void exitButtonClicked()
    {
        Application.Quit();
    }
}

Reflexione_GameManager.cs

using System.Collections;
using System.Collections.Generic;
using UnityEngine;
using UnityEngine.UI;
using UnityEngine.SceneManagement;
using System.IO;

public class ReflexioneOne_GameManager : MonoBehaviour
{
    public GameObject objectToDisable;

    public void disableObject()
    {
        objectToDisable.SetActive(false);
    }
}

```

```

}
//Timer
private float time
{
    get; set;
}
public Text timerText;
private int int_time;
private void Update()
{
    if(time > 0)
    {
        time -= Time.deltaTime;
    }
    int_time = (int)time;
    timerText.text = int_time.ToString();
}
//Initialize Board
private int difficulty
{
    get; set;
}
public void getDifficulty(int _difficulty)

```

```

{
    difficulty = _difficulty;
}

public GameObject environment;
public GameObject prefab;

public void start Setting Up Environment()
{
    time = 60;
    while(enviroment.transform.childCount > 0)
    {
        DestroyImmediate(enviroment.transform.GetChild(0).gameObject);
    }
    enviroment.GetComponent<GridLayoutGroup>().constraintCount = difficulty;
    for (int i = 0; i < difficulty * difficulty; i++)
    {
        GameObject g = Instantiate(prefab, enviroment.transform);
        g.name = i.ToString();
    }
    StartCoroutine(chooseObjects());
}

private IEnumerator chooseObjects()
{
    int objectCount = enviroment.transform.childCount;

```

```

    if(time > 0)
    {
        enviroment.transform.GetChild(Random.Range(0, enviroment.transform.childCount -
1)).GetComponent<box>().time = 1f;
        yield return new WaitForSeconds(1f);
        StartCoroutine(chooseObjects());
    }
}

public Text scoreText;
public Text highScoreText;
public void increaseScore()
{
    int hscore = int.Parse(highScoreText.text);
    int sscore = int.Parse(scoreText.text) + 1;
    if(sscore > hscore)
    {
        highScoreText.text = sscore.ToString();
        string newline = "ReflexioneOne$" + highScoreText.text;
        File.AppendAllText("Assets/Resources/ReflexioneOneResources/SaveData.txt", newline
+ System.Environment.NewLine);
    }
    else
    {
        scoreText.text = sscore.ToString();
    }
}

```



```

    }
}
public void decreaseScore()
{
    scoreText.text = ((int.Parse(scoreText.text)) - 1).ToString();
}
public void ResetGame()
{
    SceneManager.LoadScene(2);
}
private void Start()
{
    string[] lines = File.ReadAllLines("Assets/Resources/Reflexione Resources/SaveData.txt");
    string[] splitted = lines[lines.Length - 1].Split('$');
    highScoreText.text = splitted[1];
}
public void ExitToHomeScreen()
{
    SceneManager.LoadScene(0);
}
}
Shader "Custom/Tree_Billboard"
{

```

Properties

```
{  
    [PerRendererData] _MainTex("Sprite Texture", 2D) = "white" {}  
  
    _Color("Tint", Color) = (1,1,1,1)  
  
    // _Time ("Time", Float) = 0  
  
    [MaterialToggle] PixelSnap("Pixel snap", Float) = 0  
}
```

```
SubShader
{
  Tags
  {
    "Queue" = "Transparent"
    "DisableBatching" = "True"
    "SortingLayer" = "Resources_Sprites"
    "IgnoreProjector" = "True"
    "RenderType" = "Transparent"
    "PreviewType" = "Plane"
    "CanUseSpriteAtlas" = "True"
  }
}
```

Cull Off

Lighting Off
ZWrite Off

Blend One OneMinusSrcAlpha

```
Pass
{
    CGPROGRAM
#pragma vertex vert
#pragma fragment frag
#pragma target 2.0
#pragma multi_compile _ PIXELSNAP_ON
#pragma multi_compile _ ETC1_EXTERNAL_ALPHA
#include "UnityCG.cginc"

    //    uniform Float _Time;

struct appdata_t
{
    float4 vertex : POSITION;
    float4 color  : COLOR;
    float2 texcoord : TEXCOORD0;
    UNITY_VERTEX_INPUT_INSTANCE_ID
};
```

```
struct v2f
{
    float4 vertex : SV_POSITION;
    fixed4 color : COLOR;
    float2 texcoord : TEXCOORD0;
    UNITY_VERTEX_OUTPUT_STEREO
};
```

fixed4_Color:

```

v2f vert(appdata_t IN)
{
    v2f OUT;

    UNITY_SETUP_INSTANCE_ID(IN);

    UNITY_INITIALIZE_VERTEX_OUTPUT_STEREO(OUT);

    //      OUT.vertex = UnityObjectToClipPos(IN.vertex);

    OUT.texcoord = IN.texcoord;

    OUT.color = IN.color * _Color;

    // #ifdef PIXELSNAP_ON

    OUT.vertex = mul(UNITY_MATRIX_P,
        mul(UNITY_MATRIX_MV, float4(0.0, 4.1, 0.0, 1.0))
        - float4(IN.vertex.x, -IN.vertex.y, 0.0, 0.0)
        * float4(6.0, 8.0, 1.0, 1.0));

    //      OUT.vertex = UnityPixelSnap (OUT.vertex);

    // #endif

    return OUT;
}

sampler2D _MainTex;

sampler2D _AlphaTex;

```

```
fixed4 SampleSpriteTexture(float2 uv)
{
    fixed4 color = tex2D(_MainTex, uv);

    #if ETC1_EXTERNAL_ALPHA
        // get the color from an external texture (usecase: Alpha support for ETC1 on android)
        color.a = tex2D(_AlphaTex, uv).r;
    #endif //ETC1_EXTERNAL_ALPHA

    return color;
}
```

```
fixed4 frag(v2f IN) : SV_Target
{
    fixed4 c = SampleSpriteTexture(IN.texcoord) * IN.color;
    c.rgb *= c.a;
    return c;
}

ENDCG

}

}

}
```


RESULTS

5. SCREENSHOTS



Figure 5.1 Initial HomeScreen



Figure 5.2 Main Home Screen



Figure 5.3 Reflexione One Initial Screen

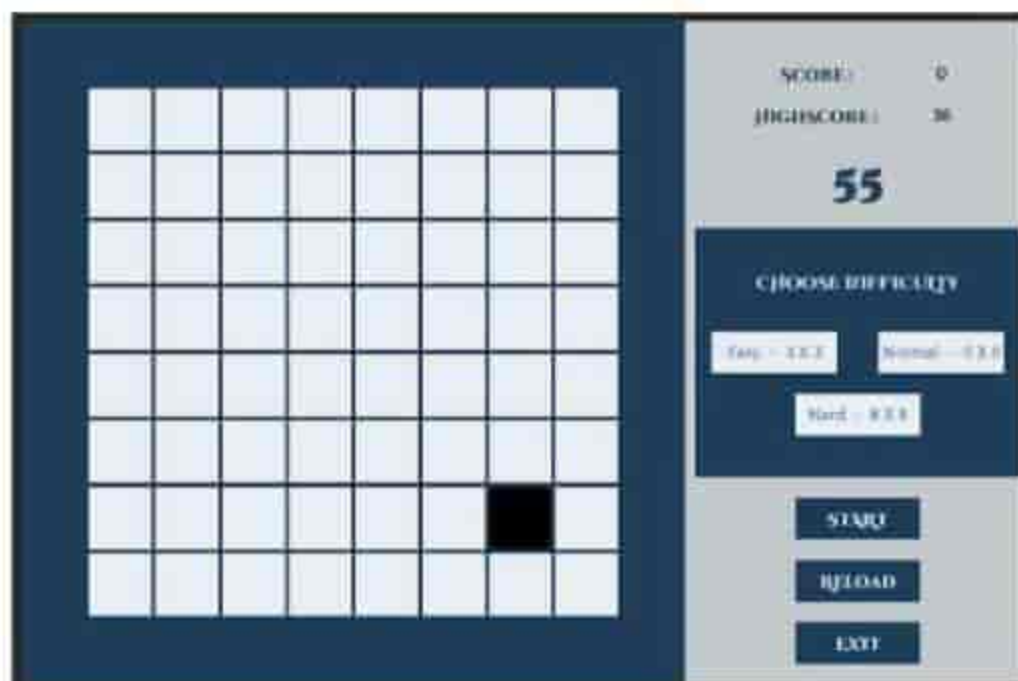


Figure 5.4 Reflexione One Game Scene



Figure 5.5 Reflexione Two Initial Screen



Figure 5.6 Reflexione Two Game Scene



Figure 5.7 Words Wizard Initial Screen



Figure 5.8 Words Wizard Game Scene

TESTING

6. TESTING

6.1. INTRODUCTION TO TESTING

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, subassemblies, assemblies and/or a finished product. It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of tests. Each test type addresses a specific testing requirement.

6.2. TYPES OF TESTING

6.2.1. UNIT TESTING

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application .It is done after the completion of an individual unit before integration. This is a structural testing that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

6.2.2. INTEGRATION TESTING

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfactory, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

6.3. TEST CASES

Test Case ID	Game	Correct Input	User Input	Result
1	Reflexione _One	Sequence Random(0,5,8)	Incorrect Sequence	Sound, Incorrect Input Reset
2	Reflexione _One	Sequence Random(3,5,8)	Correct Sequence	Sound, Correct Input Advance to next

3	Reflexione _Two	Random Container (id = 5)	Container (Id = 5)	Sound, Correct Input Advance to next
4	Words Wizard	Letter random (V)	Word starting with V	Updated in layout, next random letter
5	Words Wizard	Letter random (D)	Word starting with G	No updation in layout, next random letter

CONCLUSION

7. CONCLUSION

7.1. PROJECT CONCLUSION

The project is titled as "Cognitive game using unity" is an interactive entertainment based cognitive ability improvement application. This Interactive Application provides three different types of cognitive ability training environments. This Interactive Application is developed using the Unity game engine.

7.2. FUTURE SCOPE

Unity releases its yearly LTS versions with new features every year. Because this engine is used solely for game development we can use its latest features to develop more immersive Interactive Applications.

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https://github.com/shaiksaiyuddin/MAJOR_PROJECT.git

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⁴²
JOURNAL

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Designing an Intellective Gaming Using Unity User Interface

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Abstract— Video games have a unique ability to engage, challenge, and motivate, which has led teachers, psychology specialists, political activists and health educators to find ways of using them to help people learn, grow and change. Serious games, as they are called, are defined as games that have a primary purpose other than entertainment. This way it is demanding to create games that both educate and entertain. While game designers have embraced some psychological concepts such as flow and mastery, understanding how these concepts work together within established psychological theory would assist them in creating effective serious games. Game design professionals have understood the propensity of video games to teach while lamenting that educators does not understand how to incorporate educational principles into game play in a way that preserves the entertainment. Social cognitive theory (SCT) has been used successfully to create video games that create positive help w outcomes, and teachers have successfully used Gardner's (1983) theory of multiple intelligences (MIs) to create engaging, immersive learning experiences. This behavioral game design is a new framework that incorporates SCT and MI with game design principles to create a game design blueprint for serious games.

Keywords— intellective games ,word wizard, unity, video games, user interface

I. INTRODUCTION

This project is titled as "Designing an Intellective Gaming Using Unity User Interface". There are 3 different types of brain areas we focus on, they are memory, reflex and language. This application(interactive entertainment application) has been developed to improve the brain functionality of the users by playing cognitive games. Developed in unity, a top game engine for 2d- graphics. This application provides interactive entertainment based cognitive ability training to the users. This project is developed using the Unity game engine.

II. PROJECT FEATURES

Cognition is the ability to process information through perception (stimuli that we receive through our different senses), knowledge acquired through experience, and our personal characteristics that allow us to integrate all of his information to evaluate and interpret our world. In the Interactive application we focused on and developed Interactive application for three core cognitive abilities. Memory improvement: is part of this memory game, the process can be done with a few steps that can be easy and performed effortlessly.

A. Brain reflection: improves the reaction time of the user.

B. Language: A language-game (German: Sprachspiel) is a philosophical concept developed by Ludwig Wittgenstein, referring to simple examples of language use and the actions into which the language is woven.

C Today, mobile games consume a vast market share within the games industry, it is expected that in 2018 mobile gaming will account for 53 percent of the gaming market revenue and currently there are over a third of Americans playing mobile games daily . In regards to genre; the most popular games are brain puzzle games (with over 37 million users per month playing one), closely followed by matching puzzle games. According to the U KIE's games industry map, there are nearly a thousand games companies in London. Out of these, roughly seven hundred are working on the mobile platform and over two hundred were formed in the last Ten years. Not all of these companies will be run by younger developers but it is safe to assume that at least a small portion of them are. Considering that nearly two billion mobile devices are running a Unity-made game, it is probable that quite a large majority of these new companies will be using Unity to develop mobile games. This paper aims at developing a two dimensional(2D) game using unity. We are particularly interested in 2D games because Unity has its name for 2D game development. We are going to learn about everything that is required to develop a 2D game in unity.

III. LITERATURE

For this study, it is necessary to know concepts of terms relevant to this research as "Intellective game," and also we will discuss with the formation of this "User Interface".

A. User Interface:-

A user interface in games' purpose is to allow a user to carry out a task within a game world either through direct input or through an action on a Head Up Display (HUD). The user interface is the section of a program that allows for human-computer interactions (HCI). User Interfaces must be designed with care and understanding for human psychology and physiology, this is because the colour, shape, and way a program is used dictates how well a UI is crafted. The colour choice in UI design should be based on colour psychology theory to give the user a certain feeling while interacting with each area of the UI, the shape of a UI is equally as important in crafting certain feelings in a user. UI should not require the user to have to learn many if any, new skills to gain access to it and be built with the idea of what knowledge a user already has in mind. Many variations of UI allow for as much user choice as possible either through buttons, menus, sliders, and other optional widgets or through the creation of UIs which allow for manual changes by the user, and toggle options can be used here also. UIs purpose should always be made with the idea of enhancing the user experience and simplifying tasks.

B. Intellective Game:-

According to Dorabjee et al. [9], HMDs are wearable devices in the form of glasses that provide the user with a fully immersive and/or semi-immersive experience. These glasses block the view of the physical world and project on two screens close to the user's view, stereoscopic images (an optical technique where a 3D view is created from the fusion of two slightly different views on each retina) generated by a computer.

Recent advances in hardware technology have made it possible to produce HMDs suitable for consumers, such as, for example, the Oculus Rift, suitable for immersive VR applications such as games, simulations, and films [10]. Different types of HMDs can use the processing power of different kinds of technology. The Oculus Rift and HTC Vive are connected to a computer, while Sony's PlayStation VR uses the PlayStation 4 console's processing power. Also, Samsung's Gear VR, like Google VR, uses a smartphone as a processor and a screen and also makes use of its sensors to track the positioning of the user's head.

Two essential characteristics of these devices are FOR (Field Of Regard) and FOV (Field Of View). The FOR refers to the amount of physical space surrounding the user, where images are displayed. This space can be measured through degrees of viewing angle so that if a cylindrical screen was built, the user would be in the center of it, and the screen would have 360 degrees of horizontal FOR. FOV, or field of view, refers to the maximum number of degrees of viewing angle that can be seen immediately on a screen. Its measurement is also done in degrees, where a flat projection screen could have a horizontal FOV between 80 to 120 degrees, depending on the user's position in relation to the screen. FOV must be less than or equal to the maximum FOV of human vision (approximately 180 degrees).



Fig. 1. Content Zones. Source:

The FOV in commercial HMDs can vary from device to device. The Oculus Rift, for example, has a 94-degree FOV. However, it is worth mentioning that HMDs like this allow the user to change the orientation of their head to see more of the environment around them. Later, Alger used the results of Chu to combine these grades with the FOV in an HMD, resulting in the creation of five areas for content disposal, which can be seen in Fig. 1. They are Content Zone, Peripheral Zone, Curiosity Zone, No Zone, and the Background Zone. The Content Zone, or comfort zone, is the comfortable area for viewing and rotating the head, where objects still pass a perception of stereoscopic depth.

IV. PROPOSED SYSTEM

In this section we explain why unity is best for all kinds of developers when it comes to developing games for mobile and low end devices. While Unity and Unreal Engine are often considered the top two game engines, both engines serve different purposes. Whereas Unreal Engine is best-suited for more robust games, especially from a graphics standpoint Unity is more versatile and can be a better option for developers who are looking to build mobile games, 2D games.

Unity is in the top 3 best game engines. As you can see in the above figure Unity owns 45 percent of the global market share, this is really huge compared to other engine. It has offices all around the globe, 3.3 billion developers using unity, 600 million games and much more. The most important feature that separates unity from other engines is its supported platforms. Unity supports 17 platforms. It can run on every major Operating system. Sprites into the game engine. Unity has its own sprite technology that makes working with sprites easier. Sprite creator, sprite editor,

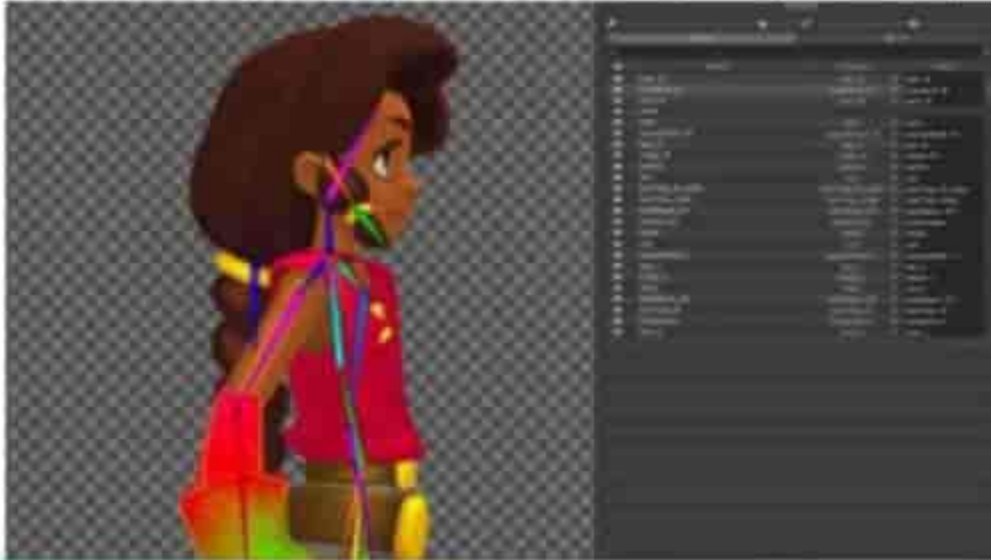


Fig:Unity Sprite Editor

Unity has visual scripting(BOLT) for non programmers. It helps team members create scripting logic with visual, drag and drop graphs instead of writing code. It also enables more seamless collaboration between programmers, artists and designers for faster programming.



Fig: Unity Visual Scripting (BOLT)

V. IMPLEMENTATION AND PROPOSED WORK

A. Assets:

Unity has its own asset store where developers can share their assets with others. It is a great place for beginners who don't want to spend time creating assets when they should be working on other parts of the game.

We downloaded a sprite UI pack from unity asset store. It has button sprites, arrows, circle sprites etc..., everything we require to create a game.

B. Layout and visuals:

Unity has an ECS system. Entity component system is a data oriented way of designing components. With one container we can customize it by adding only the tools that we need. It reduces usage of the extra tools.

So coming to the layouts Unity has different types of built in layout types such as grid, horizontal layout group, minimal work.

C. Scripting:

As we discussed unity has visual scripting. Although it makes programming easy, it limits the functionality. We will use traditional scripting.

We need to program the functionality for the layout that we created. We are using a visual studio for programming. Example logic for word game: we need to give a random letter to the screen so the player sees it. Then we need to take input from the user, then check whether the word entered by the user starts with the given letter and is there a word that is given by the user. Example: test cases:

D. METHODOLOGY

The general objective of the research is to evaluate the main guidelines used by programmers and designers of Intellectual Gaming Using Unity User Interface by head orientation.

For this research, the specific methodology steps were:

- 1) Analyze guidelines for user interaction with Unity applications available in the literature to search for common guidelines.*
- 2) Evaluate five games positively ranked in the Steam¹ platform to understand if those games apply the guidelines found.*
- 3) Identify visual elements that are recurrent during the evaluation of the popular, highly-rated games.*
- 4) Evaluate user perception about these common elements and their suggestions.*

E. IDENTIFICATION OF NEW INTERACTION

In Sandstorm [18], the author pointed out that designers are trying to use the same solutions for 2D graphical interfaces in unity applications. Thus, he indicates an example where designers use flat GUI in a virtual world and point out that this may be a bad practice since perspective texts can make reading difficult. Thus, it is necessary to identify some solutions to prevent GUI elements from being shown in perspective.

VI. MODULES & DESCRIPTION

A Engine

The game engine used in this project is Unity 5 v2019.04 . 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 a Mac OS X-exclusive game engine. The engine has since been gradually extended to support a variety of desktop, mobile, console and virtual reality platforms.

B Graphics

A variety of computer graphic techniques have been used to display video game content throughout the history of video games. The predominance of individual techniques have evolved over time, primarily due to hardware advances and restrictions such as the processing power of central or graphics processing units.

1 <https://store.steampowered.com/>



We use sprite rendering for showing objects on the screen. The problem with this is it takes a lot of memory, to ensure the minimum usage of memory units built in the profiling system is used to debug and optimize the objects.

C Audio

In video games, music can be streamed, where the audio is pre-recorded and played back when required.



While early video games were restricted to sequenced music, streaming music has become a more viable option as technology has improved.

D Interface

A user interface (UI) is the space where interactions between humans and machines occur. The goal of this interaction is to allow effective operation and control of the machine from the human end, whilst the machine simultaneously feeds back information that aids the operators' decision-making process.

E. Input

Pointer events and buttons are created on the Input window, and end users can configure Keyboard input in a nice screen configuration dialog.

F Data Manager

Comprises all disciplines related to managing data as a valuable resource.

VII CONCLUSIONS

By playing the Cognitive game we can improve reflex speed, language ability and short term memory improvement. These three fields are chosen because they play an important role in day to day life. The techniques used in the development are some design patterns and profiling techniques. Creating more games for our project. To improve our knowledge on the unity game engine and produce more optimised games in the field of 2d. And also make some 3d games to improve our understanding about all fields.

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