

A
PROJECT REPORT
ON
VR Horror Game

Submitted in partial fulfillment of the requirements of the degree of

Bachelor of Engineering
In
Information Technology

by

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2023-24

CERTIFICATE

This is to certify that the project entitled “ VR Horror Game ” is a bonafide work of “**Ritvik Babre - 5 , Hitesh Behera - 6 , Shruti Sabbani – 50 , Swapnil Yadav - 67**” submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of “**Bachelor of Engineering**” in “**Information Technology**”.

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Project Report Approval for B.E.

This project report entitled ***VR Horror Game*** by ***Ritvik Babre - 5, Hitesh Behera - 6, Shruti Sabbani - 50, Swapnil Yadav - 67*** is approved for the degree of Bachelor of Engineering in **Information Technology**.

Examiners

1.-----

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Date:

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DECLARATION

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Thanking You.

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ABSTRACT

Virtual reality offers a unique and immersive experience that allows users to interact with digital environments in a way that feels incredibly realistic. VR provides a sense of presence and immersion, allowing users to feel like they are physically present in a virtual environment.

Games can be single-player or multiplayer, and they often involve challenges, objectives, or narratives for players to engage with. Gaming is a powerful tool for promoting virtual reality technology because through VR gaming, users can experience firsthand the sense of presence and immersion that VR offers, leading to greater interest and enthusiasm for the technology.

The horror genre has established popularity among gamers makes it a strategic choice for promoting VR, as it attracts a dedicated fan base eager to explore new and thrilling experiences. Virtual reality (VR) horror games offer an unparalleled immersion by leveraging first-person perspective, realistic graphics, and interactive gameplay. Through immersive environments, we aim to showcase the transformative potential of interactive computing. Players experience the game world through the eyes of the protagonist, enhancing the feeling of presence and intensifying the horror experience. This VR horror game offers an approachable entry point into the immersive world of virtual reality

The VR Horror Game is built on Unity Game Engine, where we have utilized 3D models for environments, AI enemy, and objects. These models are animated to add movement and life to the game world, including character animations, object interactions, and environmental effects. The enemies will have advanced behaviors such as patrolling, chasing, and attacking the player, adding to the challenge and tension of the game. We're implementing a system to dynamically spawn items and objects throughout the game world. This includes tools, keys, and other essential items needed to progress through the game and overcome obstacles. The game contains a variety of sound effects and environmental sounds to enhance immersion and atmosphere. This includes footsteps, distant screams, environmental sounds and other auditory cues to heighten tension and suspense. We're implementing a quest system to provide players with objectives and goals to complete throughout the game. These quests may involve finding key items and surviving encounters with enemies. Victory conditions are defined based on completing all quests and achieving the ultimate goal of survival.

1. INTRODUCTION

The VR Horror Game features detailed 3D models for environments, enemy and objects with animations for lifelike movement. AI enemies are programmed to patrol, chase, and attack players, enhancing challenge and tension. A dynamic item spawning system provides essential tools and items throughout the game to aid progression. Immersive sound effects, like footsteps and distant screams, heighten atmosphere. A quest system sets objectives for players, such as finding items and surviving encounters, with victory achieved by completing all quests and surviving.

One way to introduce VR technology to a wider audience is to develop VR games. Gaming being one of the biggest industries in the world will allow VR to get a platform where it can showcase its endless possibilities to the world. Horror Games are some of the biggest games in the industry as they allow the player to get immersed with the environment. This makes the horror genre one of the best genres to showcase the capability of VR.

The game may have a cultural impact by influencing perceptions of VR technology and shaping immersive gaming experiences. Through innovative storytelling and gameplay mechanics, the game contributes to shaping the narrative surrounding VR and its potential impact on entertainment and society.

By promoting VR technology through a popular gaming genre like horror, the game contributes to expanding the market for VR hardware and software. It attracts new players to the VR ecosystem and encourages existing gamers to explore the possibilities of VR gaming.

2. REVIEW OF LITERATURE

Table 2.1: Literature Survey

Sr. No.	Title	Authors	Methodology	Advantages	Results
1	Virtual Reality Horror Games and Fear in Gaming (2023)	Tammy Jin-Hsuan Lin	-Evolutionary mechanism, -Excitation transfer theory and model of suspense -Three-factor model	-Immersion in VR -Audience Experience -Valueable insights to human behaviour and emotions -Interactive Storytelling	-Deeper understanding of human behavior & media effects -Helps address various phobias
2	Research on the Application of VR in Games (2023)	Shijie Bian	-Appliaction of VR in Horror, Role-Playing and Rhythmic games	-Strong sense of immersion -Realistic environments and gaming experience -Enhanced fun and entertainment	-Scope of VR -Future Gaming experience -Evolution of VR in Games
3	Research on the Progress of VR in Game (2023)	Ruiqi Zhang	-Application in VR in Action Simulation, Education, Scenario experienced Games	-Enhanced gaming experience -Improved teaching -Enhanced Immersion	-Strong Game Immersion -Real time human-machine interaction -Analysis of trends and characteristics
4	Adaptive virtual reality horror games based on Machine learning and player modeling (2022)	Edirlei Soares de Lima , Bruno M.C. Silva , Gabriel Teixeira Galam	-Conceptual Framework Development -Machine Learning Algorithms -Player Modeling -Adaptive Game Design -Evaluation	-Personalized Gaming Experience -Enhanced Immersion -Optimized Gameplay -Improved Player Retention -Innovative Game Design	-Effectiveness of Adaptive Features -Impact on Player Behavior -Player Satisfaction and Retention -Performance Metrics -User Feedback and Preferences

5	Analysis Of The Design Aesthetics And Player Emotions Of Horror Games (2022)	Ziwen Zhang	<ul style="list-style-type: none"> - Qualitative research - Quantitative research - Biometric measures 	<ul style="list-style-type: none"> - Triangulation enhances validity & reliability of results. - Combining approaches increases accuracy, strength, & generalizability. - Corroborates & crossvalidates results. Decreases biased interpretation. -. 	<ul style="list-style-type: none"> - Horror games evoke emotions such as fear & excitement. - The number of experienced players affects players' comfort & overall mood. - Players' satisfaction with the game depends on factors such as a sense of achievement, excitement & puzzle-solving.
6	Horror game design – what instills fear in the player? (2020)	Mikolaj Dymek	<ul style="list-style-type: none"> - Dark environments - Environmental design, sound design, lighting, & gameplay narrative. - Auditory hallucinations, such as human screams 	<ul style="list-style-type: none"> - Dark environments - Environmental design, sound design, lighting, & gameplay narrative. - Auditory hallucinations, such as human screams 	<p>Horror game design theories can be successful in scaring players when combined with level design & navigation patterns.</p> <p>Litreature Survey VR Horror Game using Unity</p>

7	<p>“Level Of Fear”: Analysis Of Fear Spectrum Into a Tool To Support Horror Game Design For Immersion And Fear (2018)</p>	<p>Konstantinos Ntokos</p>	<ul style="list-style-type: none"> -Level of Fear -Analyze Fear into Spectrum -Communication & Collaboration -Pacing & Relief Injections 	<p>Tool for measuring fear in horror games</p> <ul style="list-style-type: none"> - Helps developers calibrate difficulty & scariness - Plots intensity levels throughout the game - Classifies in-game elements based on their "level of fear" 	<ul style="list-style-type: none"> - Tool to measure & categorize fear in horror games - Helps developers calibrate difficulty & - Plots intensity levels of fear - Marks fear levels of different game components
8	<p>So scary, yet so fun: The role of self-efficacy in enjoyment of a virtual reality horror game (2017)</p>	<p>Jih-Hsuan Tammy Lin , Dai-Yun Wu , Chen-Chao Tao</p>	<ul style="list-style-type: none"> -Experimental Design -Measurement of Enjoyment -Quantitative & Qualitative Data Collection -Ethical Considerations 	<ul style="list-style-type: none"> -Insights into Psychological Factors -Relevance to VR Gaming Industry -Methodological Rigor -Practical Implications -Interdisciplinary Collaboration 	<ul style="list-style-type: none"> -Positive correlation between self-efficacy and enjoyment -Impact of self-efficacy on immersion -Differences based on experience -Implications for game design

3. REPORT ON PRESENT INVESTIGATION

3.1. Requirement Analysis:

3.1.1. Scope

The VR horror game is crafted with the purpose of showcasing VR's capabilities and its associated advantages such as immersive experience and entertainment.

One way to introduce VR technology to a wider audience is to develop VR games. Gaming being one of the biggest industries in the world will allow VR to get a platform where it can showcase its endless possibilities to the world. Horror Games are some of the biggest games in the industry as they allow the player to get immersed with the environment. This makes the horror genre one of the best genres to showcase the capability of VR.

By promoting VR technology through a popular gaming genre like horror, the game contributes to expanding the market for VR hardware and software. It attracts new players to the VR ecosystem and encourages existing gamers to explore the possibilities of VR gaming.

3.1.2. Feasibility study

Market Analysis:

- Demographics
- Market Demand
- Market Trends
- Budget Power

Technical feasibility:

- High Computational Power
- Rendering
- Power Usage

Financial Feasibility:

- Hardware Cost
- Entry Cost
- Spending Power

Legal Considerations:

- Copyrights

3.1.3. Hardware and Software requirements

Table No. 3.1 Hardware & Software requirements

Hardware	Software
Android device	Google cardboard SDK
Gyroscope	Game Engine - Unity
Gamepad Controller	Version Control System - GitHub
VR Headset	Scripting Language – C#
	IDE – Visual Studio

Hardware Requirements:

- Android Device: Serves as a platform for our VR game, leveraging its processing power and display capabilities to provide immersive experiences through compatible
- Gyroscope: The gyroscope enables precise motion tracking in VR horror games, enhancing immersion by accurately detecting head movements for a more realistic experience.
- Gamepad Controller: The Gamepad controller is a hand-held device that makes gaming easier and more fun with its buttons and joysticks and enhances player interaction in VR horror games, providing intuitive input for navigating environments and engaging with immersive gameplay mechanics.
- VR Headset: The VR headset immerses players in virtual world using the lenses attached to it and the screen of the Android device that the user is using.

Software Requirements:

- Google Cardboard SDK: Transform your Android device into a virtual reality headset, offering immersive experiences with stereoscopic rendering and head tracking.
- Game Engine – Unity: Unity serves as the ideal game engine for VR game development, providing powerful tools and capabilities for creating immersive and terrifying experiences with ease.
- Version Control System – GitHub: It provides a user-friendly interface for managing code repositories on GitHub, facilitating collaboration and version control for Unity projects with ease.
- Scripting Language – C#: A powerful and versatile programming language used for building a wide range of software applications and systems.
- IDE – Visual Studio: A versatile integrated development environment (IDE) equipped with powerful tools for software development across multiple platforms.

3.2 Problem Statement:

Virtual reality (VR) is an emerging technology that has the potential to revolutionize the way we interact with games and other experiences. However, VR is still relatively new and expensive, and many people lack the understanding of how it works. This limits the reach of VR technology and prevents it from becoming an integral part of our lives.

Developing a VR horror game involves addressing significant challenges, including accessibility and affordability concerns due to the high cost of VR hardware and the niche market for VR gaming. Additionally, technical constraints such as hardware limitations, performance optimization, and platform compatibility must be overcome to ensure a smooth and seamless gameplay experience. Balancing these factors is crucial to creating an inclusive and enjoyable VR horror game that appeals to a broad audience while promoting VR and delivering immersive and engaging gameplay.

One way to introduce VR technology to a wider audience is to develop VR games. Gaming being one of the biggest industries in the world will allow VR to get a platform where it can showcase its endless possibilities to the world. Horror Games are some of the biggest games in the industry as they allow the player to get immersed with the environment. This makes the horror genre one of the best genres to showcase the capability of VR.

3.3 Project Design:

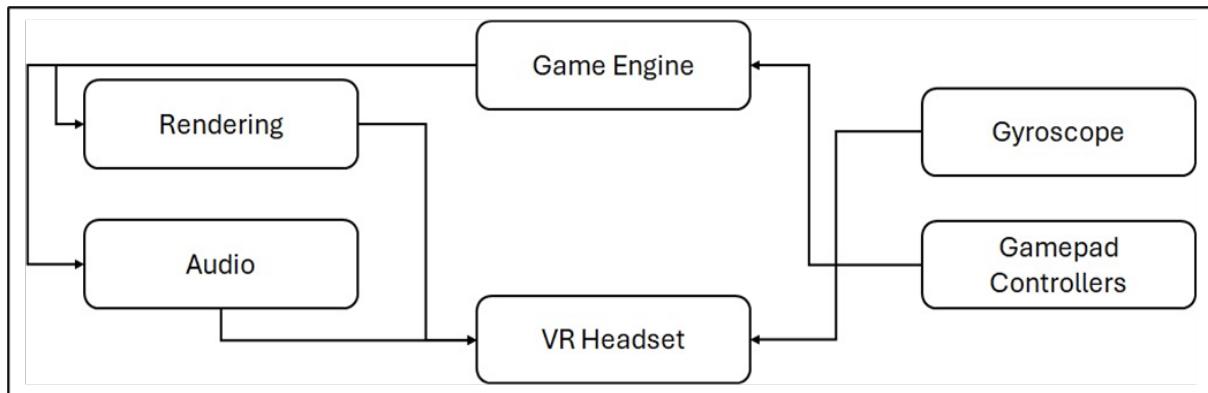


Fig. 3.3.1 Game Architecture

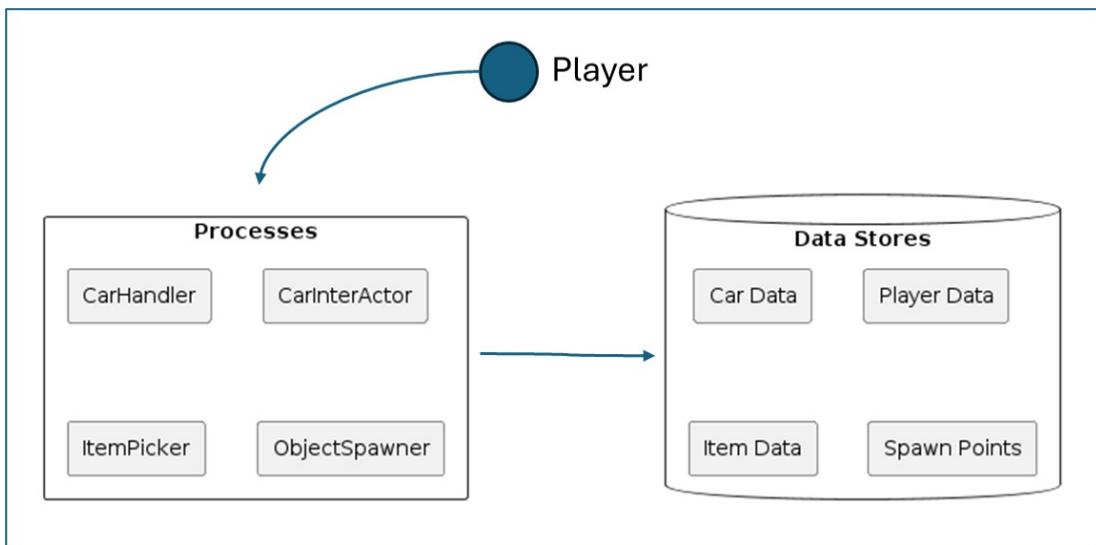


Fig. 3.3.2 DFD Level 0

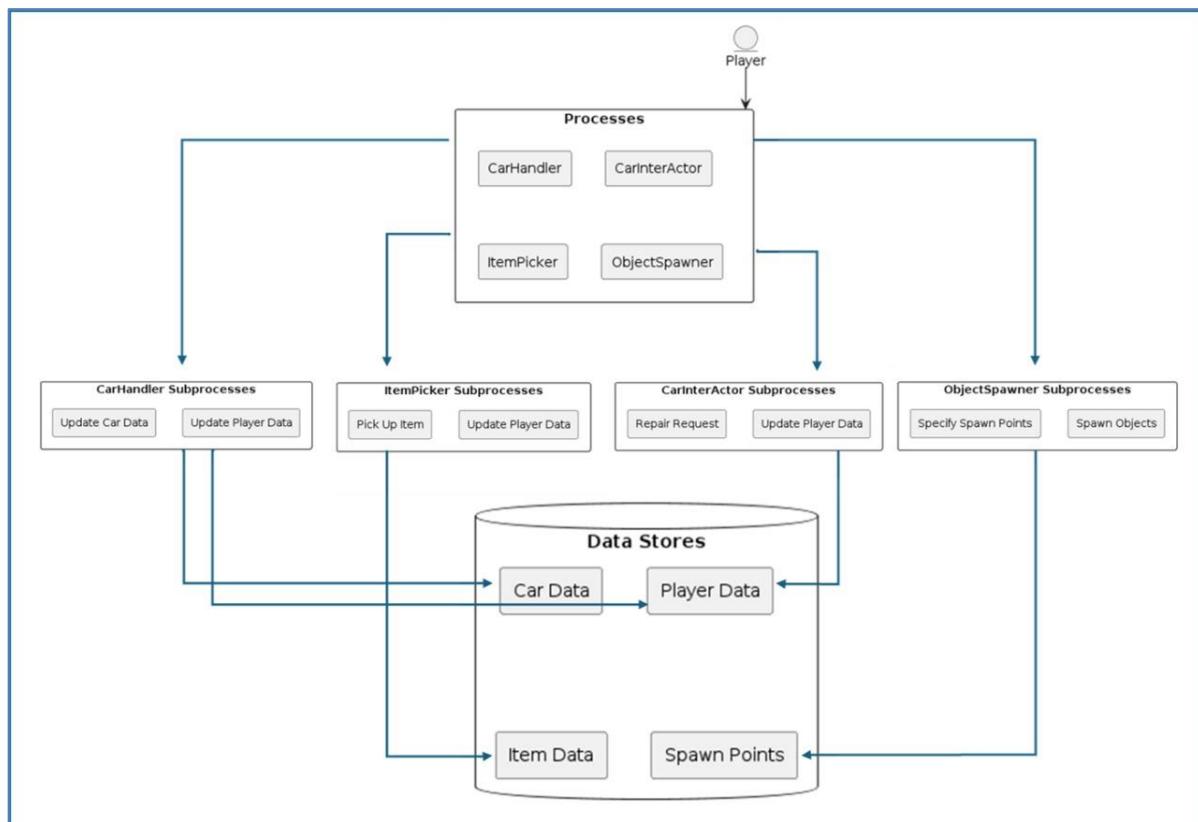


Fig. 3.3.3 DFD Level 1

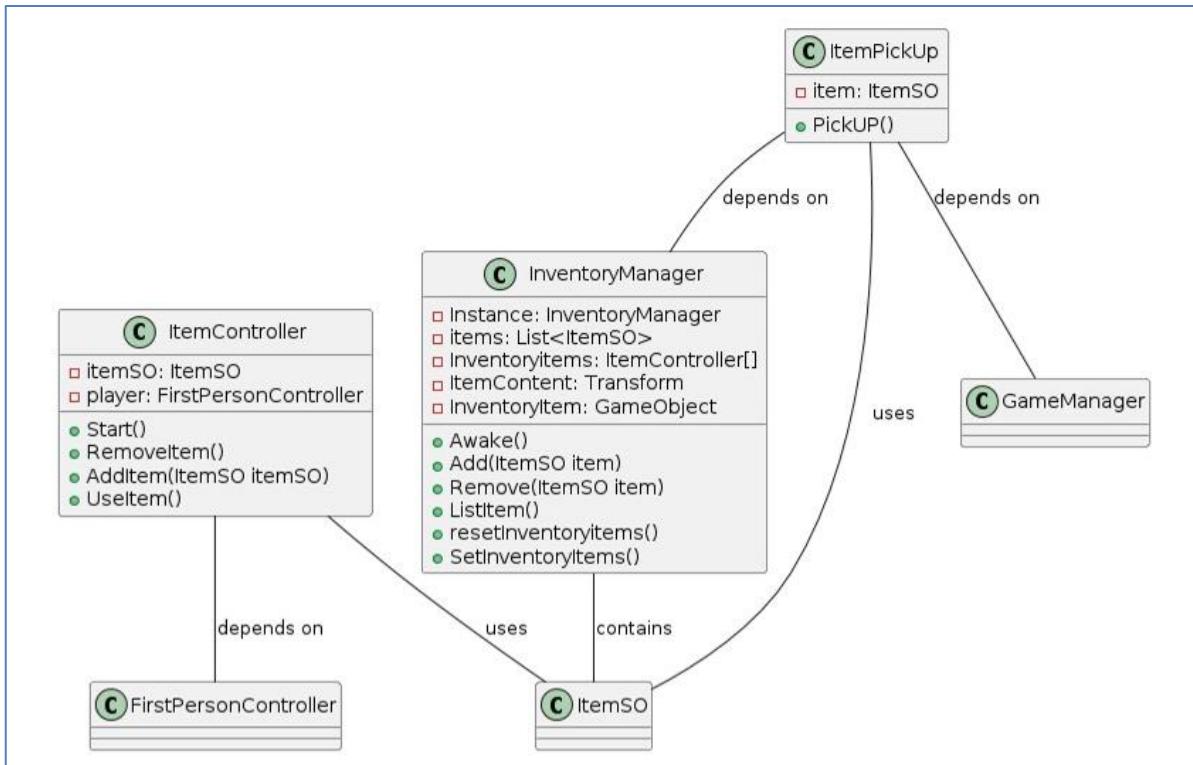


Fig. 3.3.4 Class Diagram

3.4. Methodology

The game is a survival horror experience, challenging players to complete all quests to achieve victory.

- 1. Object Collection:** Players collect various items essential for completing tasks and progressing.
- 2. AI Enemies:** AI enemies relentlessly search players, instilling a constant sense of terror.
- 3. Google Cardboard SDK:** Integrates VR functionalities on Android devices, including stereoscopic rendering and headtracking.
- 4. Gyroscope:** Utilizes sensor data to track players' head movements, enhancing immersion.
- 5. Game manager:** The central hub oversees game elements like states, UI, input, events, logic, and win-loss condition. It synchronizes the elements to ensure a cohesive player experience.
- 6. Item Spawner:** The algorithm enhances game replayability by randomly spawning items from strategically positioned points across the map.
- 7. Audio Management:** Implements 3D spatial audio, ambient music, and eerie sounds for a heightened atmosphere.

8. User Interface (UI): VR-friendly UI elements provide essential information and enhance player interaction.

9. Win Condition: Victory is achieved by completing all tasks and escaping from pursuing enemies.

10. Lose Condition: Failure occurs when players are caught by enemies, leading to game over.

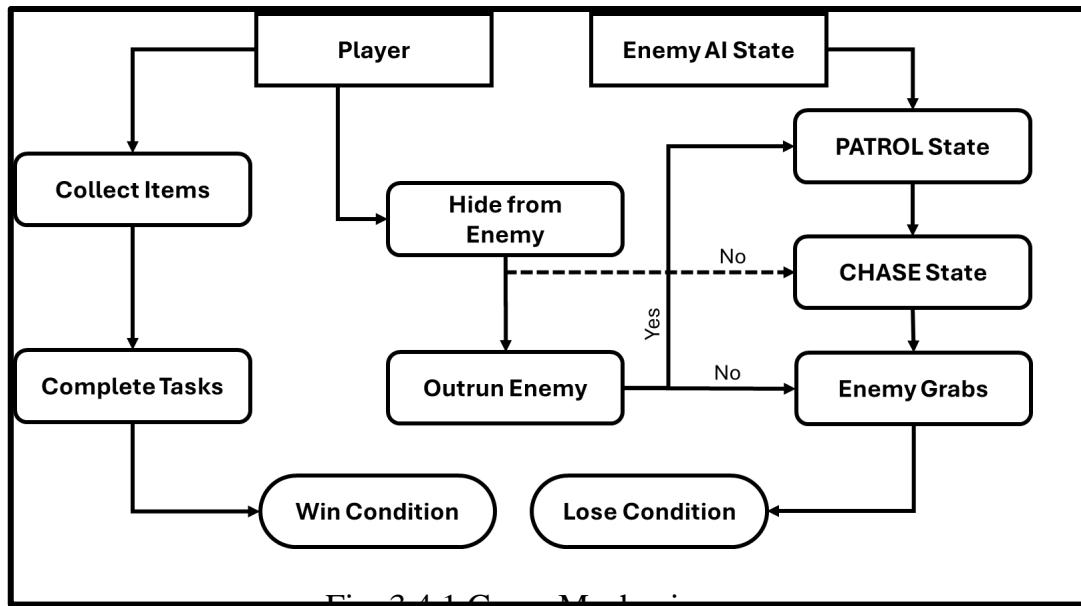


Fig. 3.4.1 Game Mechanism

3.5. Implementation

System Features

3.5.1. HEAD TRACKING:

Head tracking in the VR horror games on Android will be implemented using Google Cardboard SDK which uses the device's built-in sensors, particularly the gyroscope. These sensors detect the user's head movements, including rotation and tilt. Unity's Android VR integration allows to access this sensor data and update the virtual camera's position and orientation accordingly.

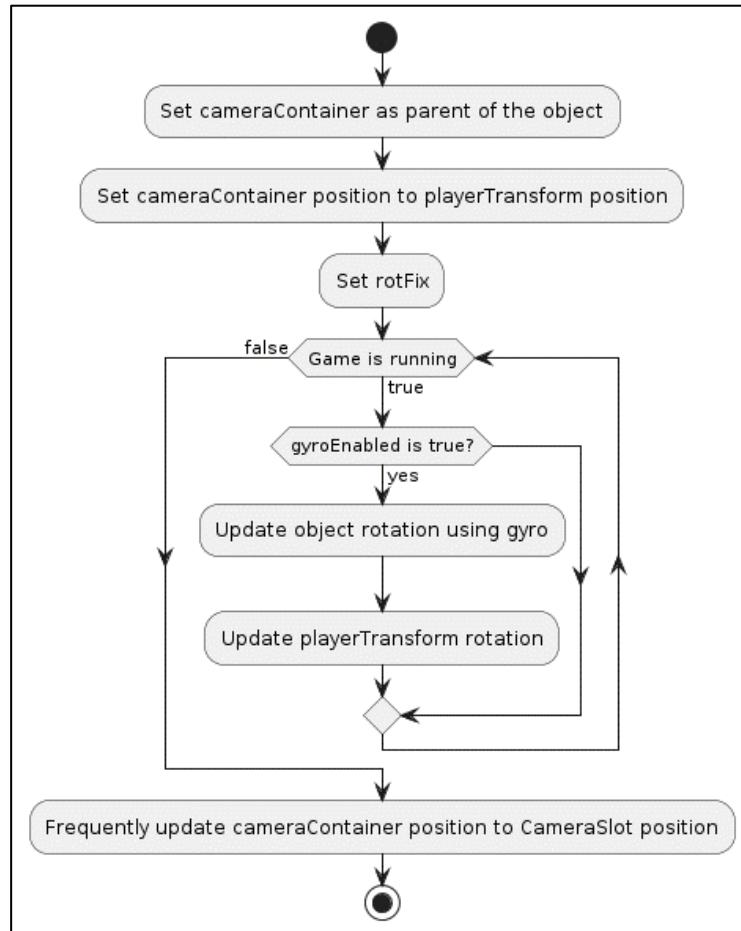


Fig. 3.5.1 Gyroscopic head tracking flowchart

3.5.2 ITEM PICKUP & SPAWNER:

The game uses raycasting for item pickup, enabling players to interact with virtual objects. When the player's VR camera focuses on an object, a ray is cast from the camera's position. If this ray intersects with an interactable object, players can trigger a pickup by pressing a button on their VR controller. Raycasting offers a natural and intuitive interaction method, enhancing immersion and gameplay in the VR horror experience.

The game objects spawn at specified spawn points. The game engine randomly selects spawn points from corresponding lists and instantiates objects based on the specified count, ensuring a varied and engaging gameplay experience. This approach adds randomness and unpredictability to the game world, enhancing player exploration and interaction with objects throughout the game.

Tyres and other items spawn randomly at designated positions

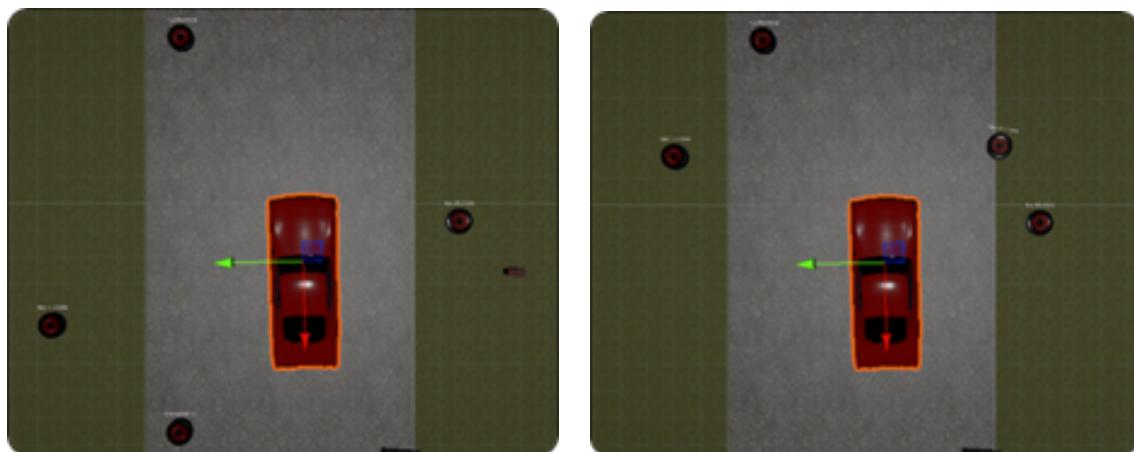


Fig. 3.5.2 Random Item Spawner

3.5.3 ENEMY AI:

The enemy's AI is designed with various states like idle, patrol, chase, grab, and return to patrol. These states dynamically change based on player proximity and randomized movement algorithms, creating suspenseful gameplay. To navigate the terrain, the enemy utilizes a Nav Mesh Agent for smooth movement. The patrol radius gradually reduces over time, adding strategic depth to the enemy's movements and behaviour.

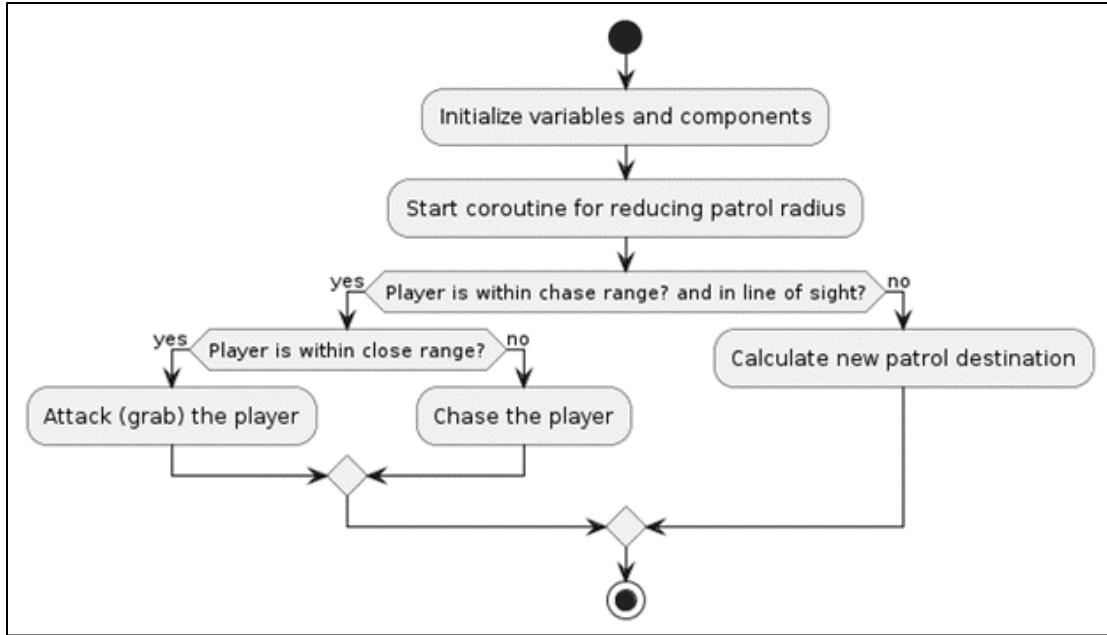


Fig. 3.5.3 Enemy AI Behaviour Flowchart

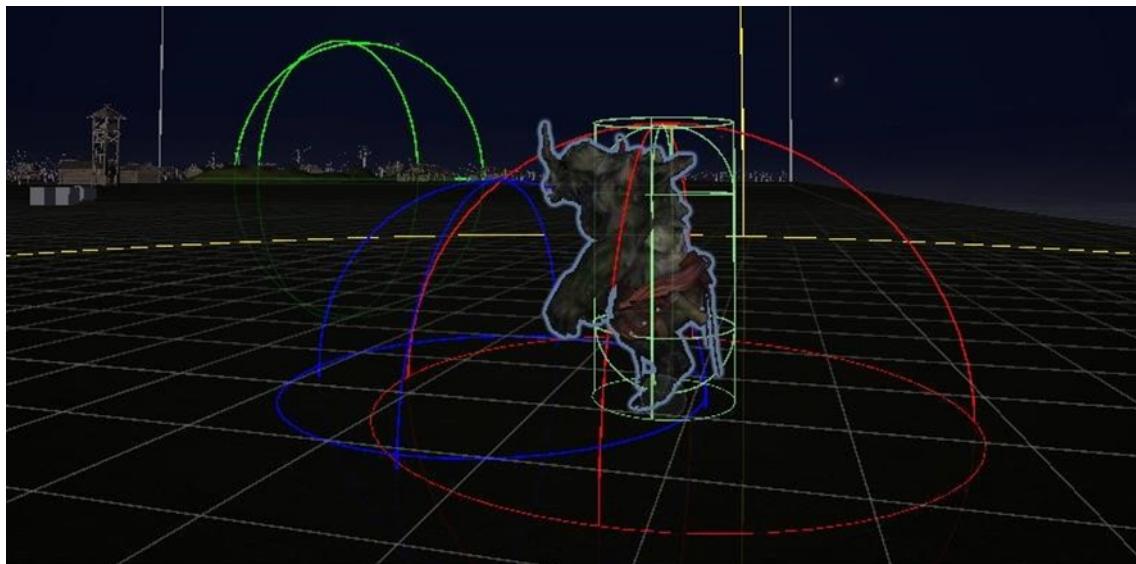


Fig. 3.5.4 Enemy in PATROL State

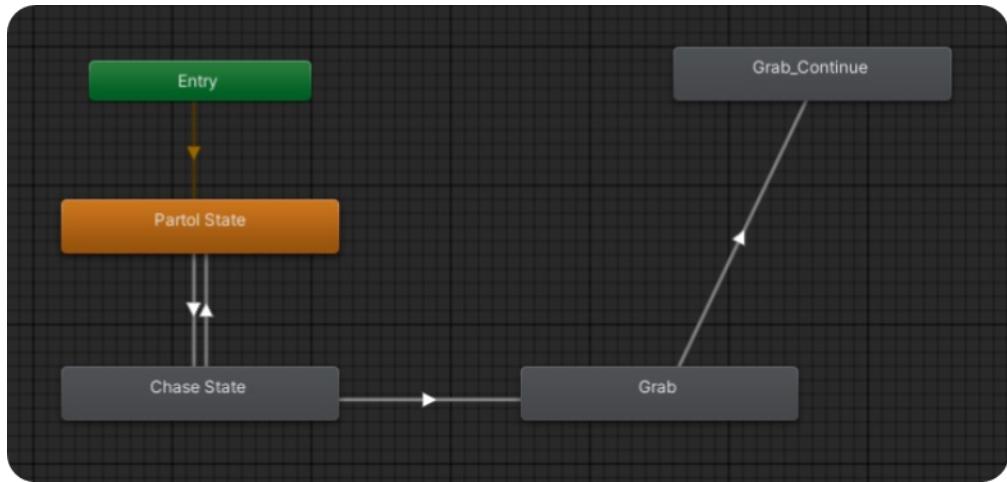


Fig. 3.5.5 Enemy <Animator> Component

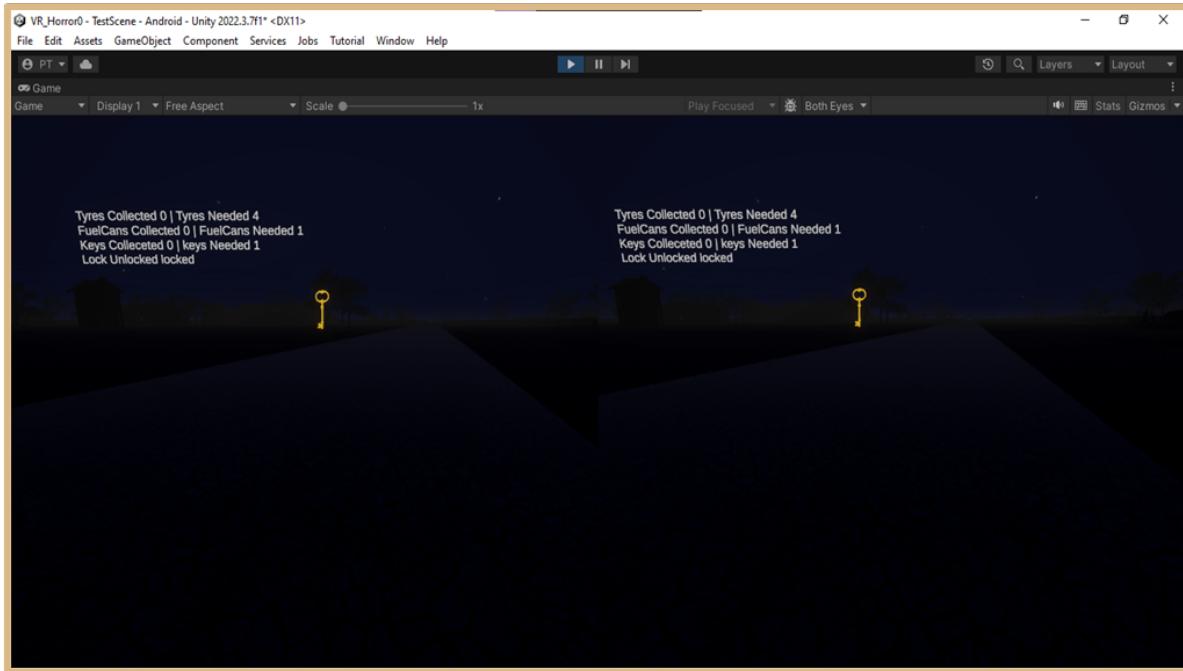


Fig. 3.5.6 Stereoscopic Game Interface

3.5.4 GAME MAP:

Game maps play a crucial role as they provide players with a structured environment to navigate and explore. Well-designed maps not only guide players through the game but also prevent confusion and aimless wandering. The map is crafted with diverse topography, offering varied challenges and encounters. It includes strategically placed elements and eerie audio settings, creating an immersive atmosphere that enhances the overall gameplay experience.

4. TEST CASES

Table 4.1: Test Cases

Sr. No.	Name	Input	Output	Type
1	Environment and Navigation	Gamepad Controller and Gyroscope	The player can navigate through the virtual environment and interact with objects in the environment using VR controllers	Functionality
2	Gameplay Mechanics	Interactive Objects, Pickable Objects, Enemy, Repairable Objects, Movement	Gameplay mechanics such as puzzle-solving, hiding from enemies.	Functionality
3	Visual and Audio Effects	Textures, Materials, Lighting, Footsteps Sound, Environmental Sounds, Enemy Audio	Visual effects create the intended atmosphere for a horror experience.	Functionality
4	User Interface and Controls	Inventory Panel, Captions, Health Bar, Journal	Ensure that the user interface elements are clear and readable in VR.	User Interface
5	Compatibility and Integration	Android Devices, Windows	Test compatibility with different input devices to ensure consistent functionality across platforms	Usability Test

5. CONCLUSION & FUTURE SCOPE

Our VR horror game incorporates a holistic approach to gaming, seamlessly blending immersive environments with advanced technology while catering to the traditional enthusiasm for consuming horror stories. It represents a fusion of past, present, and future elements, presenting VR seamlessly into daily life experiences. Adhering to VR rules and integrating cohesive features, our game sets a new standard for immersive entertainment.

Integration of advanced comfort settings and locomotion techniques, such as teleportation, snap turning, and field-of-view adjustments, to minimize motion sickness symptoms. Implementation of dynamic storytelling elements, nonlinear narratives, and branching paths to enhance player agency and immersion in VR horror environments. Addressing concerns about eye health due to prolonged VR headset use, future VR games may incorporate features such as regular breaks, adjustable display settings, and eye-tracking technology to mitigate potential risks and promote safe VR experiences.

Expanding on multiplayer capabilities, future beginner VR horror games may introduce cooperative or competitive modes for shared immersive experiences. Additionally, offering downloadable content (DLC) can extend gameplay longevity with new levels, characters, or storylines. Optimization efforts will focus on enhancing performance across VR platforms for smoother and more immersive gameplay experiences.

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PUBLICATIONS BY THE CANDIDATES





2nd International Conference on
Advances in Technology and Management
(ICATM -2024)



CERTIFICATE

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THIS IS TO CERTIFY THAT

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Has co-authored and presented a paper titled *Virtual Reality Horror Game* in the 2nd International Conference on Advances in Technology and Management (ICATM-2024) which was held on April 5-6, 2024, organised by A. C. Patil College of Engineering Kharghar, Navi Mumbai India.

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interact with monuments from multiple perspectives, providing detailed historical information and enhancing their understanding of cultural significance. The fusion of physical and digital realms presents an opportunity for both travelers and cultural heritage sites to thrive in the modern age

VR Horror Game

Shruti Swami Sabbani ,Ritvik Babre , Hitesh Behera, Swapnil Yadav and Punam Bagul

In this study, we proposed an analysis framework that examines participants' immersive experience processes from three dimensions: (1) the state of enjoyment, (2) the transformation of the awareness of time, and (3) a sense of spatial integration. We found that the balance of skills and challenges is threshold factor affecting participants' overall enjoyment state and experience of transforming the time awareness during a VR gaming process. With cutting-edge VR technology, you will be transported to a place where your every sense is assaulted by the unknown, and your survival instincts are pushed to the limit. Confront your deepest fears, solve intricate puzzles, and face grotesque monstrosities as you journey deeper into the darkness

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NAAC ACCREDITED A+

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Dr. Ramesh Kulkarni
Principal,ACE



ATHARVA EDUCATIONAL TRUST'S
ATHARVA COLLEGE OF ENGINEERING
(APPROVED BY AICTE, RECOGNIZED BY GOVERNMENT OF MAHARASHTRA
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ISO 21001: 2018 ISO 14001 : 2015 ISO 9001 : 2015 ACE/PROJECTATHON 2.0/CMPN/FR/---/23-24
NAAC ACCREDITED A+

DEPARTMENT OF COMPUTER ENGINEERING AWARD CERTIFICATE

This is to certify that *Swapnil Yadav* from *K.C. College of Engineering* has been awarded **SECOND PRIZE** in the **PROJECTATHON 2.0 NATIONAL LEVEL PROJECT COMPETITION 2024**, held on 19th April 2024 organized by Department of Computer Engineering, Atharva College of Engineering, Mumbai

Dr. Suvarna Pansambal
HOD,CMPN



Dr. Ramesh Kulkarni
Principal,ACE



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Xzibit 2024

CERTIFICATE FOR PARTICIPATION

THIS CERTIFICATE IS PRESENTED TO

RITVIK BABRE

from K.C. COLLEGE OF ENGINEERING & MANAGEMENT
STUDIES & RESEARCH, THANE

for participating in XZIBIT 2024 held on 13th & 15th April.

Prof. Amarja Adgaonkar
(IQAC COORDINATOR)

Dr. Vilas Nitnaware
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