Enhancing Player Experience in A 3d Tactical Shooter Through Objective-Driven Mission Design

Mr. S. Uma Maheshwara Rao[1], Johan John[2], Sidharth J[3]
[1]*Head of the Department, Computer Science and Design, Rajalakshmi Engineering College*
[2] *UG Student, Computer Science and Design, Rajalakshmi Engineering College*
[3] *UG Student, Computer Science and Design, Rajalakshmi Engineering College*

***Abstract*—This paper details the development of a 3D tactical shooter game called Blackout Operation developed using Unity Game Engine, featuring a player-controlled soldier on a mission to secure a terrorist-occupied base. Enemy is designed for adaptive behaviour, including patrol routines and threat detection, while the objective system guides the player through mission phases that require completing specific tasks. This paper examines the design principles, technical challenges, and optimization strategies used to create an immersive, objective-driven gameplay experience.**

***Index Terms*—Unity Game Engine, Blackout Operation, Objective-driven gameplay.**

I. INTRODUCTION

The gaming industry has significantly changed the way in which technology and gameplay mechanics are perceived. 3D shooter games pop up among the most popular genres, given the immersive and interactive experiences they offer. These games require good diversification, realistic visuals, and engaging gameplay elements to hold a player exceedingly well. The main focus of this endeavor is to utilize 3D game development in such a manner that it entertains, but at the same time challenges, inspires, imparts, and has a lasting effect on our audience [1]. This paper discusses the design and development of a 3D tactical shooter game created in Unity, in which players take the part of a soldier assigned to an enemy-occupied base and try to free it. The camera in this third-person shooter is pulled back so that the player can say, "I'm this person," and actually see and control that person doing great things. Sometimes you don't want to step into the action and become the character. Rather than looking directly through the eyes of a video game hero, you interact with an on-screen avatar [2]. The game is based on mission-based objectives requiring players to accomplish tasks to allow further gameplay, thereby constructing a structured yet flexible gameplay experience.

One of the highlights of this game is the intelligent enemy AI which will adapt to the varying actions of players through patrolling routines, threat responses, and coordinated attacks. This kind of adaptive behavior will not only provide a challenge but also recreate real combat situations-a level of engagement in the game experience. Moreover, advanced principles of environment designing are adopted to create a base with strategic complexities, such as cover points, entry zones and varying enemy positions.

Therefore, the aim of this paper focuses on detailing the technical processes involved in the design of objective-driven gameplay in a 3D environment; understanding the objective design, interactions between player and objectives, enemy development, and the optimizations for performance that ensure the smooth experience of gameplay were among the prime concerns in this thesis. This study seeks to offer insight into game development, specifically that related to engaging and visually animating 3D shooter games.

II. OVERVIEW OF UNITY GAME ENGINE

Unity 3D is a very powerful, versatile, and commonly used game development engine for the creation of a wide range of interactive 2D and 3D experiences [3]. It was first released in 2005, and since its inception has received much attention from developers and designers for its flexibility, ease of use, and its extensive asset database. Unity supports a multitude of platforms: Windows, Mac, Linux/Steam OS, Unity Web player, Android, Ios, Blackberry 10, Windows Phone 8, Tizen, Windows Store apps, WebGL, PlayStation 3, PlayStation 4, PlayStation Vita, Wii U, Xbox One, Xbox 360, Android TV, Samsung Smart TV, Oculus Rift, and Gear VR [4], providing developers an opportunity to reach a wider audience with a click-and modify code changes to the common

codebase. Unity's component-based architecture that combines assets, scripts, and settings within a visual editor enables developers to manage complex game elements intuitively.

Fig 1. Unity Technologies

The mighty strength of Unity rests on extensive C# scripting support, which enables developers to create custom game mechanics, carry out artificial intelligence projects, and integrate interactive keys. Additionally, Unity's powerful physics engine, real-time rendering and animation tools equip developers with the resources necessary to build realistic, immersive experiences. The asset store-a gigantic library of pre-made assets and plugins-provides an exemplary fast track for developers to accelerate the development process by integrating pre-built assets and amongst others, 3D models, sounds, and scripts.
The accessibility and modularity of Unity make it particularly suited for developing 3D games, from first-person shooters to role-playing games. It was chosen as a game engine in view of its advancing implementation of complicated game mechanics, adaptive enemy AI, and mission-based objectives. Unity's large assortment of tools and community resources greatly facilitated the implementation of realistic combat mechanics, environment design, and optimization techniques which provide for an unforgettable gaming experience. Therefore, it is found that with passing time and rapt attention, Unity has been umbrellaing game development, giving itself a boost and effectiveness and efficiency along with industries' devotion to Unity amplifying together [5].

III. GAME DEVELOPMENT

The game design of the 3D tactical shooter Blackout Operation is committed to an immersive, objective-driven gaming experience, with the players assuming the role of a soldier completing a high-stakes mission to retake a secure base taken over by hostile forces. The narrative flows into stages that seamlessly guide the player, where each is an integral piece of the process of regaining control over a specific base. Finding that sense of progression in a mission-based gameplay continually keeps the players hooked, as it fuses elements of action-oriented gameplay with narrative arcs.

A. STORYLINE

The storyline follows the player character, a well-trained soldier deployed to infiltrate and neutralize a base occupied by terrorists. The narrative unfolds as the player progression through different zones within the base, each presenting new challenges. As the player encounters some tasks – such as finding key for opening the generator room where he can disable the generator, disabling the security systems, and engaging enemies. Each successful completion of an objective leads the player forward in the game.

B. GAME DESIGN

Each game mission is structured to cause players to think strategically, tacitly planning their next move. This is essentially the basis for a game's design: achieve objectives, take out enemies, and move forward in-game. This gratifying progression, based on objectives, provides direction to the player that will keep them motivated and glued to it.

a) Layout and Environment
The environment is thus designed for various combat and exploration experiences. Open spaces for actions, narrow corridors for stealthy maneuvers, and fortified areas where players can find cover or set ambushes are located in the base. Without this, different objectives would not feel unique, and the player wouldn't be able to adapt as he/they progressed through each area of the base.
b) Game Mechanics
Movement, aiming, and shooting are the main gameplay mechanics, tuned to create a realistic and responsive experience. Resource management mechanics-such as limited ammunition and the strategic placement of health packs throughout the game-come into play and thus make exploration much more challenging and worthwhile
c) Enemy AI and Challenging objectives
The game ups the intensity and realism by incorporating integrated enemy AI, which adapts to the player's actions. When detected by enemies, they can patrol an area, take cover, or call for reinforcements. This dynamic AI makes for varied gameplay and increases the difficulty as the player progresses, culminating in intense and immersive combat sequences.

Certain objectives will need to be completed inside the base, with the enemy guarding most of these zones. The player will have to remove the enemy presence and continue on fulfilling the objectives for mission progression and base retaking.

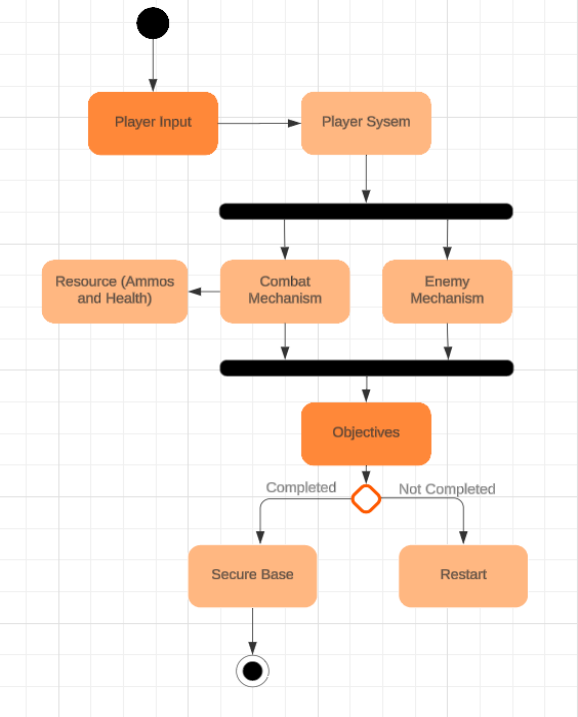

Fig 3. Game System

C. CHARACTER DEVELOPMENT

The player character is designed in such a way that the skills and attributes work well with the role of a tactical shooter-tactical stance toward weapons handling, reflexes, and movement all come together to create a character profile appropriate for high-risk missions. Despite the limited backstory developed for the player character, the focus is squarely on the realistic skills and actions of a soldier in order to immerse the player into the role. To better enhance this realism, the model of the player character wears an outstanding range of military clothing and gear, including body armour, utility belts, and weapon holsters. The level of visual detail here not only translates to aesthetic pleasure but also makes the character more believable within the surroundings of the game. The design of the game embeds resource management elements-in the form of limited ammunition-so as to encourage the strategic decision making a soldier must make in combat.

Fig 2 Player Character

a) Character Controls

The controls are made intuitive, precise, and responsive to facilitate navigation within the game environment while allowing for combat seamlessly. These comprise the following:

- *Movement:* The player character can walk, sprint, crouch, or take cover. Both crouch and cover are crucial for stealth and tactical positioning-giving leeway to the player in avoiding detection and minimizing incoming fire.
- *Aiming and shooting*: The shooting mechanics are designed to support accuracy and rapid response when the player character is shooting from the hip for close quarter or aiming down sights (ADS) for accurate long-haul attacks. Recoil mechanics are yet incorporated to add to the sense of realism, demanding players to manage resources-intents for better ammo management.
- *Interaction:* Interaction controls are pivotal for executing actions with mission objectives, such as disabling security systems and picking up keys and items. One single button for interaction allows players to perform an action and act over the controls as simple and user-friendly.

D. ENVIRONMENTAL DESIGN

The environmental design plays an important role in this game-it brings a lot of immersion to the player experience, influencing gameplay flow at some point as well as strategic decision-making. The aspects of the game environment are built primarily upon realism and immersion of military arenas-patched together with variances in temperatures, arguments of cover, and the extent of graphical detail. Important places of the dominant base-like bunkers, generator rooms, open courtyards, and so on- are built to pose specific challenges to the combatant or strategist moving through them. The layout is both functional and believable, paying attention to how its physical spaces

can guide player movement and impact combat strategies. Some key environmental aspects include:

Fig 4. Base Design

a. *Terrain and Obstacles*: Natural and man-made obstacles, such as walls, barricades, and crates, are littered throughout the environment. These should bring tactical advantage and concealing spots on behalf of the player. These obstacles should represent the spot for cover, which applies in the same way as strategic attack avoidance of detection by the players, thus contributing to actual gameplay interest.

b. *Lighting and Atmosphere*: Lighting will set the tone of the game. Shadows in strategic areas, dim lights in cover areas, and bright lighting areas where the player is exposed create tension.

c. *Soundscapes*: Sound ambiance of distant gunfire, the sound of feet upon surfaces, and the miscellaneous sounds of the environment mixed on the canvas of the game render the atmosphere real and immersive. The sound information also serves as a tactic-helping tool to hone in on enemy spots or indicate when they are in hot zones.

d. *The Enemies-Rich Areas*: Certain zones are populated with enemies. These zones force players to adopt stealth or careful positioning to avoid being overwhelmed. These zones grant the players to select among different options based either on the player's choice or commitment.

e. *Backtracking interactive elements*: Important interactive objects that include doors, switches, control boards, for achieving mission objectives or opening up new areas. Either the player may have to find a key to open a gate or breaking into a building to destroy computer installations goes undetected.

IV. FUTURE WORKS AND IMPROVEMENTS

The present game, however, has some areas earmarked for future works and improvements. The improvements seek to add depth in gameplay, engage the player further, and add new technologies if they will benefit the overall experience. The directions for potential future development are as follows.

a. *The storyline and the quests are expanded*: The game currently seems to present a linear sequence of objectives; yet, the future versions should devote attention to providing players with branching storylines and side missions that provide players with more choices and consequences depending on their actions. This was to increase its re-playability and allow for an experiential variety within a uniform platform.

b. *Multiplayer Features:* The game can be immensely improved with some multiplayer addition. With co-op or competitive modes plugged into the game, players can play together or against each other, by so- doing provides social interaction and community acknowledgment. Each should provide some extra oomph to the matchmaking system for team deathmatch or some objective-based missions.

c. *Improved Graphics and Optimization*: With the advancement of technology, graphics need to improve regularly with performance optimization. Slight improvement in graphical features such as enhanced textures, better particle effects, and advanced lighting techniques may be included in future game versions. Also, if the game can be optimized for a combination of various platforms such as consoles and older PCs, it will really have the potential for a larger audience.

d. *Customization Options*: Players will get more interaction as character and weapon loadouts customization options increase. This way, players could also have the choice of customizations that involve skill tree progression, weapon modifications, etc., which suit each individual's play style. Having rewarded game progress toward completing the challenges or objectives may encourage them to continue over time with a game.

e. *Enhanced Enemy Behaviour*: Basic AI behaviors are used by the game's adversary characters; additional development could enable more complex AI systems. Machine learning and other sophisticated algorithms may enable adversaries to pick up on your tactics and adjust their tactics accordingly. Throughout the game, players will remain interested and alert due to the surprise and challenge this dynamic AI brings.

V. CONCLUSION

In conclusion, this article has described the Unity game development process for the 3D tactical shooter game "BLACKOUT OPERATION," emphasizing several important components like character, game,

and environmental design. Players assume the role of soldiers entrusted with entering a terrorist-occupied base, defeating the terrorists, accomplishing the objectives, and regaining the base in this realistic and captivating game. In addition to offering a gripping story, the game pushes players to think strategically and modify their approach in a changing setting. In order to make sure the game keeps improving and living up to consumer expectations, further research will examine improvements in storytelling, AI behavior, and multiplayer features.

VI. ACKNOWLEDGMENT

First and foremost, we praise the almighty god for the project's successful completion. Our heartfelt gratitude goes to our Chairman, Mr. S. Meganathan, B.E., F.I.E., for his honest efforts in teaching us at his excellent university. We would like to thank our beloved Chairperson Dr. Thangam Meganathan, Ph.D., for her ardent enthusiasm, which motivated us much in finishing this project, as well as Vice Chairman Mr. Abhay Shankar Meganathan, B.E., M.S., for providing us with the necessary facilities. We also thank our college Principal, Dr. S.N. Murugesan M.E., PhD., and Dr. Uma Maheshwar Rao M.E., Ph.D., Head of the Department of Computer Science and Design, as well as our project guide, Dr. Uma Maheshwar Rao, for their encouragement and guidance throughout the project, as well as our loved ones, parents, all faculty members, and all of the supporting staffs for their direct and indirect involvement in the project's successful conclusion.

REFERENCES

[1] Maitreya Milind Juvekar, Chaitanya Jayanta Rajwade, Sudhir Mangesh Charkari, Pranav Ramesh Raut, Poornima Pawar (2024). 3D GAME DEVELOPMENT.
[2] Gourav Saini, Udit Verma, Amit Kumar Saini (2022). Third Person Shooter Game.
[3] Unity Technologies https://unity.com/
[4] Pa. Megha, L. Nachammai (2018) 3D GAME DEVELOPMENT USING UNITY GAME ENGINE.
[5] Faizan Hussain (2020). Unity Game Development Engine: A Technical Survey