

Mawa Highway Racing Game

BY

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This Report Presented in Partial Fulfillment of the Requirements for the
Degree of Bachelor of Science in Computer Science and Engineering

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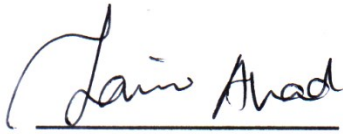
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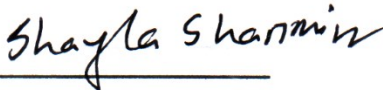
This Project titled “**Mawa Highway Racing Game**”, submitted by **Amit Sutra Dhar**, ID: 201-15-14203 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on Monday, **July 15, 2024.**

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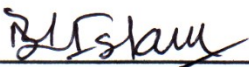
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It hereby declare that, this project has been done by me under the supervision of **Tapsay Rabeya, Senior Lecturer, Department of CSE** Daffodil International University. I also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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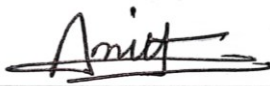


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ABSTRACT

Modern highways with realistic traffic and urban landscapes. Fast-paced arcade-style racing with a focus on highway scenarios.

Intuitive controls for acceleration, braking, steering, and possibly drifting. Support for various input devices, including touch controls for mobile platforms.

Dynamic camera angles, including behind-the-car view and cockpit view. Implement camera shake and effects to enhance the sense of speed. Include a diverse selection of modern vehicles, from sports cars to high-end luxury cars and possibly motorcycles. Design realistic and visually appealing highway environments with modern cityscapes, tunnels, bridges, and dynamic weather effects. Implement a realistic traffic system with AI-controlled vehicles. Introduce challenges such as navigating through dense traffic, avoiding accidents, and strategically overtaking. Single-player campaign with progressive difficulty. Time trials, challenges, and possibly an endless mode. Multiplayer mode for online or local racing against friends or other players. Implement online leaderboards to encourage competition among players. Include a variety of achievements for different in-game accomplishments. Realistic engine sounds, tire screeches, and ambient highway noises. Dynamic music that complements the intensity of the race.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Mawa Highway racing is an elating online floating amusement created by Solidarity, advertising players an immersive and adrenaline-pumping involvement within the world of float dashing. From the shrieking tires to the smoke-filled tracks, the diversion captures the quintessence of the float culture with dazzling visuals and reasonable material science. In Mawa Highway racing, players jump into the dynamic world of underground floating, where aptitude and fashion rule preeminent. The diversion highlights a tremendous cluster of customizable cars from eminent producers, permitting players to fine-tune their vehicles to flawlessness. Whether it's tweaking the suspension, altering adapt proportions, or overhauling horsepower, every adjustment tally within the interest of acing the craftsmanship of floating. The gameplay rotates around seriously float fights over different tracks and situations. From winding mountain streets to urban circuits, each area presents its claim set of challenges and openings for players to grandstand their floating ability. With exact controls and responsive taking care of, players can execute jaw-dropping floats, chaining together slides and maneuvers to gain focuses and climb the leaderboards. Mawa Highway racing too offers a profound movement framework, permitting players to open modern cars, parts, and overhauls as they advance through the amusement. Whether you are a prepared float experienced or a newcomer to the scene, Mawa Highway racing gives bounty of substance and challenges to keep you snared for hours on conclusion. With its shocking illustrations, reasonable material science, and addictive gameplay, Mawa Highway racing stands as a confirmation to Unity's commitment to conveying high-quality gaming encounters. So, rev up your motors, strap in, and get ready to drift your way to radiance within the extreme test of ability and fashion.

1.2 Motivation

The motivation behind the development of Mawa Highway Racing is to provide players with an immersive and exciting experience in the world of drift racing. Drifting has a loyal following around the world and Mawa Highway Racing aims to capture the excitement and adrenaline of this motorsport. With realistic physics and detailed vehicle customization options, this game will appeal to enthusiasts who love the art of drifting. Mawa Highway Racing is designed to provide addictive and challenging gameplay to the player. Intense drifting battles, a variety of tracks, and a comprehensive progression system will appeal to players looking to master the art of drifting and climb the leaderboards. Games like Mawa Highway Racing often foster a strong sense of community among players who share a common interest in drifting and car culture. This game provides players with a platform to interact, compete, and share experiences, forming a vibrant community of drifting enthusiasts. Mawa Highway Racing, a game developed in Unity, serves as a demonstration of the capabilities of the Unity engine. This game demonstrates Unity's ability to deliver high-quality graphics, realistic physics, and immersive gaming experiences across multiple platforms. After all, Mawa Highway Racing main motive is to provide entertainment and fun to its players. Whether you're a drifting veteran or a beginner, this game provides a fun and rewarding experience that will keep you coming back for more.

1.3 Objectives

Mawa Highway Racing is all about mastering the art of drifting while completing the game's challenges and events.

Master Drifting Techniques: The main goal of Mawa Highway Race is to become an expert drifter. Players aim to perform precise and stylish drifts and master techniques such as power slides, feints, and transitions to maintain control of their vehicle while sliding sideways through corners.

Earning Points and Rewards: As players drift around the track, they earn points based on the length, angle, and type of drift. These points contribute to your overall score and help

you move up the leaderboard. Additionally, successful drifts reward players with in-game currency and other rewards, allowing them to unlock new cars, parts, and upgrades.

Car Customization and Upgrades: Another main goal is to customize and upgrade your car to improve his drifting performance. Players can change various aspects of their vehicle, including engine performance, suspension settings, tire type, and appearance. By investing in upgrades and tuning, players can create their own drift machine to suit their tastes and playstyle.

Participate in Events and Challenges: Mawa Highway Racing offers a variety of events, challenges, and competitions in which players can participate. These include time trials, drift battles against AI opponents or other players, and special events with unique objectives and rewards. Players can test their skills and earn rewards by successfully completing these challenges.

Exploring Tracks and Environments: The game offers players to explore different tracks and environments. From winding mountain roads to urban circuits, each location offers unique challenges and opportunities for drifting. Players can strive to master each track and discover the best lines and techniques for optimal drifting performance.

1.4 Expected Outcomes

Mawa Highway Race varies depending on each player's goals and preferences. The player can expect to improve his drifting skills by spending more time racing his Mawa on his highway. Through practice, experimentation, and learning from mistakes, players can hone their techniques and become skilled at performing stylish, controlled drifts. Players collect points, complete challenges, and win contests to progress through the game and unlock new content such as cars, parts, and upgrades. The expected outcome is a sense of accomplishment and progress as players build garages, customize vehicles, and climb leaderboards. Successfully overcoming challenges, mastering difficult courses, and outperforming opponents provides players with a sense of accomplishment and satisfaction. The expected outcome is a sense of pride and accomplishment when you overcome challenges and achieve gaming milestones. Mawa Highway Racing fosters a sense of community among players who share a passion for drifting and automotive

culture. Players can interact with each other and share tips, strategies, and experiences through in-game contests, leaderboards, forums, and social media. The expected outcome is camaraderie and connection with other enthusiasts. Ultimately, the expected outcome of playing Mawa Highway Racing is entertainment and fun. Whether players are playing for fun, competition, or self-improvement, this game provides an immersive and exciting experience that will provide hours of entertainment and fun.

1.5 Project Management and Finance

Developing a game like Mawa Highway Racing requires careful project management to keep the development process on track and within budget. This typically includes: Establish clear goals and objectives for the project, define the scope, and create a development roadmap. Divide the development process into manageable tasks, estimate the duration of each task, and create a development plan. Allocate resources such as human resources, technology, and budget effectively to support the development process. Facilitate communication and collaboration between team members and keep everyone aligned with project goals and deadlines. Identify potential risks and challenges that may arise during development and implement strategies to mitigate them. The financial aspects of developing a game like Mawa Highway Racing include: Determine the overall budget for the project, including costs for development, marketing, distribution, and ongoing maintenance. Monitor expenses throughout the development process to ensure your project stays within budget.

Estimate potential revenue streams from games such as:

B Sales, In-App Purchases, Advertising, or Subscription Services. Evaluate your project's potential return on investment based on sales forecasts and development costs. Develop strategies to effectively monetize your game, including: Pricing Models, Microtransactions, or DLC (Downloadable Content).

1.6 Report Layout

In this report, we try to gradually cover the complete overview, related works and technologies. In the chapters, we will discuss our projects more extensively. We try to describe the requirement specifications. We are currently researching the answer to the question “What features need to be developed to be more attractive”. We will also cover the problems and challenges we face. In different chapters of the report, we try to discuss different topics, such as problems and challenges, solutions, detailed structure of the application as well as future plans.

CHAPTER 2

BACKGROUND

2.1 Preliminaries/Terminologies

The goal of developing this project is to create a world-class 3D car racing game. Although the world has developed 3D car racing game technology, in our country this field is still not developed. When creating such a project, I aim to attract investors and entrepreneurs to invest in this field to be able to compete with large companies such as Ubisoft, Rockstar, EA Sports, etc. Some common terms used in racing and drifting games on Mawa Highway,

Drifting: A driving technique in which the driver intentionally overspeeds, causing the rear wheels to lose traction and the car slides to one side when cornering.

Angle: The degree of rotation of the car's wheels compared to the direction of travel when drifting. Higher angles often result in smoother, more powerful drifts.

Speed: Vehicle speed when drifting. Maintaining high speed through turns is important to achieve long, impressive drifts.

Line: The road the driver turns into while drifting. Finding the optimal line is essential to maintain control and maximize points.

Counter-steering: The act of turning the steering wheel in the opposite direction to the original drifting direction to regain control of the vehicle while drifting.

Power Over: Press the accelerator when starting a drift to break traction and cause the rear wheel to slip, commonly used when cornering at high speed.

Transition: Change of direction while drifting, often accompanied by rapid changes in weight transfer and steering maneuvers.

Tandem Drift: Drift in close proximity to another vehicle, often synchronously, commonly seen in side-by-side drifting or multiplayer competitions.

Clipping Point: A designated point or marker on the road that the driver aims to "cut in" or approach while drifting, used to judge the line and angle.

Cornering handbrake: A technique in which the driver uses the handbrake to induce oversteer and initiate a drift, typically used when turning sharply or quickly.

Power Slide: A type of drift in which the rear wheel loses traction because the force applied to the wheel is too great, causing the vehicle to slide to one side.

Understeer: Condition in which the front wheels lose traction when turning, causing the vehicle to continue in a straight line rather than following the intended path, the opposite of oversteer.

2.2 Related Works

Mawa Highway Racing stands out as a drift game loved by many people. There are several other games and franchises in the racing genre that players may find interesting or similar, such as the

Need for Speed series which is known for its wide selection of cars customization options and thrilling roads. With racing gameplay, the Need for Speed franchise offers a thrilling experience similar to racing on the Mawa Highway.

Forza Horizon combines open-world exploration with racing events, including drifting challenges. It is known for its realistic graphics, huge list of cars, and dynamic weather system.

Assetto Corsa was praised for its realistic driving physics and detailed car models. While it focuses more on simulation than arcade gameplay, it offers a realistic drifting experience for players looking for realism.

Gran Turismo is a long-standing racing franchise known for its extensive car collection, detailed tracks, and realistic driving mechanics. Players can participate in drift trials and competitions in different versions of the series.

Initial D Arcade game series is based on the popular manga and anime series Initial D, this arcade racing game series focuses mainly on drift racing. It features iconic cars and tracks

from the series, while emphasizing drifting technique and strategy. Although primarily focused on off-road racing,

the Dirt series offers a variety of racing genres, including both road racing and off-road racing, including drifting elements. It is known for its immersive environments and diverse terrain. Drift Max Pro, this game focuses specifically on drifting, offering a variety of cars and tracks for players to master. It features simple controls and arcade-style gameplay suitable for casual gamers. There are many travel-related projects on the Internet.

But the problem is that no app can solve all those problems together. The problem is that these apps, if one of them has good features, lack other features. That's why this is the only project specifically designed to solve all the problems together. The main goal of a project is to solve all the problems of other applications.

2.3 Comparative Analysis

Projects	Unity	Waterfall Model	Use (C#)
Drift Hunter	Yes	No	Yes
Need For Speed	Yes	Yes	Yes
My Work	Yes	Yes	Yes

Table 2.3.1: Comparative table.

2.4 Scope of the Problem

This can include issues related to game performance, such as optimizing for different devices, managing server load for online play, or fixing bugs and issues affecting the experience. player experience Balances game mechanics, such as car driving, drift physics, and difficulty level, to ensure a fair and fun experience for players of all skill levels. Determine the scope for additional content updates, such as new cars, tracks, customization options, and game modes to retain players and attract new users. Develop a sustainable monetization strategy that effectively generates revenue without compromising game integrity or alienating players with overly aggressive monetization tactics. Manage the

game community, including responding to player comments and concerns, moderating forums and social media, and promoting a positive and engaging environment for player interaction work. Understand the competitive landscape of the racing game genre, identify strengths and weaknesses relative to other titles, and develop strategies to effectively differentiate and position Mawa Highway racing. Expand your game's reach in international markets by localizing content, considering cultural sensitivities and preferences, and adapting marketing strategies to suit many different audiences. Analyze player retention metrics and identify factors that contribute to player attrition, such as boredom, frustration or lack of content, and implement strategies to improve levels engagement and player retention. Provides quick and efficient technical support to respond to player requests, resolve issues, and ensure a smooth gaming experience for all users. Ensure compliance with relevant laws and regulations relating to gaming, privacy and consumer protection in the various regions where Mawa Highway racing is located. To ensure my game was realistic, I had to research real scenes and movements. Because the project was so detailed, my home computer had to work overtime to produce the results.

Also, it complex to build graphical interface of game as a computer science student.

2.5 Challenges

Developing and maintaining a game like Mawa Highway Racing can pose some challenges. Creating realistic physics for drifting posed a significant challenge. Achieving the balance between realism and playability requires careful tuning and testing to ensure the car behaves realistically while still being fun to drive. Mawa Highway Raceway will run smoothly on a variety of devices, including low-end mobile devices and high-end gaming PCs. Optimizing performance without sacrificing visual fidelity is a complex task that requires extensive testing and iteration. Continuously adding new cars, tracks, and features to keep players engaged requires significant resources and time. Balancing the workload of creating new content with ongoing maintenance and bug fixes is an ongoing challenge for development teams Building and maintaining an active and engaged community around Mawa Highway races requires active communication, moderation and

support. Responding to player feedback and addressing their concerns in a timely and constructive manner is essential to cultivating a loyal player base. Designing a monetization strategy that generates revenue without alienating players can be difficult. Finding the right balance between in-app purchases, advertising, and other revenue streams while maintaining a fair and enjoyable experience for players is extremely important. The video game market is very competitive, with many other racing games vying for players' attention. Standing out in a crowded market requires unique features, engaging gameplay, and effective marketing strategies. Bugs, crashes, and other technical issues can occur at any stage of development and after launch. Resolving these issues quickly and effectively is essential to maintain player satisfaction and avoid negative reviews or churn. Attracting new players and retaining existing players requires targeted marketing efforts, effective player onboarding, and ongoing engagement initiatives. Keeping players coming back to Mawa Highway races over the long term is an ongoing challenge. Adapting Mawa Highway racing to different markets and cultures requires careful consideration of language, cultural references and sensitivities. Ensuring the game attracts players from diverse backgrounds is essential to achieving global success. Complying with regional laws and regulations, including those related to privacy, consumer protection, and game content, can be complex and time-consuming. Staying up to date with legal requirements and industry standards is essential to avoid potential legal issues. However, for this project, my main goal is to attract game creators and other organizations.

CHAPTER 3

REQUIREMENT SPECIFICATION

3.1 Business Process Modeling

Business process modeling involves mapping the various activities and workflows involved in developing, marketing, and operating a game like Mawa Highway Racing. By modeling and optimizing these business processes, the development team can streamline operations, improve efficiency, and maximize Mawa Highway Racing's success in the competitive gaming market: Brainstorm and come up with game ideas, including the game's theme gameplay mechanics and target audience. Create detailed design documents that describe the game's features, mechanics, levels, characters, and art style. Implement designs using programming, 3D modeling, animation, and other development tools and technologies. Perform rigorous testing and quality assurance to identify and resolve errors, malfunctions, and other issues. Publish games on various platforms including mobile, PC and consoles, through app stores, digital distribution platforms or direct downloads. Continuously update the game with new content, features and improvements based on player feedback and market trends.

Monetization Strategy: Analyze market trends, player preferences, and competitor strategies to make monetization decisions. Choose the appropriate monetization model(s), such as free-to-play with in-app purchases, premium pricing, advertising, or subscriptions, based on target audience and game content. Integrate in-game monetization mechanisms, including virtual currency systems, ad networks, payment gateways, and purchase reminders. Monitor key performance indicators (KPIs) related to monetization, such as average revenue per user (ARPU), conversion rate, and lifetime value (LTV), and optimize Strategies to maximize revenue while maintaining player satisfaction.

Community Management: Interact with players through forums, social networks, newsletters and other channels to create a vibrant and engaged community. Provide quick and helpful support to respond to player questions, feedback, and technical issues. Collect and analyze player feedback to identify areas for improvement and make development

decisions. Organize community events, contests and promotions to reward loyal players and attract new ones.

Marketing and Advertising: Plan marketing and advertising campaigns to increase awareness, generate downloads, and attract new players. Create engaging marketing materials, including trailers, screenshots, blog posts, and social media content to showcase your game's features and engage your target audience. Distribute marketing materials through various channels, such as social media platforms, gaming sites, influencers, and email newsletters. Track marketing campaign performance with analytics tools and optimize strategies based on metrics like click-through rate, conversion rate, and return on investment (ROI).

3.2 Game Development Life Cycle

It's disastrous when there are too many iterations in the design after development, or the development team is in production before the game is designed, there are too many unidentifiable flaws in the product design but I never perform technical analysis. Quotes like Who reads design documents, I don't write any technical design documents and that's how I've always worked, In the end I see it all these, our develop and design have dealt with similar issues in the past. I fix everything » Blame the game like customers asked us to change change this when the product is ready to ship. I have no idea about the process of removing design from the product story and requirements. The business owner is a “marketer” Invests nothing research (technology, art and framework) and start development according to its schedule. Therefore, due to this industry ideology, I see artists struggling to get stories, developers struggling to achieve the required quality of performance, people project managers delay delivery times, testers have difficulty documenting reports, and finally the publisher or game maker includes their vision for the product. Just because a careful, correct and standard approach cannot be followed, everyone in the process loses the charm, the beautiful journey that is game development. Therefore, everyone can understand the correct approach and value GDLC process of all stakeholders to create a successful, quality, and on-time product. There are almost no

schools/universities that offer game development courses includes software engineering architecture + graphics creation and 3D model development. Most developers/artists, out of curiosity, taught themselves. Unfortunately, GDLC still does not have international standards written by industry veterans (like IEEE) that are recognized as technical principles. We often see publishers wanting to develop the next game everyone is talking about. It's really good. However, it's quite simple. You have to know where you want to end up. If I don't follow the standard process, I could spend a year developing a product that doesn't even make sense or might not even be a game.

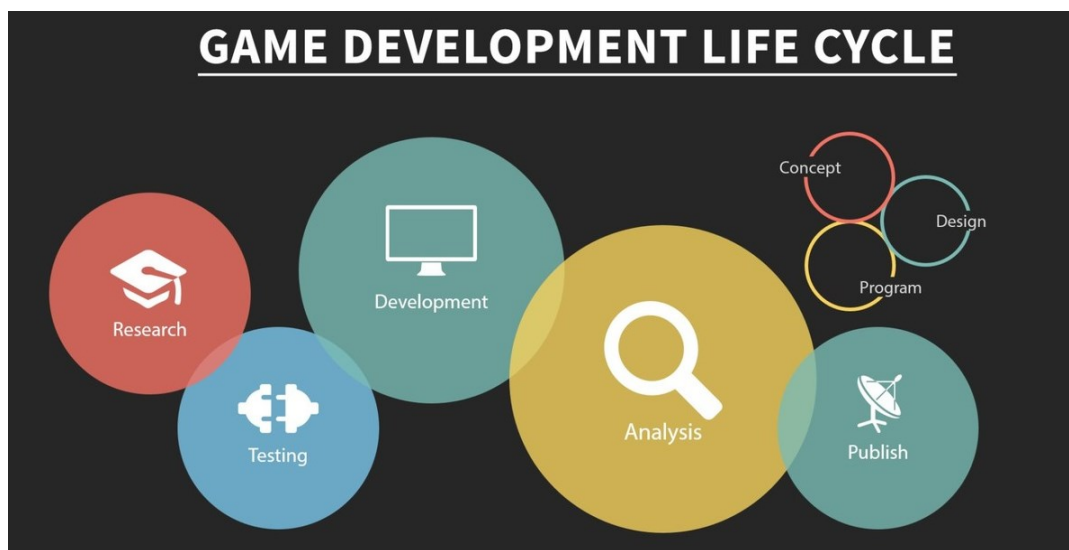


Figure 3.1: Game Development Life Cycle

3.3 Use Case Modeling and Description

The Waterfall model is another interesting option and is sometimes considered a counterpart to Agile development. It is much less dynamic but much simpler, effectively representing a linear approach to development. Each step of the process is fully completed before starting the next step, so analysis and design lead to design, then coding, and so on. without causing confusion or overlapping projects. This process isn't necessarily suitable

for today's more complex game designs, but can still work well for simpler projects or companies with fewer resources.

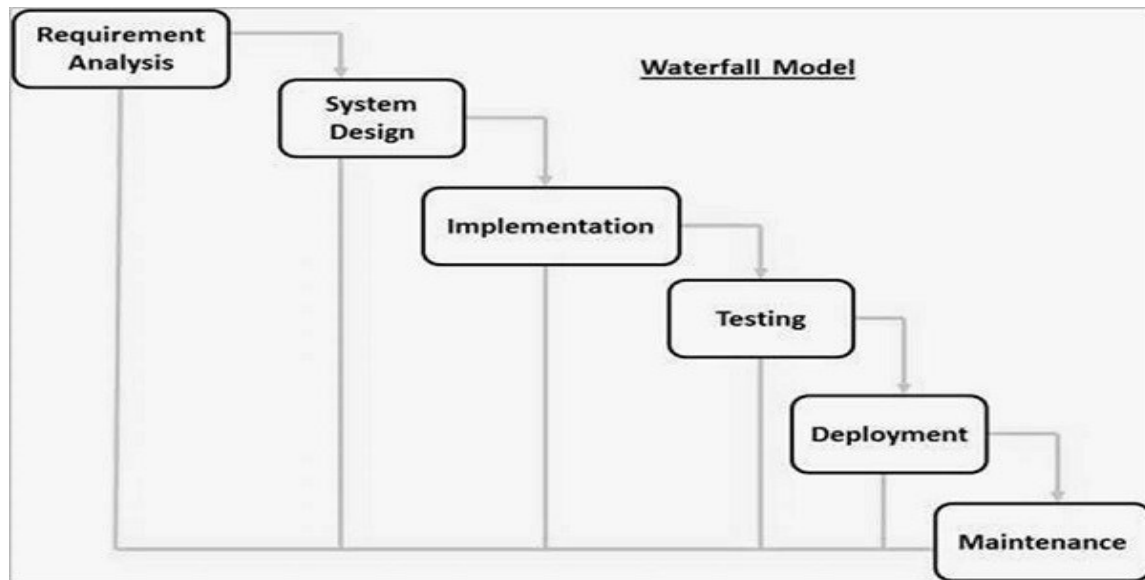


Figure 3.2: Waterfall Model

Description of this racing video game franchise, with primary users interacting with the game. Computer-controlled characters within the game environment and overall game infrastructure choose and participate in a single race against NPCs or in a time trial. Players participate in a series of races and challenges to progress through the game's career mode. Players modify and customize their vehicle's appearance, performance, and handling. Players upgrade vehicle parts such as engine, brakes, tires, etc. to improve performance. Players compete against other human players in online multiplayer races. Players freely explore the game world without participating in structured races. Players purchase new vehicles with in-game currency earned from races and challenges. Players adjust various vehicle parameters, such as suspension, transmission, and aerodynamics, to optimize performance for different types of races. Players check their performance rankings against other players around the world or in their friends list. Players complete specific challenges, such as time trials, drifting competitions, or escape chases. Players interact with the game system to access various features and functions. NPCs act as opponents or allies in races and challenges, interacting with players and the game system.

3.4 Logical Data Model

The Model of Waterfall

For big, complicated systems with a long lifespan, the waterfall model is advised². Certain systems that possess these qualities are also essential systems. This implies that in the event of a malfunction, there could be a risk to

- human life (death or injury)
- financial loss.
- Damage to the environment

Given that the waterfall model places a strong emphasis on thoroughness, it is thought to be a suitable option for designing a critical system. Treating each activity independently is the fundamental idea. In the same manner that water flows down certain falls, one activity is constantly followed by another. When examining a model visualization, this description becomes further clearer.

3.5 Design Requirement

To develop this project, I had to use some software. They are mentioned below:

- Unity 2019.4f
- Visual studio 2019
- 3ds max
- Notepad++

CHAPTER 4

DESIGN SPECIFICATION

4.1 Front-end Design

The first step of creating this car racing game was to create a script and storyboard. So that I have developed my script and storyboard of the shooting game so that I can go further easily. I used the classic method of developing to create the car racing game and character for my game. After creating all the models, I proceeded to texturing. To properly texturize a model, I had to use uvw mapping and unwrap uvw. These two methods are used to properly place the texture on the models. I used the unity asset store to get the maximum substances for my game.

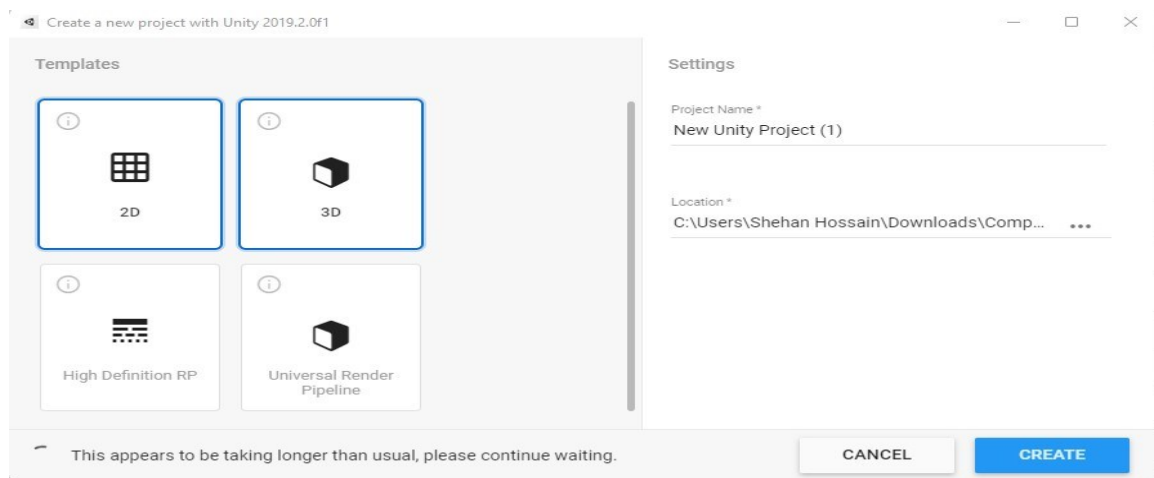


Figure 4.1: Creating a project file

Creating a drivable car

- In Unity, open the Vehicle Tools project
- Create an empty Scene
- Create a simple plane to use as a surface to drive on
- Set the scale of the plane to 100, 1, 100
- From the top menu, select Vehicles > Create skeleton
- A wizard will appear, where you can set the values for your vehicle
- For now, simply leave the default values as they are
- SelectGenerate to generate a vehicle

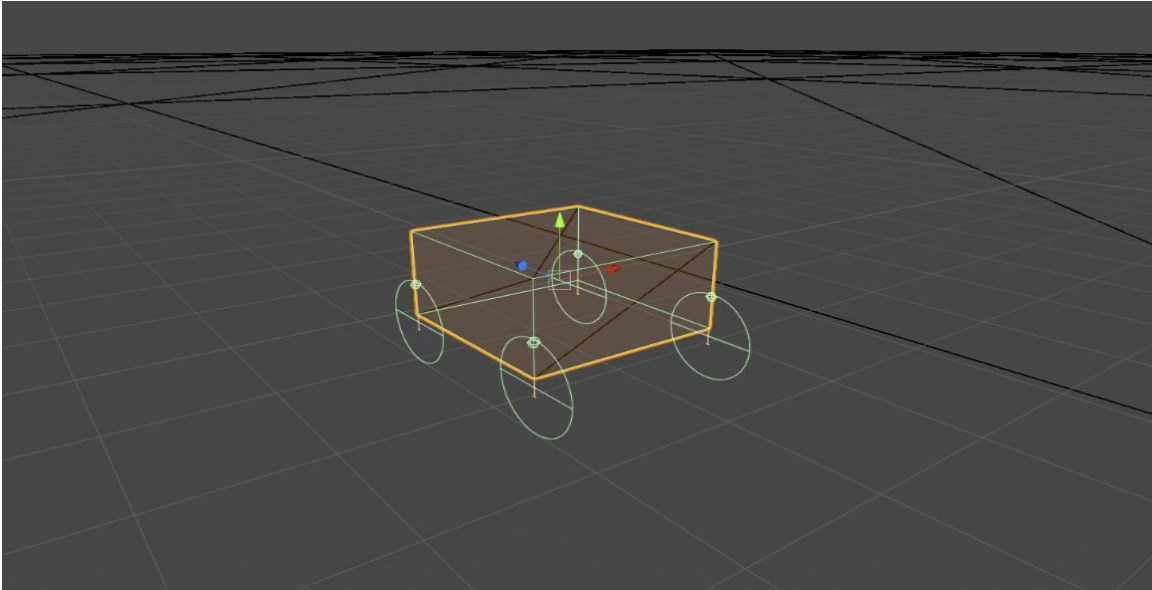


Figure 4.2: Creating a car

The Vehicle Skeleton Wizard. The Create skeleton wizard allows you to configure your drivable car. Unless otherwise specified, units of measurement are SI units examining a generated drivable car. The car generated by the wizard is a fully functional and drivable skeleton, based on the settings chosen in the wizard

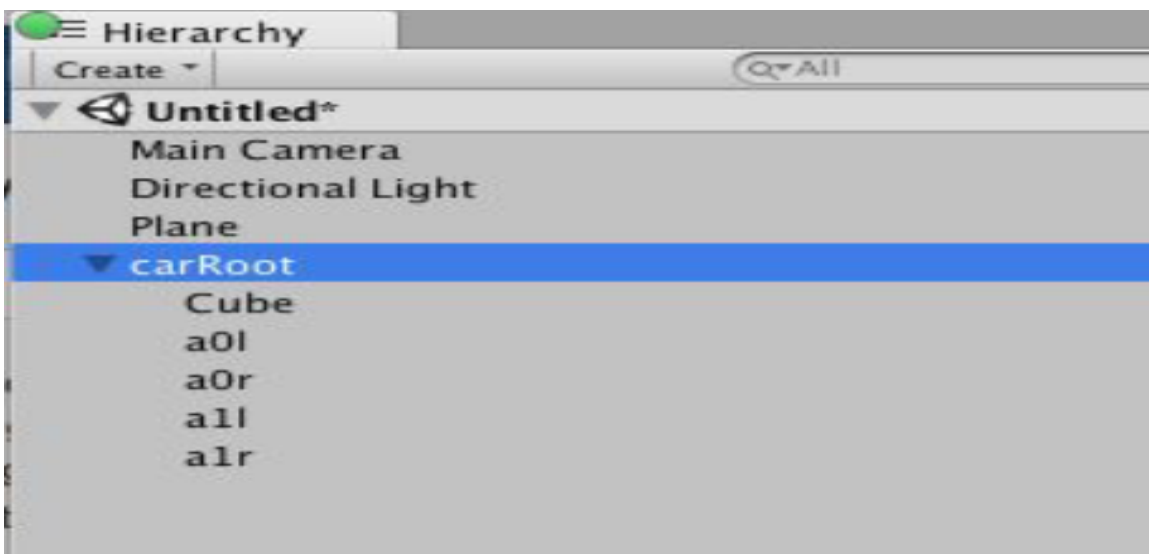


Figure 4.3: Examining a generated drivable car

If you examine the hierarchy of a generated car, you can see that it consists of a parent GameObject. Named carRoot and child GameObjects that represent the wheels and body of the car.

The body of the car,

By default, the GameObject called Cube serves as both the graphics and the collision geometry of the generated car. Any WheelCollider-based car requires a Collider to represent the body of the car. This Collider is used by the physics engine to compute the distribution of masses over the wheels. Cube can be replaced with non-placeholder graphics and collision geometry as needed. Issues with friction are the most frequent cause of simulated vehicles failing to accelerate and corner correctly. Most often, this happens because the physics code is not performing enough substeps - that is to say, it is not making frequent enough calculations.

The GraphOverlay component helps us to debug the friction calculations of our generated drivable cars.



Figure 4.4: Debugging friction

With the information from this component, we can decide whether we need to adjust the number of substeps.

4.2 Back-end Design

How to use the GraphOverlay component

- Add the GraphOverlay to any GameObject in your Scene
- Drag the carRoot GameObject of the car that you wish to debug into the Vehicle field of
- the GraphOverlay component
- Enter Play Mode and observe the graph of wheel slips in the Game view
- Accelerate the car (for example, from 0 to 100 km/h) and observe the changes in the graph

Interpreting the graph generated by the GraphOverlay component



Figure 4.5: Interpreting the graph

The x axis of the graph represents time and the y axis represents the slip value. The red and the green lines represent the longitudinal and lateral friction over time, respectively. The

blue lines on the graph represent the corridor $[-1, 1]$. The white line at the centre corresponds to the slip of 0. Ideally, both curves should be smooth and fall close to 0, right where the value doesn't yet reach the extremum. Consider the following graph, produced by a test car at low speed.

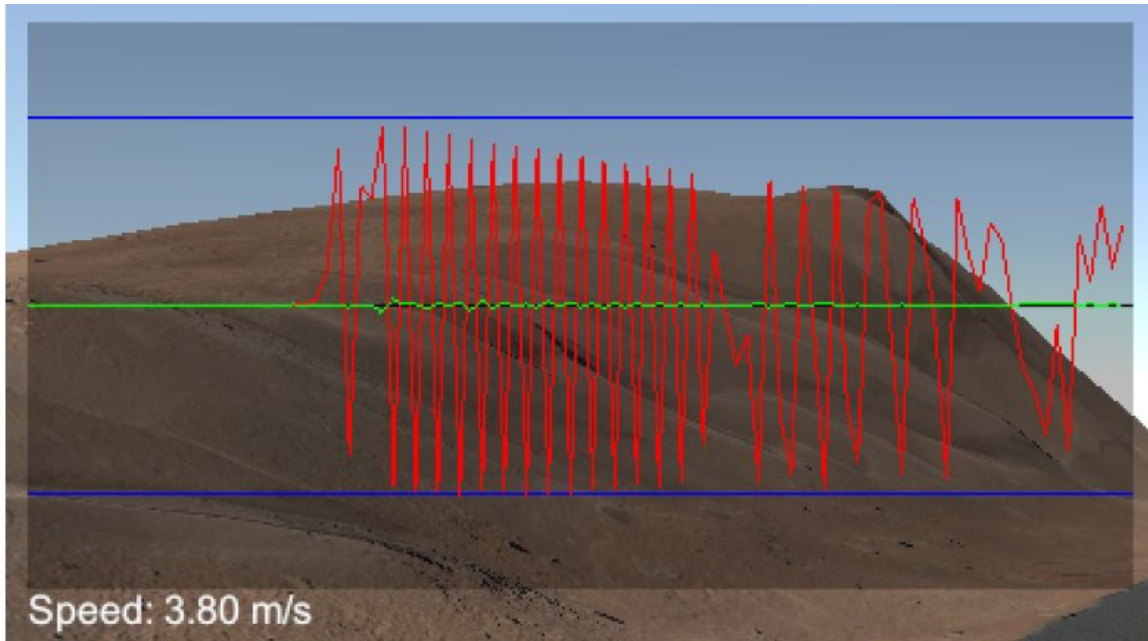


Figure 4.6: Test car at low speed

At these low speeds, the slip (the red line) repeatedly goes above and below zero (the green line). The oscillations are a direct indication that not enough substeps are taking place. This means that the code fails to work out the longitudinal slip, which results in force being applied in opposing directions. This results in the vehicle struggling to accelerate. In this case, the Critical Speed value for the WheelDrive component is set to the default value of 5 m/s. When the speed of the vehicle is below the Critical Speed value, the number of substeps is determined by the Steps Below value. As this problem occurs speeds below the Critical Speed, increasing the Steps Below value of the WheelDrive component is advised. Now consider the following graph, taken from a test car at a high speed.

In this case, the slip does not jitter at above and below 0 moderate speeds. However, when the vehicle reaches a speed of 5m/s the slip began to jitter above and below 0. Again, the Critical Speed value for the WheelDriver component is set to the default value of 5 m/s.

Once the speed of the vehicle reaches the Critical Speed, the number of substeps is determined by the Steps Above value. In this case, increasing the value of Steps Above is advisable

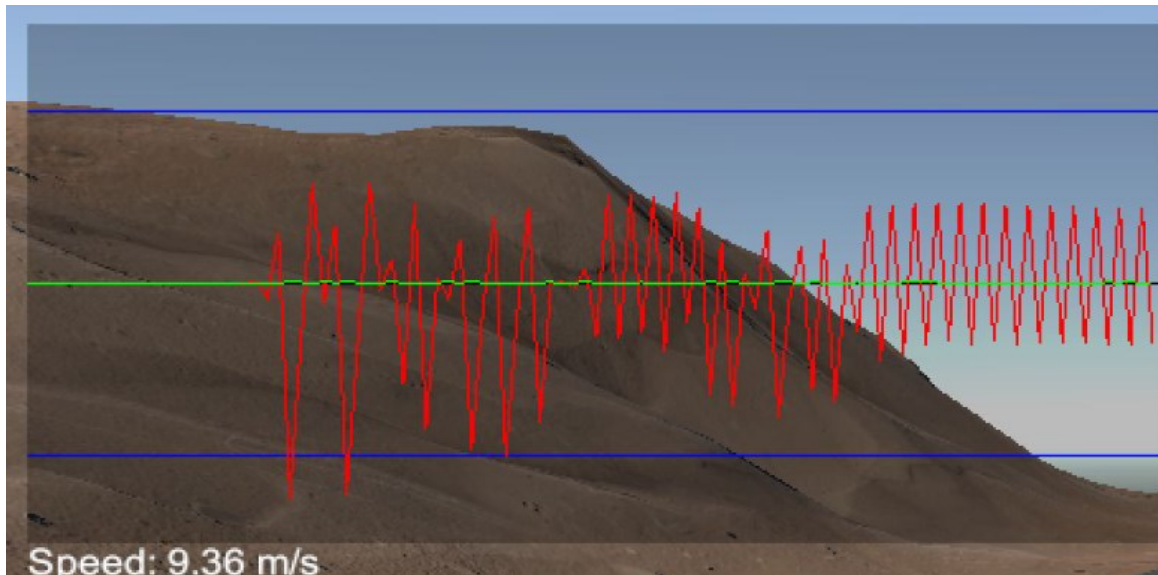


Figure 4.7: Test car at high speed

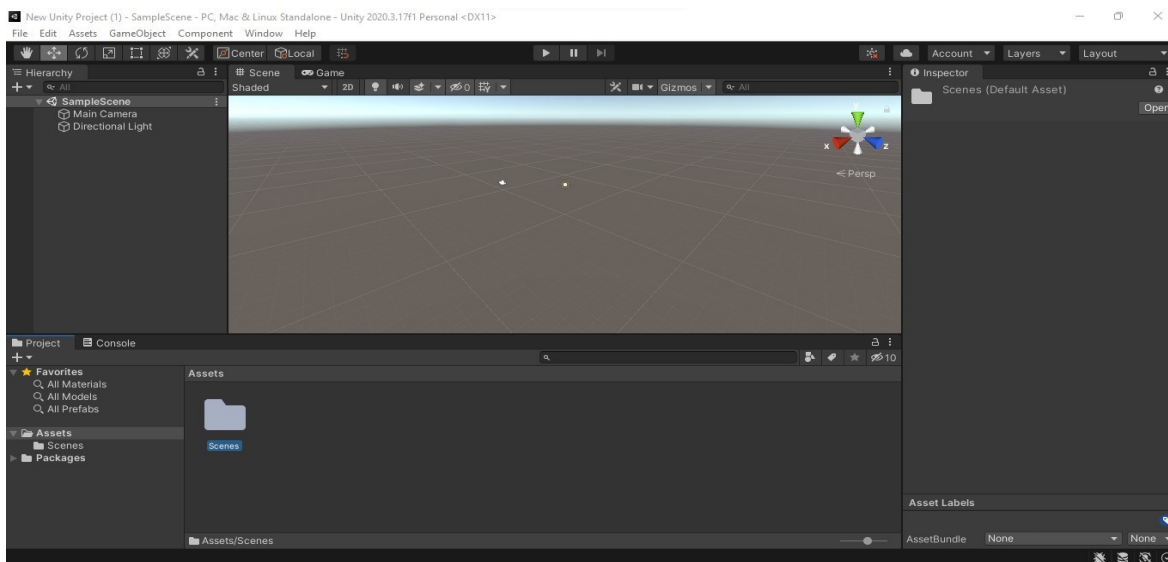


Figure 4.8: Unity Interface.

Inputting codes, build and run

After applying all the substances, materials I started coding and merging all of them . To animate the scenes, I gave the codes which were given in the classes.

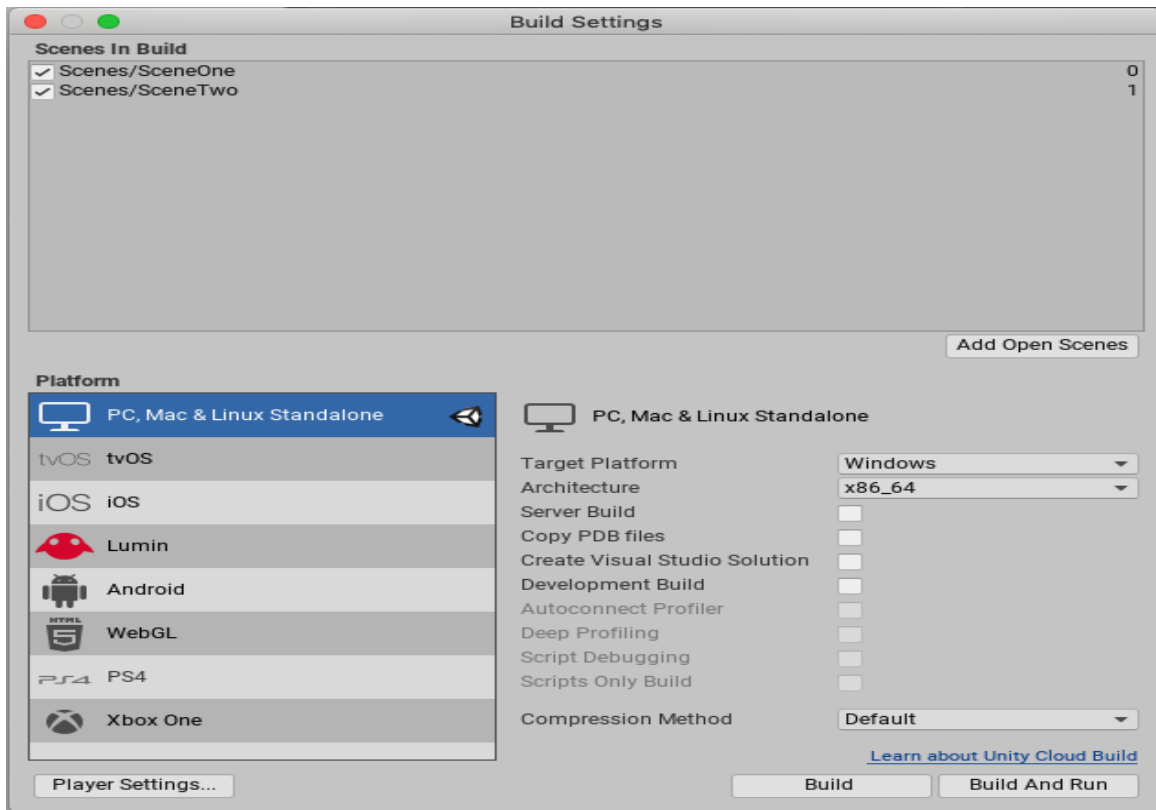


Figure 4.9: Build and run

Almost all the methods were used to develop this car racing game. Only few of them are showed in here. After building the game I exported the files to create the “.exe” format.

```

C# GameManager.cs X
E: > final project > New folder > Mawa Highway Race > Mawa Highway Race > Assets > scrip

1  using System.Collections;
2  using System.Collections.Generic;
3  using UnityEngine;
4  using UnityEngine.SceneManagement;
5  using UnityEngine.UI;
6
7  public class GameManager : MonoBehaviour {
8      //public vehicle Vehicle;
9      public vehicleList list;
10     public controller RR;
11     public GameObject neeedle;
12     public GameObject startPosition;
13     public Text kph;
14     public Text currentPosition;
15     public Text gearNum;
16     public Slider nitrusSlider;
17     private float startPosiziton = 32f, endPosition = -211f;
18     private float desiredPosition;
19     private GameObject[] presentGameObjectVehicles, fullArray;
20
21     [Header("countdown Timer")]
22     public float timeLeft = 4;
23     public Text timeLeftText;
24
25     [Header ("racers list")]
26     public GameObject uiList;
27     public GameObject uiListFolder;
28     public GameObject backImage;
29     private List<vehicle> presentVehicles;
30     private List<GameObject> temporaryList;
31     private GameObject[] temporaryArray;
32

```

Figure 4.10: Codes(#C)

4.3 Interaction Design and User Experience (UX)

Mawa Highway Racing involves creating intuitive interfaces and gameplay mechanics that engage and delight players while providing easy access to game features and content such as.

Intuitive menu layout with clear categories and labels for easy navigation. Consistent placement of common menu options like Play, Garage, Settings, and Store. Get quick access to important features and information without unnecessary clicks or touches. Simplified interface for car customization with intuitive controls and intuitive feedback. Easily compare different customization options, such as paint colors, body kits and performance upgrades. Preview feature to see how changes affect your vehicle's appearance and performance before making your final choice. The race setup screen is simple and intuitive with options to select track, car, race mode and difficulty level. Clear indication of racing conditions such as weather, time of day and track conditions. Ability to adjust settings on the fly without interrupting the gaming experience. Responsive and intuitive controls for drifting maneuvers, including throttle, steering and braking controls. Visual and audible feedback to indicate when the vehicle is drifting and how much control is being maintained. Control sensitivity and assist adjustment options to accommodate different player skill levels. A clear progression path with milestones, achievements and rewards to motivate players to keep playing. Visual cues and notifications celebrate achievements and highlight rewards earned during gameplay. Balanced reward system to ensure play is rewarding without being too painful or costly. Incorporates social features such as leaderboards, challenges, and multiplayer modes to encourage competition and cooperation between players. Seamlessly share game highlights, replays, and achievements across social media platforms. In-game events, tournaments, and community challenges aim to foster a sense of belonging and camaraderie among players. Collect player feedback through surveys, ratings, and user testing sessions to identify areas for improvement. Iterate on game design based on user feedback and analytics data to continuously improve the user experience. Update and patch regularly to fix bugs, add new features, and accommodate changing player preferences. After playing some demos and samples, I felt the performance

of the fast-paced car game might be an issue with Unity. Unity will run a "very nice" game like Need4speed with similar performance,



Figure 4.11: Community Map



Figure 4.12: Community Map 2

4.4 Implementation Requirements

Races on the Mawa Highway involve a variety of engineering and design requirements to ensure the game runs smoothly and provides an engaging user experience. Select a suitable game engine such as Unity or Unreal Engine to develop Mawa Highway races. Familiarize yourself with the features, tools, and workflow of the selected game engine for efficient development. High-quality 3D graphics with detailed car models, environments and special effects for realistic visuals. Optimized rendering pipeline and shaders to ensure smooth performance across different devices. Realistic physics simulation for car driving, drift mechanics, collisions and environmental interactions. Integrate physics engines or custom physics systems to accurately model vehicle dynamics and interactions. Supports a variety of input devices including keyboards, game controllers, touchscreens, and motion controls. Responsive, customizable input controls for drifting and menu navigation. Designed and implemented intuitive and visually appealing user interfaces for menus, HUD elements, and in-game screens for multiple screen resolutions, aspect ratios, and device orientations to accommodate a variety of platforms and devices. Combines sound effects, engine sounds, screeching tires, and ambient sounds to improve immersion and realism. Implement a dynamic sound system to adjust volume, pitch, and effects based on in-game events and player actions. Profile and optimize game code, assets, and rendering techniques to achieve smooth performance and fast load times. Use techniques like Level of Detail (LOD), occlusion removal, and texture transfer to maximize efficiency. Extensive testing and quality assurance procedures to identify and resolve bugs, glitches, and gameplay crashes. Tested across different devices, platforms, and network conditions to ensure compatibility and stability.

Also, the system with high configuration the game will play more efficiently.

System Information

Current Date/Time: Monday, January 8, 2024, 2:34:39 AM

Computer Name: DESKTOP-3LR0PS5

Operating System: Windows 11 Home 64-bit (10.0, Build 22631)

Language: English (Regional Setting: English)

System Manufacturer: HP

System Model: HP Laptop 15s-fq2xxx

BIOS: F.32

Processor: 11th Gen Intel(R) Core(TM) i5-1135G7 @ 2.40GHz (8 CPUs), ~2.4GHz

Memory: 8192MB RAM

Page file: 8628MB used, 6118MB available

DirectX Version: DirectX 12

☒ Check for WHQL digital signatures

DxDiag 10.00.22621.0001 64-bit Unicode Copyright © Microsoft. All rights reserved.

Figure 4.13: Mid System Information

CHAPTER 5

IMPLEMENTATION AND TESTING

5.1 Implementation of Front-end Design

Unity uses the slip-based friction model to calculate how much longitudinal and lateral force should be applied to a vehicle that uses WheelColliders. Those forces determine how fast the vehicle reacts to acceleration as well as steering. In order to compute the forces, the physics engine works out the longitudinal and lateral slip values for each wheel first. Thus, all the computational inaccuracies that occur during the slip computation, have a direct impact on the forces produced by wheels, and, in the end, on the handling of your vehicle. The slips are computed from values like the angular speed of the wheel that are obtained an iterative integration process, and are sensitive to the amount of simulation sub-steps, and the natural frequency of the spring attached to the wheel. If it happens that there are not enough sub-steps for this given natural frequency of the spring, then one can observe a wheel oscillating instead of rotating smoothly. This is clearly visible on the slip graph shown by the GraphOverlay component, as explained below. The slip-based friction model simulates a simplified version of the processes that take place in a real tyre. When a wheel starts turning, the rim of the wheel slips relative to the ground as the rubber of the tyre stretches and produces momentum. The more torque one applies to the wheel, the faster it rotates and the bigger slip it produces. Bigger slip stretches the rubber even more, producing more grip. This continues until the extremum slip is reached, after which the tyre loses the stiff contact with ground at the contact patch. At this point, the rubber stretch gets relaxed and thus produces less momentum. After the slip becomes bigger than the asymptote slip, it no longer matters how high the slip is: the rubber of the tyre reaches the state where the remaining slight contact with the surface would no longer let it compress further, and thus the momentum produced by the wheel remains constant no matter how much torque is applied. As an example, let's look at how the longitudinal slip works. The picture below shows a wheel rolling to the left. Once the angular momentum (acceleration due to the engine; shown in cyan) is applied, the wheel starts spinning, and slips a little as the rubber gets compressed. Because of that, the distance along the surface travelled by the centre of the wheel will be different from the distance the tyre travelled along the surface

(shown in orange). The physics engine computes the longitudinal slip as the difference between those two distances over the one that has the biggest absolute value. The result is normalised to be in $[-1;1]$. The lateral slip is computed in a similar way.

This package contains a Scene named TestTrack. This Scene contains a race circuit and 3 pre-configured vehicles to try out. The Scene also includes a working example of the GraphOverlay, and code to switch between vehicles at run time,

5.2 Testing Implementation

Determine testing goals, scope, and strategy based on project requirements and goals. Create a test plan that describes test cases, scenarios, and expected results for each aspect of the game, including game mechanics, user interface components, network features, and performance testing capacity. Verify that all game features and mechanics work as expected, including car controls, drift physics, behavior, menu navigation, and in-game interactions. Test games across different devices, system operating conditions, screen resolutions, and hardware configurations to ensure consistent performance and hardware configurations compatibility. Measure and optimize game performance metrics such as frame rate, load time, memory usage, and network latency under various conditions and scenarios. Evaluate a game's user interface, controls, and overall user experience through user feedback, playtest sessions, and usability studies. Verify that new updates, fixes, or changes do not introduce unexpected bugs or game regressions by retesting previously validated features. Identify and remediate potential security vulnerabilities, such as data breaches, fraud or hacking exploits, to ensure the integrity and security of player data and game assets.

5.3 Testing Tools:

Use a combination of manual and automated testing tools to streamline the testing process and improve efficiency. Automated testing tools like Unity Test Framework, XCTest or Appium can be used for repetitive tasks, regression testing and performance benchmarking. Performance monitoring and profiling tools like Unity Profiler, Xcode Instruments, or Android Profiler can help identify performance bottlenecks and optimization opportunities.

5.4 Test Environment Setup:

Configure a dedicated test environment with a variety of hardware configurations, operating systems, and network conditions to simulate real-world usage scenarios. Use a cloud-based testing platform or device cluster to access a variety of devices for compatibility testing without the need for physical hardware.

5.5 Bug Tracking and Reporting:

Implement a bug tracking system "e.g., Jira, Bugzilla or Trello"; to record, prioritize, and track reported issues throughout the testing process. Encourage testers and users to provide detailed bug reports with reproducible steps, screenshots, and system information for easy debugging and resolution.

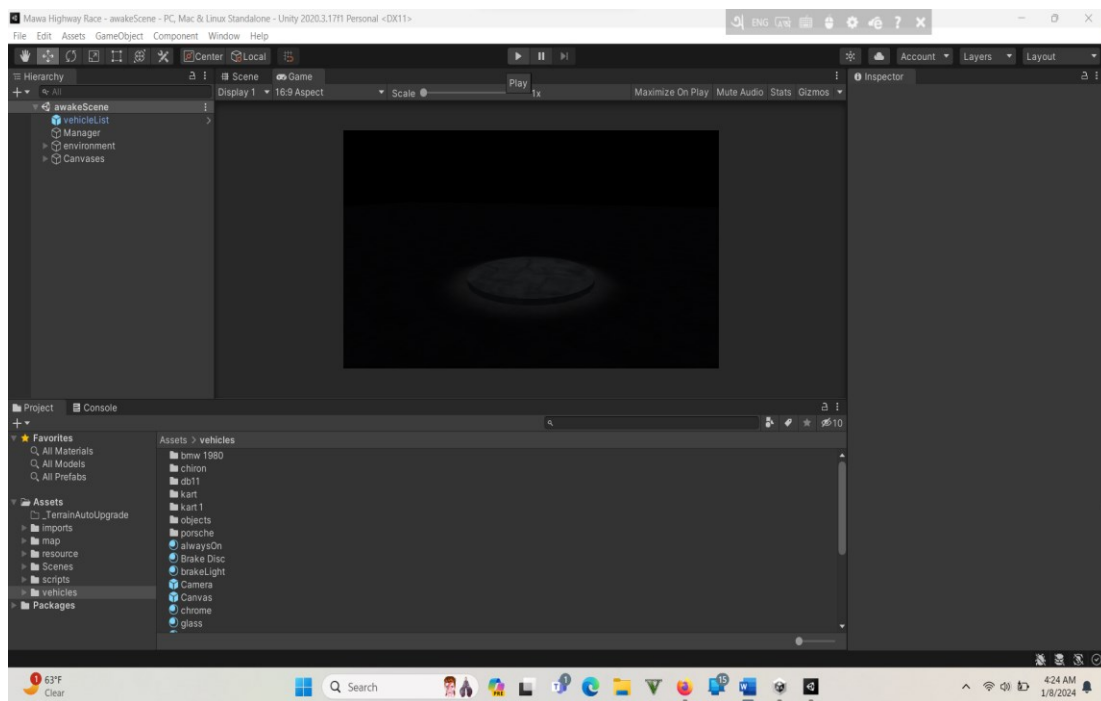


Figure 5.1: 1st Interface

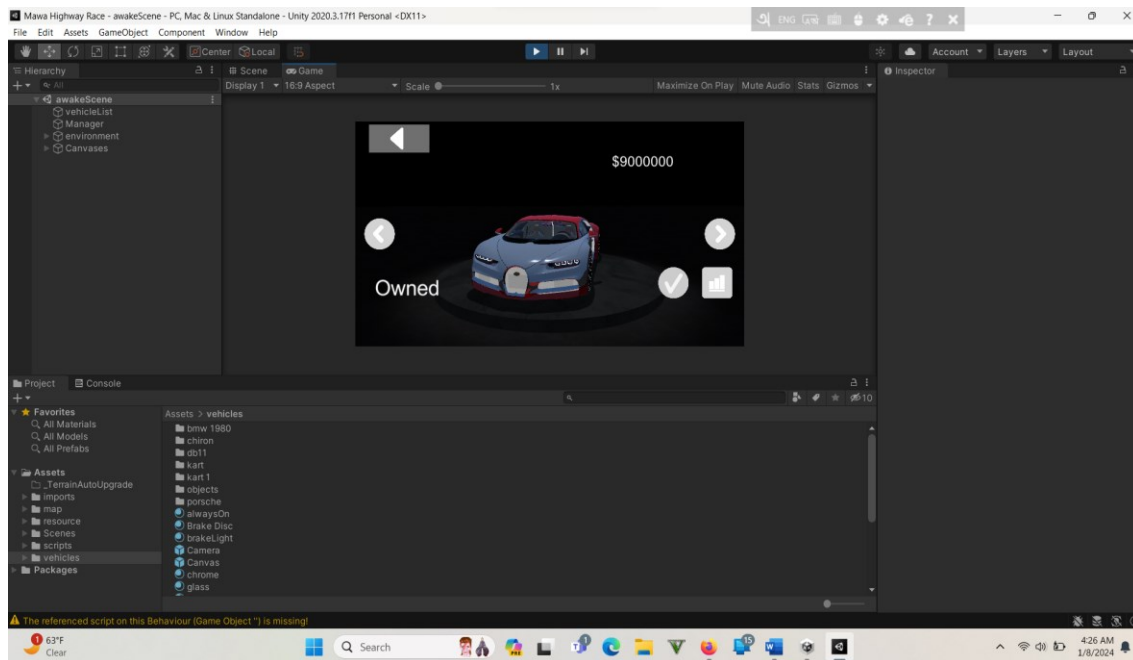


Figure 5.2: 2nd Interface

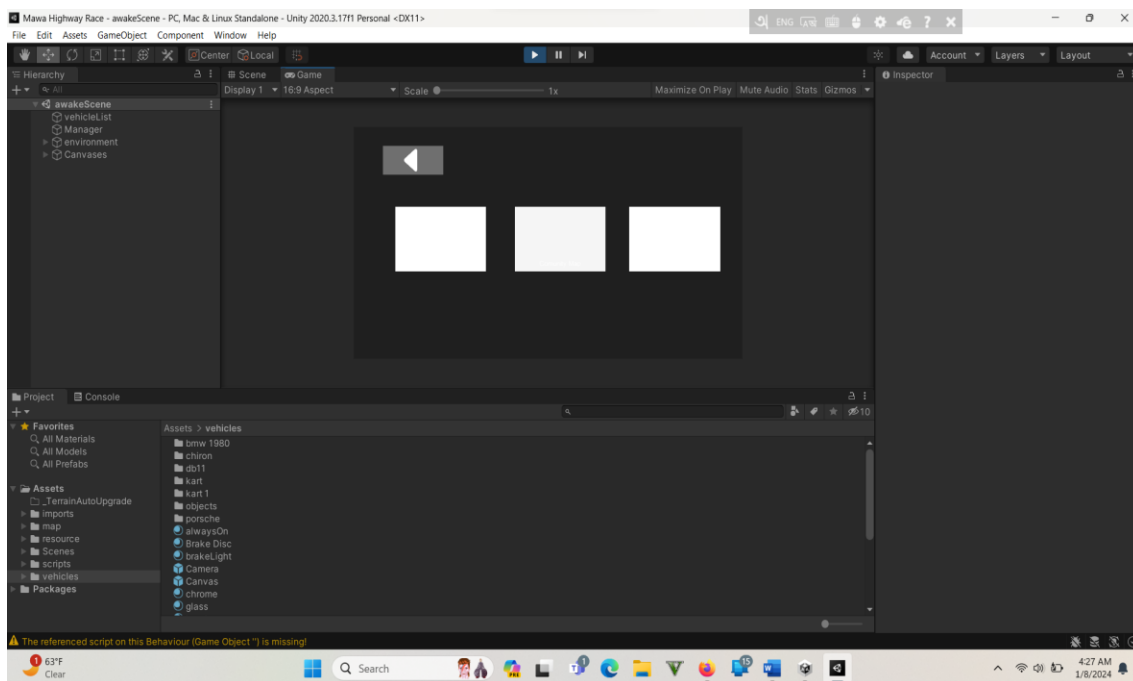


Figure 5.3: 3rd Interface

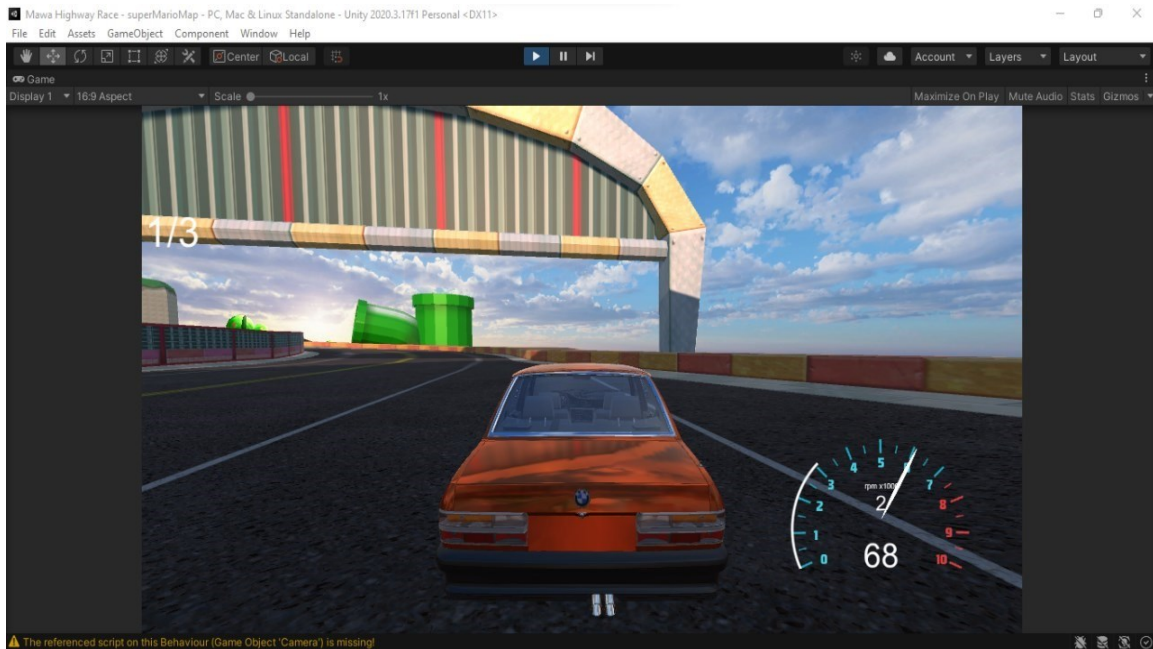


Figure 5.4: 4th Interface

5.6 Test Results and Reports

After completing all the steps, the animation is ready to watch. The resolution of the animation is 1920*1080 which is hd (high definition). Before releasing the final output, a quality assurance check had been done to ensure every single frame of the animation was working properly.



Fig 5.5: Gameplay 1



Fig 5.6: Gameplay 2



Fig 5.7: Gameplay 3

CHAPTER 6

IMPACT ON SOCIETY, ENVIRONMENT AND SUSTAINABILITY

6.1 Impact on Society

Mawa Highway Racing's impact on society can be considered from many different perspectives, including its influence on gaming culture, technological advancement, and social interaction. Mawa Highway Racing pushes the boundaries of gaming technology by taking advantage of advances in graphics, physics simulation, and online multiplayer capabilities. The game's realistic physics engine and vibrant graphics demonstrate the capabilities of modern gaming hardware and engines, inspiring innovation and pushing the boundaries of future racing games. Mawa Highway Racing could also enable technological advances in related fields such as virtual reality and augmented reality, leading to new possibilities and immersive gaming experiences. Races on the Mawa Highway give players the opportunity to develop and perfect skills such as hand-eye coordination, reflexes, strategic thinking and problem solving. The game encourages players to experiment with different car configurations, tuning options and driving techniques, promoting a deeper understanding of vehicle dynamics and racing strategy. Mawa Highway Racing's emphasis on precision driving and mastery of complex maneuvers can bring tangible benefits to players interested in motorsport or automotive engineering. Mawa Highway Racing reflects and contributes to broader cultural trends and interests surrounding car culture, street racing and drifting subcultures. The in-game representation of a variety of cars, tracks, and customization options reflects the global appeal and diversity of the automotive enthusiast community. Races on the Mawa Motorway can also serve as a platform to highlight and celebrate the achievements of real-world drivers, racing events and automotive brands, contributing to increased visibility and recognition of the drifting scene within the dominant gaming culture. Car racing games provide a source of entertainment and relaxation for individuals. They deliver an immersive and thrilling experience, allowing players to enjoy a form of high-speed virtual racing. The development of realistic racing games often leads to advances in graphics, physics engines, and other technologies. This could contribute to improving the entire gaming industry and impact other areas, such as virtual reality.

6.2 Impact on Environment

The impact of racing on the Mawa Highway on the environment is relatively small compared to other activities,

- **Energy consumption:** Although racing on the Mawa Highway itself does not consume much energy directly. However, Devices used to play games (such as consoles, computers, or mobile devices) consume electricity. However, compared to many other forms of entertainment or work-related activities that require more energy, energy consumption when shopping on Mawa Highway is relatively low.
- **Electronic waste:** The production and disposal of electronic devices, including game consoles, computers and smartphones, contributes to the generation of electronic waste (e-waste). When these devices reach the end of their lifecycle, they can have an impact on the environment if not recycled or disposed of properly. Encouraging the recycling and responsible disposal of electronic devices can help reduce this impact.
- **Digital Distribution:** Mawa Highway Racing is primarily distributed digitally through online platforms such as app stores or digital distribution platforms. While this reduces the environmental impact associated with manufacturing, shipping, and packaging physical game discs, there are still energy and resource considerations associated with the central, server infrastructure data, data and Internet connection.
- **Awareness and Education:** Although the Mawa Highway races themselves do not directly address environmental issues, they can serve as a platform to raise awareness and promote environmental stewardship between players. Game developers can integrate environmental themes, messages, or educational content

into gameplay or storytelling to encourage players to consider their environmental impacts and take action in their everyday lives their day.

6.3 Ethical Aspects

Games depict and address a variety of ethical considerations, both within the game itself as well as its broader impact on players and society. Racing on Mawa Highway should strive to represent diverse personalities, cultures and perspectives in a respectful and non-stereotypical manner. This includes avoiding harmful stereotypes and promoting inclusion and representation of different genders, races and backgrounds. Although Mawa Highway Racing is a racing game with a focus on drifting, it is important to ensure that the depiction of racing and vehicle collisions in the game is handled responsibly and not glorifies reckless driving or dangerous behavior. Game mechanics and narrative elements will discourage dangerous driving practices and promote responsible behavior on the road. Mawa Highway races may include in-game purchases and monetization features. I must implement these features ethically and transparently, ensuring that they are not exploitative or exploitative, especially for vulnerable players such as children or those with a tendency to gamble. Exciting gaming environment. Developers must actively moderate in-game chats, forums, and social networks to prevent harassment, hate speech, and toxic behavior, and take appropriate action against them violators.

CHAPTER 7

CONCLUSION AND FUTURE SCOPE

7.1 Discussion and Conclusion

Creating a simple car racing game using C# and Unity hub can be a fun and engaging project for both beginners and experienced programmers. The game requires the use of several programming concepts, such as object-oriented programming, event handling, and game physics. Mawa Highway Racing is an exciting racing game that gives players an immersive experience in the world of drifting. With realistic physics, customizable cars and challenging tracks, Mawa Highway Racing offers an emotional adventure for players of all levels. Throughout our exploration of Mawa Highway Racing, we delved into various aspects of the game, including gameplay mechanics, features, social impact, ethical considerations, and more. From exciting gameplay to potential educational and social impact, races on the Mawa Highway offer a diverse range of experiences for players. Like any game, Mawa highway racing is not without its challenges and considerations. From ensuring responsible representation and inclusivity to addressing environmental and ethical concerns, developers must navigate a complex landscape to create an entertaining game. while promoting positive values and behaviors. Ultimately, the Mawa Highway races are a testament to the creativity, innovation and passion of game developers around the world. With its combination of high-speed action, strategic gameplay and community engagement, Mawa Highway Racing continues to engage players and push the boundaries of racing games in the digital age.

After 4 months of learning Game analysis and development course I have combined the teachings of all the lessons into one single game. Hopefully this Car racing game will help our game industry become better day by day.

7.2 Future Scope

Creating a racing game on Mawa Highway presents exciting possibilities for players and developers. Some potential avenues for growth and innovation in the development of the racing game Mawa Highway, Enhanced Graphics and Realism: As technology continues

to advance, future versions of racing game Mawa Highway can have even more immersive environments and realistic car models. Improved lighting, particle effects, and physics simulation can further improve a game's visual fidelity and immersion Virtual reality (VR) and augmented reality (AR) integration. The integration of VR and AR technology in the racing game Mawa Highway can bring. players have an even more interactive and engaging experience. Imagine yourself behind the wheel of a virtual drift car, feel the thrill of drifting in a virtual reality environment, or use AR to overlay drift lines onto real-world locations for an immersive experience. Unique racing experience.

- Expanded customization options: Future Mawa highway racing games may offer expanded customization options for cars, tracks, and game settings. Players can create and share their own custom tracks, design unique car liveries, and tweak every aspect of the game. Their drifting experience is based on their preferences.
- Dynamic weather and environmental effects: The introduction of dynamic weather and environmental effects could add a new layer of challenge and realism to Mawa Highway racing games. Players may face changing weather conditions such as rain, snow or fog, as well as environmental hazards such as changing track surfaces, terrain obstacles or day-night cycles.
- Improved social and multiplayer features: Future Mawa Highway racing game may develop social and multiplayer features, allowing players to participate in tournaments on a larger scale, form drift teams and participate in collaborative competitions. Integrated social features such as in-game chat, leaderboards, and sharing options can further enhance the sense of community and competitiveness among players.
- Cross-platform compatibility: With the growing popularity of cross-platform gaming, future Mawa Highway racing games may support smooth play across

multiple devices and platforms, allowing players to compete regardless of their favorite gaming platform or device.

- Ongoing support and updates: To keep players engaged and invested in the Mawa Highway racing franchise, future games may offer updates, expansions, and content packs regular downloadable (DLC). These updates can introduce new cars, tracks, game modes, and features to keep the gaming experience fresh and exciting over time.
- Accessibility and inclusivity: Future Mawa Highway racing games could prioritize accessibility and inclusivity, ensuring that players of all skill levels can enjoy the game. This may involve implementing customizable controls, support features, and accessibility options to accommodate different player needs and preferences.

Reference:

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- [10] Inspiration videos available at <<https://www.youtube.com/watch?v=6Y1bAvRYqbU&list=PLhWBaV_gmpGXxscZr8PlcreyYkw8VlnKn>>,

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