

Multiuser VR Car Racing Game

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Abstract— The Multi-User VR Car Racing Game” is a game-changing development in multiplayer gaming that uses virtual reality (VR) technology to create an immersive and unparalleled gaming experience. This project provides a fast virtual racing environment of players Responding to the growing demanding a unique and engaging multiplayer experience that can compete with each other in fast-paced racing the game uses virtual reality technology to immerse players in a fantastical life-like world that packed full of stunning car models, race tracks and gameplay features. It also encourages technological innovation. The multiplayer VR car racing game promises to engage players from different backgrounds and interests, giving it an exciting new dimension in the world of gaming and the potential to revolutionize gaming by humans many are fulfilled.

INTRODUCTION

The project's goal is to create a multi-user virtual reality car racing game that will immerse users in an exciting virtual world where they may compete in thrilling races. High-fidelity car models and realistic weather effects are combined with elaborately built racing tracks situated in a variety of locales, all with an emphasis on realism and excitement. The multiplayer feature allows several users to race at the same time, encouraging communication and rivalry in the same virtual environment. The game appeals to a broad audience of players, social groups, and VR enthusiasts by fusing intuitive gameplay mechanics with social elements. It provides an exciting experience that pushes the limits of VR gaming.

The project's goal is to provide an engaging entertainment experience that highlights the immersive qualities of virtual reality technology by developing this VR racing game for cars. The game seeks to fascinate audiences and revolutionize the gaming environment by giving players access to a virtual arena where they may unleash their racing ability and compete in exhilarating events. As a result of its focus on realism, interactivity, and multiplayer capabilities, the project advances virtual reality gaming while simultaneously providing entertainment. The Multi-User VR Car Racing Game showcases the revolutionary potential of virtual reality technology in transforming the gaming business and providing unmatched gaming experiences by allowing players to feel the thrill of racing in a virtual world.

I. RELATED WORK

Many studies have examined the possibilities of immersive settings and multiplayer experiences in the field of virtual reality (VR) gaming, offering insightful analysis and useful frameworks for the creation of projects such as the Multi-User VR Car Racing Game. A noteworthy study conducted by Bowman et al. (2008) examined the design principles that should be followed while developing VR apps, with a focus on user engagement and immersion. In a similar vein, Slater and Wilbur's (1997) study explored the idea of presence in virtual reality and showed how the sensation of "being there" increases user pleasure and engagement.

Moreover, research like that done by Diemer et al. (2015) and Riva et al. (2007) has examined the psychological and emotional impacts of virtual reality (VR) experiences, providing insight into how players' extreme emotions and behaviors might be elicited by immersive gaming settings. Because they guide design choices meant to optimize player immersion and enjoyment, these findings are especially pertinent to the Multi-User VR Car Racing Game.

Regarding VR experiences for multiplayer, Billinghurst and Duneier's (2012) research offers insightful information about cooperative virtual spaces, emphasizing the possibility of social engagement and teamwork in shared VR areas. Furthermore, research on the technological difficulties and solutions related to multiplayer VR networking has been conducted by Huang et al. (2017) and Heldal et al. (2019). These studies provide recommendations for maximizing scalability and performance in virtual worlds that are big in size.

Overall, the Multi-User VR Car Racing Game adds to the extensive body of study on VR gaming and multiplayer experiences. It does this by including cutting-edge gameplay mechanisms and immersive surroundings that are customized to meet the demands and tastes of contemporary players, while also drawing inspiration from earlier studies

IMPLEMENTATION

There are several key components to use in a multiplayer VR car racing game, each of which contributes to a seamless and immersive gaming experience. The System Architecture diagram shows how the user and Unity The /Wizard client communicates and displays the various implementation options.

A. Modelling Phase

This first phase involves creating 3D models for the game environment, including racetracks, cars, obstacles, and scenery. Using modeling software like Blender or Maya, designers design and refine visual elements that will fill the virtual world.

B. Exporting to Unity

Once the models are completed, they are exported to the Unity or Wizard development environment. In this step the 3D assets are modified to match the selected platform and imported into the project workspace.

C. Adding Behaviors, Scripts, and Functionality for Interactivity

In Unity or Wizards, developers add behavior and functionality to 3D models to enable dynamic interaction and gameplay. This includes scripting vehicle controls, implementing collision detection, and explaining game rules such as lap counting and scoring.

D. User Interaction

Users interact with the VR environment through wearable devices such as VR headsets, motion controllers and steering wheels. System architecture diagrams show how user actions translate into virtual interactions within the game, such as driving, accelerating and braking.

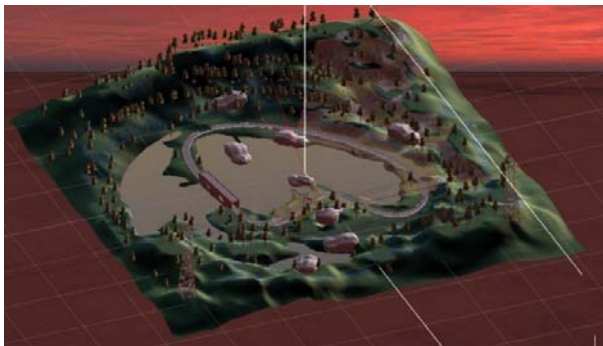


Fig .1.Top view of model

A. Create /Join the Lobby

The lobby system in a multi-user VR car racing game acts as an entry point for players to participate or conduct game sessions. When a player launches a VR application they are provided with options so create a new lobby or tell them about existing ones. Once all players are ready and the lobby host has started the game, the lobby system switches players into the racetrack mode, where the multiplayer racing experience begins.

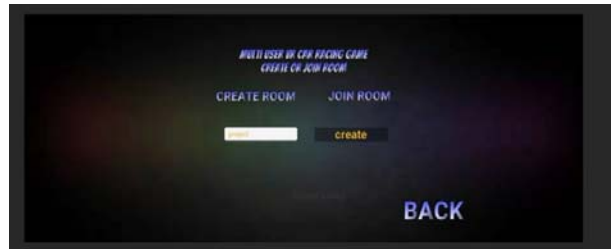


Fig.2.Create or join the lobby

B. Pick a color of car and number of laps

After choosing color for your car and deciding on laps, you'll be ready to dive into the heart of the race. This step ensures that each player can personalize the experience, adding its own element to the adrenaline-pumping thrill of the game. Wearing bright red jerseys through the virtual track and looking forward to completing the next three miles, players are set for an immersive and fun racing experience.



Fig.3.color and no of laps

2.FUNCTIONALITY

The functional aspect of multiplayer VR car racing games typically explains how various features and technologies work in the game. It includes information about how players interact with the game environment, such as proximity to entrances, traffic choices, race starts, control of their vehicles, competition with other players including competition detection, scoring systems, voice chat functions, and Any aspects such as special features or enhancements, such as weather effects or power ups are also included Overall, it provides detailed information on how the game works on functional departments are what players can expect when participating in the virtual racing experience.

A. Rain effect

As the game begins, players will be thrown into the heart of the action, their engines roaring rapidly to life along the way. Suddenly the sky darkens, and the rain begins to fall, adding a new level of challenge and excitement to the race. Carefully designed to mimic the feel of driving in bad weather, the rain effect will test the skills of even the most experienced racers. Points splash against the windshield, and tires struggle to traction on vulnerable areas, players must adjust their plans during the race to navigate treacherous trails and emerge victorious in this electrifying VR experience. Race against ANAs like never before. Be prepared to experience the thrill of the chase every moment.



Fig.4.Game start and Rain effect



Fig.5.Rain

Lap control points

In racing, lap control points are specific locations or markers on the track that act as a reference point for when a car has completed a lap. These control points are usually strategically located at key locations on the track so, such as start/finish line or other important markers that is. Lap control points are needed to accurately track each athlete's progress during the race and utilize game technology such as lap counters, lap times, leaderboards, etc. It helps ensure fairness and consistency during the race in the list of results.



Fig.6.Lap control points

C.Player Inactivity Situations

Various features are used to maintain engagement and ensure a seamless gaming experience if players are idle while playing. These features include using automatic controls to temporarily disable a player's vehicle, notify other players of the status of an inactive player, and provide options for reassembly or replacement. Furthermore, dynamic game elements such as changing the environment or introducing challenges can help re-engage casual players. By actively addressing casual player scenarios, the multiplayer VR car racing game maintains its appeal and competitiveness, improving the overall gameplay for all involved.



Fig.7.Inactivity of player

D.Respawn

In the context of multiplayer VR car racing games, "respawn" usually refers to the act of bringing a player's car back into play after it has been damaged, disabled, or taken off the track due to an accident or other event. Therefore, this mechanic allows players to do so back in the race quickly without interrupting the game significantly. Respawn points are strategically placed along the route to ensure fair and balanced play, and players are often given a short period of indestructible time after respawn to prevent an immediate re-wipe. The Respawn feature contributes to the sharpness and pace of the game, allowing players to recover from setbacks. It provides opportunities to win and remain competitive.

E. Sound

Background music has the power to improve the ambiance and tone of the space. To inspire diverse feelings or concepts, separate parts of the virtual world could have their own distinctive soundtracks. Realistic noises that enhance the virtual environment's realism and immersion include wind blowing, birds tweeting, and city traffic.

F. Interaction

Events Triggered by the User: When a player activates interactive objects like switches, levers, or buttons, certain events can be set off. For instance, pushing a button could cause a mechanism to start, a door to open, or a preprogrammed sequence to begin.

The multiplayer car racing game developed with Unity 3D represents a significant breakthrough in providing players with an immersive and competitive gaming experience. Through careful design, prototyping and iteration, the game offers diversity such as multiplayer modes, customizable cars, dynamic tracks and power-ups. Player networking. Despite facing challenges in areas such as , performance and optimization, the development team succeeded in delivering a beautifully designed game ready to be used across platforms so provided. With continued support and possible future developments, the game has the potential to keep players engaged and expand its features in order to deliver more fun and entertainment.

A. Problems Encountered

Multiplayer networking: Challenges arose during the development process to implement reliable synchronization and reduce latency. **Performance Excellence:** Extreme attention to detail and optimization effort was required to ensure the game would run smoothly across devices and network environments.

Balance: Finding a fair and enjoyable game for players of varying skill levels required iterations and constant adjustments to car type, power delivery and track layout.

B.Future work

Expanded Content: Adding new vehicles, tracks, and customization options to enhance the gameplay experience and engage players. **Enhanced multiplayer features:** Features such as tournaments, tournaments, and social integration are being introduced to create a vibrant multiplayer community. **Virtual Reality Support** Integrating VR support to provide players with an immersive racing experience using VR headsets.

Live Events and Updates: To maintain player interest and participation in the game by organizing live events, tournaments and regular updates.

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We would like to express our gratitude to all members of the development team who contributed their time, effort and expertise to bring this game to life. Additionally, we extend our gratitude to the Unity community for their valuable resources, education, and support throughout the development process.

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