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# Car Driving Simulator On Real-Time 3D Platform

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The goal of this project is to develop the Car Driving Simulator On Real-Time 3D Platform project represents a adventure into the world of immersive 3D simulation and development. Combining great features such as autonomous driving and adrenaline-driven Hot Pursuit mode, the program aims to offer a great driving experience suitable for everyone, from educational events to entertainment platforms and research initiatives.

One of the advantages of this project is its modular development. By decomposing the process into several modules, including logic generation, screen generation, and audio handling, a powerful and adaptable framework for creating the participant's dream simulator is guaranteed. This modularity not only helps simplify development, but also allows for seamless integration of new features and reliability as the project grows.

Participating in this program, participants not only improve their Integration and C# programming skills, but also gain valuable experience in collaboration, problem solving and innovation. Each stage of development brings its own challenges and opportunities, and we encourage participants to participate wholeheartedly, knowing that each step forward brings them closer to receiving information from our audience about the activation of the Unity 3D car driving simulator.

## I.INTRODUCTION

Unity 3D Car Simulator project is an exciting journey into an immersive world. Real-time 3D simulation and development. The program will start in line with this great need Create a rich and powerful driving simulator using the Unity project engine Episode and the power of C# programming. project goes beyond driving simulators and even offers a heart-pounding hot pursuit mode. The provides a versatile and engaging driving experience for a variety of applications. Education and research .Driving simulators have gained popularity and importance in recent years essential tools for teaching, research and entertainment. Our programs are designed to help you Episode Contains the skills and knowledge needed to create a powerful 3D car driving simulator.The Unity 3D car driving simulator project has three main modules. First episode logic generator used to calculate logic of submersible vehicle simulator such as collision detection Keyboard input as obstacles, speed control, opponent control and path creation.The module is software based.

The second is the screen processing module we use. Sprite Graphics technology decomposes the display screen. The last one is the sound module produces the necessary sounds under the control of game logic.

At the end of the program, participants will gain the necessary knowledge and skills a 3D car driving simulator designed to provide driving experience.The purpose of the is to create a training vehicle, provide an enjoyable driving experience or This program, cutting-edge research platform, will help them turn their vision into reality.

The ambition to embark on the journey of creating a Unity 3D car driving simulator inspiring. It is the pursuit of knowledge and skill development,C# programming and 3D modeling keeps us moving forward. The program is a canvas for innovation, an opportunity to update traditional education and

teach specific, groundbreaking content. Learning potential is another factor because simulators can have a positive impact on riders of all levels by creating good habits and advanced technology. The world of entertainment as well as education beckons, providing cooperation and real driving. The practical applications of the project, from automotive research services to business.

## II. ARCHITECTURE

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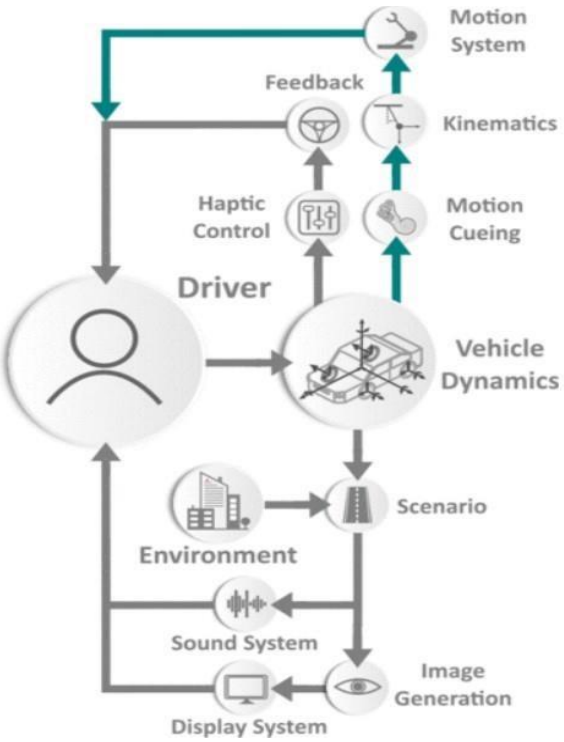


Fig. 1 Architectural Diagram

Fig. 1 shows the Architectural Diagram.

*A. Vehicle Dynamics Model* :
*B.* In vehicle simulation, often third-party software is dedicated to the vehicle dynamics model. This model must contain a mathematical representation of the vehicle subsystems (i.e. body frame, suspension, tires, brakes, steering and powertrain).
*C. Scenario Design:*
Another key feature of driving simulator is the possibility of creating specific scenarios. In driving simulation, a scenario can be described as an event that happens in a virtual environment.

*C. Visual Cues:*

Visual cues evolved from analog video presentations and film to digital graphics. These digital graphics rapidly improved from a low number of polygons to high count textured and shaded polygons that provide a highly realistic environment for use in driving simulation.

*D. Auditory Cues*

The auditory cues play a pivotal role in simulating the soundscape of a real driving scenario, contributing not only to the authenticity of the simulation but also to the development of crucial auditory skills for safe driving.

*E. Haptic Cues*

Haptic feedback is used to simulate the sense of touch in a driving simulator. This includes vibrations and forces transmitted through the steering wheel and pedals to replicate the feel of different road conditions and driving situations.

*F. Kinematics*

In the context of a driving simulator, kinematics is crucial for accurately modeling the motion of the vehicle without considering the forces involved. It helps simulate realistic movements and reactions of the virtual vehicle.

*H. Motion System*

The motion system in a driving simulator replicates the movements and vibrations associated with driving a real vehicle. This includes simulating accelerations, decelerations, turns, and other motions to provide a realistic feel to the driver.

## III. FLOW CHART

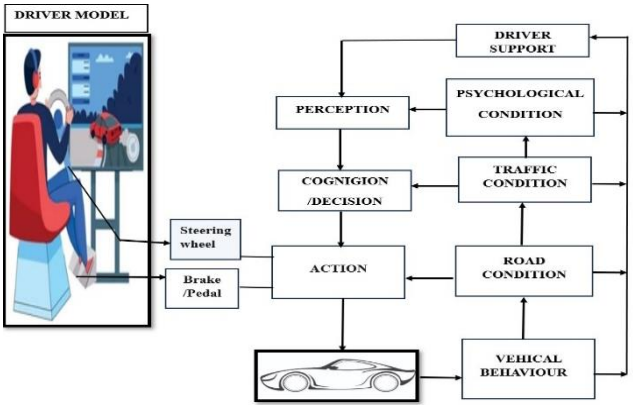


Fig. 2 Flow Chart

Fig. 2 describes broadly the Modules Division

1. Vehicle dynamics module: The can handle many types of vehicles, including four-, six- or eight-wheelers. This model simulates how the vehicle responds to inputs (steering, braking, acceleration) and external forces (road, aerodynamics).

2. Environment and terrain module: 3D mapping objects create detailed virtual environments. It includes roads, buildings, terrain and other things.

3. Management and planning module: The planning module generates recommendations based on sensor data and environmental data. It takes time for vehicles to comply with traffic rules and avoid accidents in terms of safety, performance and comfort.

4. The control module : determines trajectories by adjusting the throttle, steering and braking. A Scene creation and testing module: Scientists create different scenarios (city, highway, extreme weather conditions) to use the system. Virtual assessment enables self-management work (teaching, judging, studying).

5. Test scenarios: covers litigation, emergency drills, and complex interactions.

## IV. IMPLEMENTATION WITH C#

Fig. 3 Hardware Components

The implementation of the project is done using C# and Unity platform. This contains Hardware and the Software part. The Hardware contains streeing, accelerator and brake. The Software part is done through C#. There are many assets in the project, the assests contain scripts of C# written for lanes, traffic signals, for vehicles passing by and also the city.

```
using UnityEngine;
using UnityEngine.UI    ;
using UnityEngine.EventSystems;
using EdyCommonTools;


namespace VehiclePhysics.UI
{

public class GearModeSelector : MonoBehaviour,
        IPointerDownHandler
    {
    public VehicleBase vehicle;

    public Color selectedColor = GColor.ParseColorHex("#E6E6E6");
    public Color unselectedColor = GColor.ParseColorHex("#999999");
    public Transform selector;

    [Header("Gear elements")]
    public Graphic gearM;
    public Graphic gearP;
    public Graphic gearR;
    public Graphic gearN;
    public Graphic gearD;
    public Graphic gearL;
```

Fig. 3 C# code of vehicle gear modes

## V. RESULTS

The Results of a car driving simulator on a real-time 3D platform mainly looks upon its usability, realism, training, effectiveness, and performance. Drivers reported satisfaction with the simulator's interface and controls, while noting its ability to accurately replicate real-world driving conditions. Moreover, drivers can improve their skills and get train. Furthermore, the simulator contributes to reduced carbon emissions by offering a safe training environment, thus fostering safer driving practices.

Fig. 5 shows the data of vehicles speed, acceleration, angle, etc. The driving result and visualization is seen on the windows, as shown in Fig. 6.

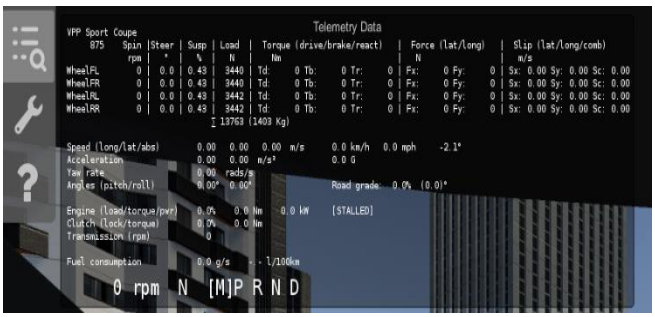


Fig. 5 Data of the vehicle speed.

Fig. 6

Fig. 6 Contains the following
1. Acceleration and Speed of Car
2. Traffic Signals
3. Road Lanes with Vehicles passing

## VI. CONCLUSION

The ***Car Driving Simulator On Real-Time 3D Platform*** project represents an ambitious journey into the realm of immersive 3D simulation and development. With its incorporation of advanced features like AI self-driving cars and hot pursuit mode, the project aims to deliver a comprehensive and captivating driving experience suitable for a diverse range of applications, from educational endeavors to entertainment platforms and research initiatives. The modular approach to development, spanning logic generation, screen rendering, and audio modules, ensures a robust and adaptable framework for constructing the simulator of participants' aspirations. Through this project, participants stand to gain not only practical proficiency in Unity and C# programming but also invaluable experience in project coordination, problem-solving, and creative innovation. As the project advances, participants are encouraged to embrace the challenges and opportunities ahead, recognizing that each step taken brings them closer to the realization of their vision for a dynamic and immersive Unity 3D Car Driving Simulator.

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