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1. Introduction

Within the dynamic realm of digital entertainment, where technology and culture coexist, "Khel-Dhemali" stands as a monument to the revolutionary potential of game design. Through the development of an immersive computer game, this final year project sets out on a captivating adventure to bring the classic Assamese games of "Luka Bhaku" (hide and seek) and "Sua-Sui" (game of tag) to life. Built on the powerful Unreal Engine 5 platform, "Khel-Dhemali" aims to immerse players in a colorful virtual world that captures the spirit of treasured childhood recollections.

This project pushes the boundaries of traditional game production, emphasizing the confluence of tradition and innovation. By painstakingly creating an experience that is modelled after Assamese culture, "Khel-Dhemali" honors the rich history that is ingrained in traditional games while also providing entertainment. In order to replicate the charm of "Luka Bhaku" and "Sua-Sui," the project makes use of Unreal Engine 5's state-of-the-art features. This allows gamers to experience a thrilling trip into the past while also embracing modern technical breakthroughs.

This introduction provides an overview of the various aspects of "Khel-Dhemali." We explore the reasons behind the project, the techniques used in game design and development, and the complex interplay between technology and cultural quirks that influence the gaming experience as we set out on this investigation. "Khel-Dhemali" represents the ability of digital media to span generations, generating a sense of nostalgia and connection to cultural roots, going beyond a simple re-enactment of childhood pastimes.

Join us as we explore the layers of inventiveness, cultural preservation, and creativity that are present in "Khel-Dhemali." We encourage you to experience the meeting point of tradition and technology as we go through the report's chapters, where a computer game serves as a means of remembering and commemorating the happy times of Assamese childhood.

2. Literature Review

- 1. Unreal Engine 5.0 Documentation, (2022)**
- 2. Unreal Engine 5.3 Documentation, (2023)**
- 3. Epic Games Developer Community Forum**
- 4. Epic Games Learning Library, (Unreal Engine)**
- 5. Discord, Unreal Engine Community**

2.1 Objective:

The "Khel-Dhemali" project endeavors to create a computer game that transcends traditional entertainment, focusing on the cultural preservation of Assamese childhood games, namely "Luka Bhaku" and "Sua-Sui." Rooted in nostalgia, the game aims to evoke a deep emotional connection, allowing players to relive the carefree and exhilarating moments of their youth. Through innovative use of Unreal Engine-5, the project showcases technological advancements while preserving traditional experiences. Additionally, it seeks to educate players about the cultural significance of these games, fostering community engagement and unity. "Khel-Dhemali" becomes more than a game - a cultural bridge that connects players to their roots, celebrating the rich tapestry of Assamese heritage.

3. Methodology:

The methodology consists of different stages such as **Cultural Research, Game Design and Conceptualization, Unreal Engine 5 Implementation, User Testing and Feedback, Educational Components Integration, Documentation and Reporting.**

The entire Game Design flow diagram is shown below:

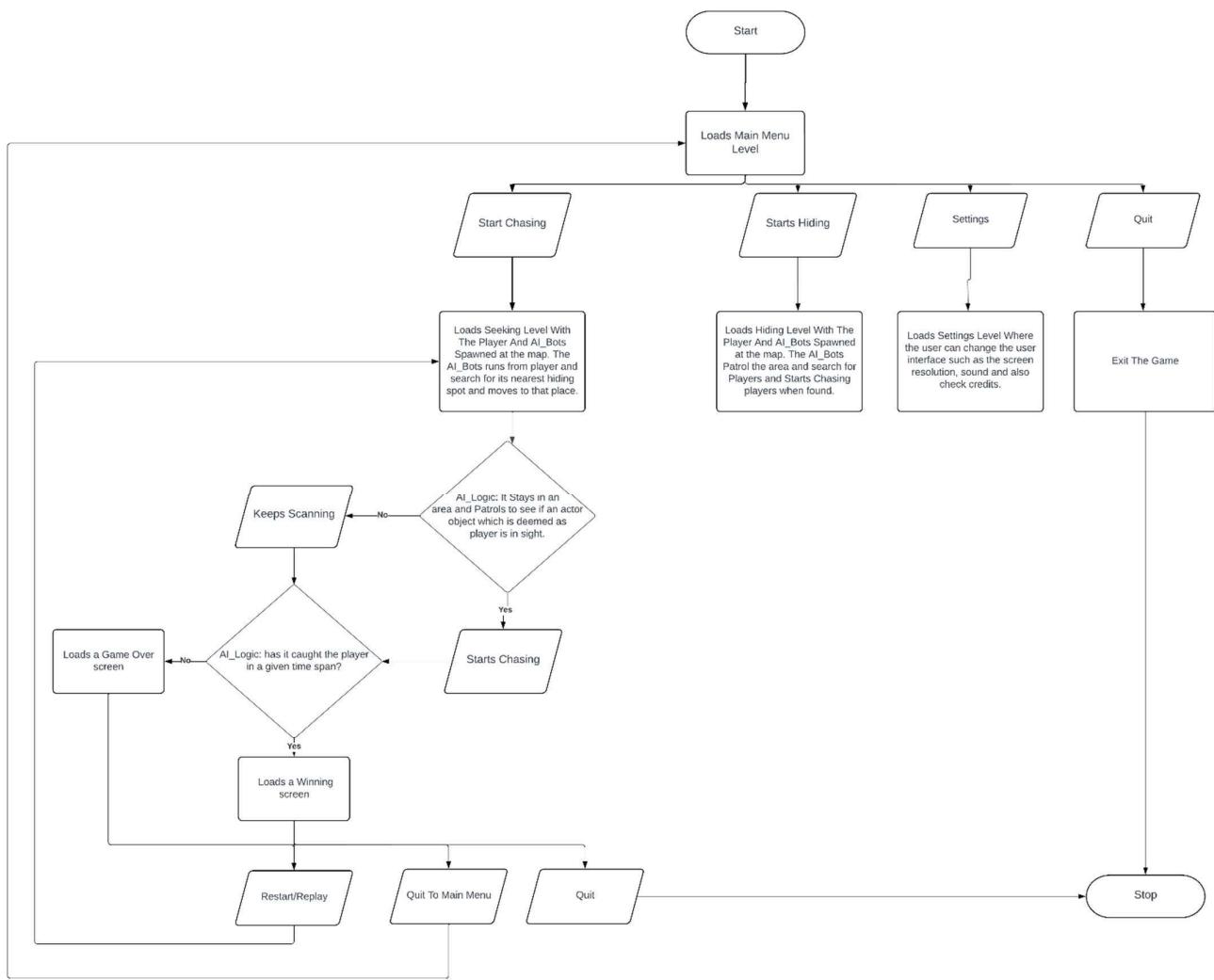


Fig 1.a: Dataflow Diagram Seeking/Chasing level logic

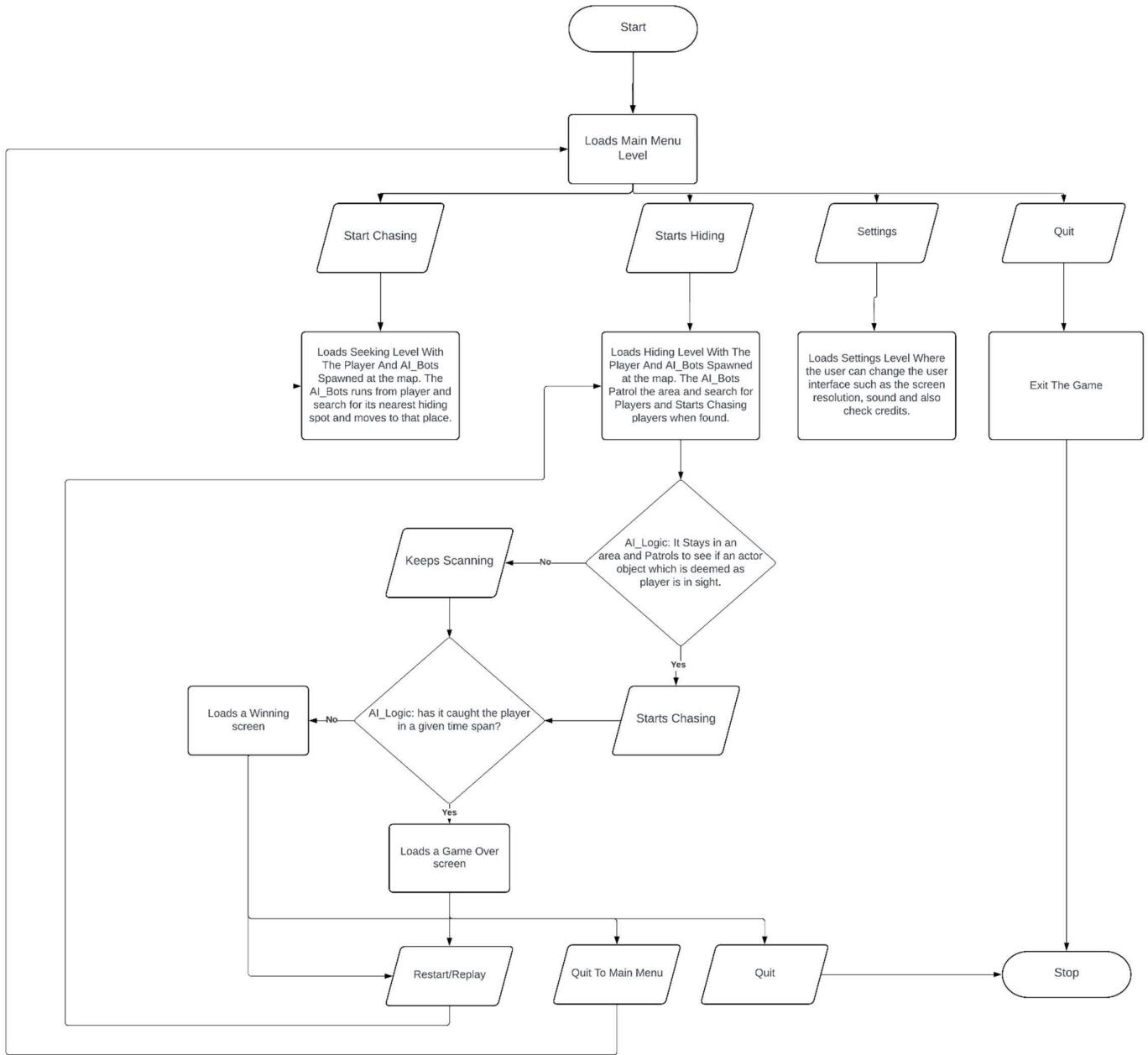


Fig 1.b: Dataflow Diagram Hiding level logic

1. Cultural Research:

- Conduct an in-depth study of Assamese culture, specifically focusing on the traditions, values, and social significance associated with the childhood games of "Luka Bhaku" and "Sua-Sui."
- Collaborate with cultural experts, historians, and local communities to ensure accuracy and authenticity in representing these traditions within the digital context.

2. Game Design and Conceptualization:

- Develop a comprehensive game design document outlining the core mechanics, objectives, and visual aesthetics of "Khel-Dhemali," ensuring that the game encapsulates the spirit of the Assamese childhood games while leveraging Unreal Engine 5 capabilities.
- Integrate cultural elements seamlessly into the game mechanics to enhance the player's connection with Assamese traditions.

3. Unreal Engine 5 Implementation:

- Leverage Unreal Engine 5's advanced features for rendering realistic environments, dynamic lighting, and immersive gameplay, ensuring a visually stunning and technically robust representation of "Khel-Dhemali".
- Implement coding and scripting to bring the game mechanics to life, emphasizing a balance between technological innovation and cultural authenticity.

4. User Testing and Feedback:

- Conduct iterative testing phases involving a diverse group of players to gather feedback on gameplay, visuals, and overall user experience.
- Refine and iterate the game design based on user input, ensuring that the final product resonates with a broad audience while remaining true to its cultural objectives.

5. Educational Components Integration:

- Develop informational elements within the game to educate players about the cultural significance of "Luka Bhaku" and "Sua-Sui," integrating narratives or pop-ups that provide historical context during gameplay.
- Collaborate with educators and cultural institutions for insights into effective educational game design strategies

6. Documentation and Reporting:

- Maintain detailed documentation throughout the development process, including cultural research findings, design decisions, implementation details, and user testing results.

- Compile a comprehensive project report highlighting the methodologies employed, challenges faced, and lessons learned in the development of "Khel-Dhemali".

3.1 Logic Built:

The logic behind "Khel-Dhemali" is built using Unreal Engine 5's robust features, with a focus on creating an immersive, interactive experience that captures the essence of traditional Assamese childhood games. Below are the key components and detailed logic implementations:

1. Loading Screen Level:

The loading screen level provides a seamless transition for players as they enter the game. We utilized a standard asset plugin called Async Loading Screen to create a visually appealing and functional loading experience.

- **Images and Captions:** We added culturally relevant images and tailored loading captions to keep players engaged during the load time.
- **Screen Timing:** Adjusted the timing to ensure that the loading screen is displayed just long enough to load game assets without causing unnecessary delays.

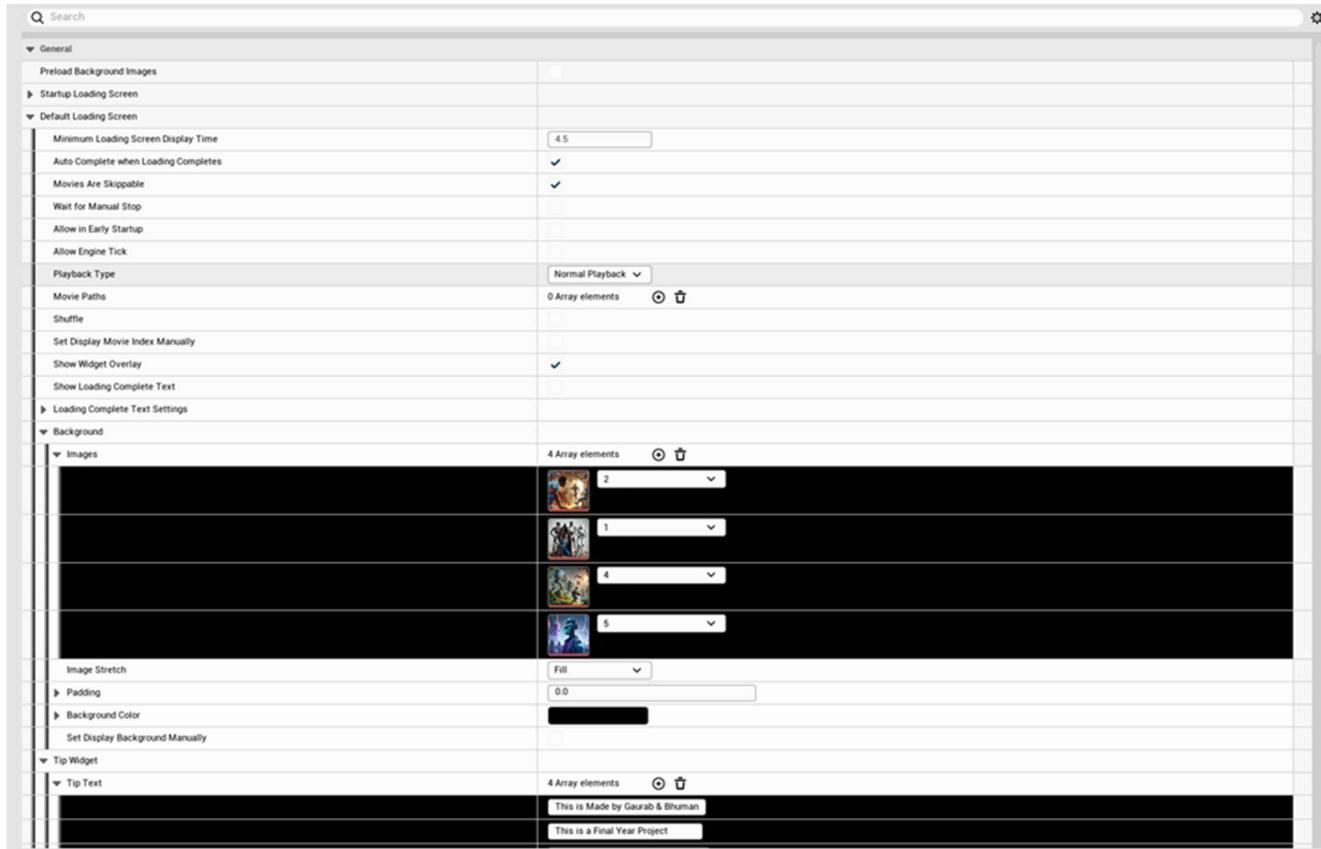


Fig 2: Loading Screen Deployment

2. Widget Screens for the Functions:

To enhance user experience, several widget screens were created, each serving a specific function within the game.

- **Main Menu:** The main menu is designed to be intuitive, allowing players to start a new game, load an existing game, adjust settings, and exit the game. The logic includes:
 - Navigation Buttons: Easy-to-navigate buttons for each option.
 - Animation Effects: Subtle animation effects for button hover and click actions.
 - Background Music: Ambient background music to set the tone.
 - Settings Options: Adjustable game settings for graphics, sound, and controls.

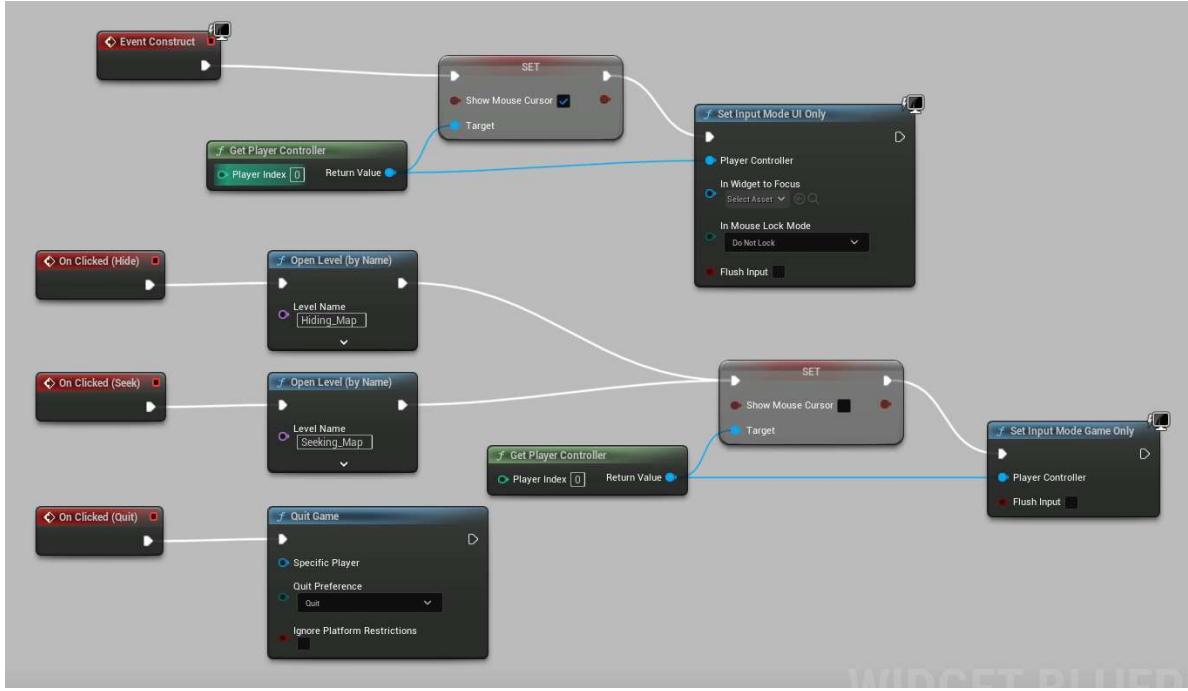


Fig 3.a: Main Menu Widget Logic

- **Pause Menu:** The pause menu provides options to resume the game, adjust settings, or quit to the main menu. Key logic components include:
 - Pausing Game Time: Freezing all game activities when paused.
 - Saving Game State: Ensuring the current game state is saved upon pausing.
 - Muting Game Sounds: Muting all sounds during pause to avoid distraction.
 - Options Navigation: Easy navigation to settings and main menu from the pause screen.

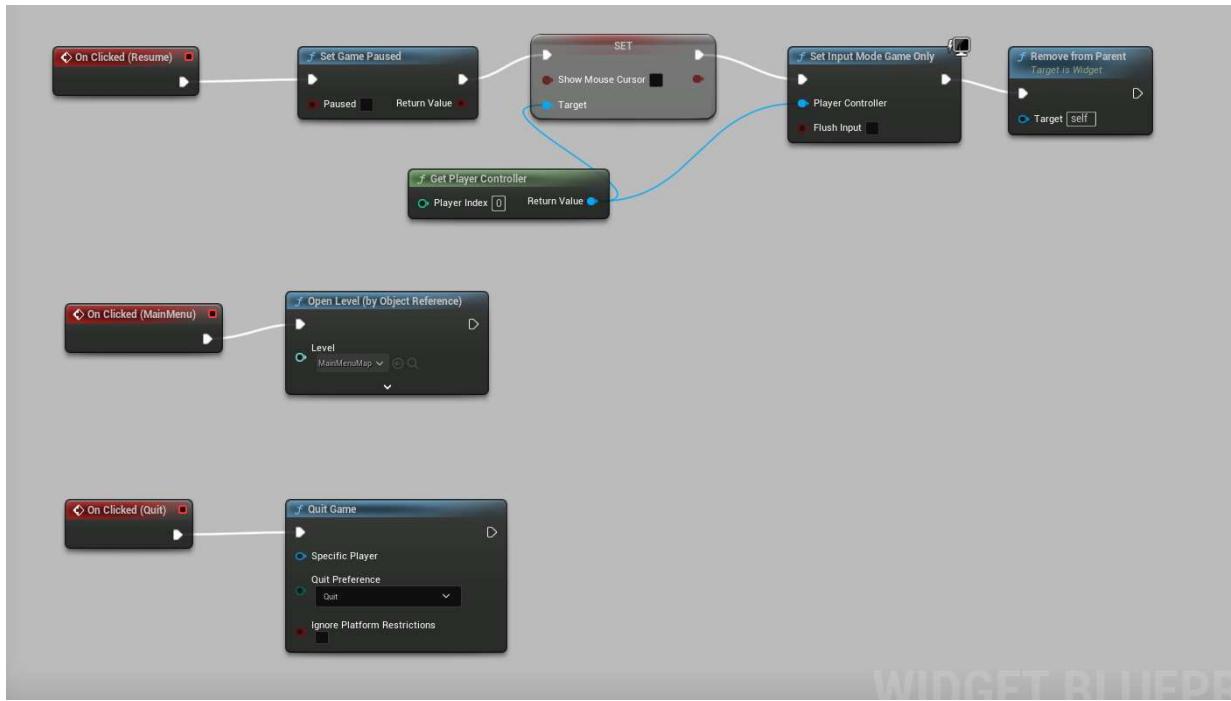


Fig 3.b: Pause Menu Widget Logic

- **Winning Screen:** Displayed when a player successfully completes a level or achieves a goal. Logic includes:
 - Score Display: Showing the player's score and achievements.
 - Next Level Option: Option to proceed to the next level or return to the main menu.
 - Celebratory Animations: Animated effects to celebrate the player's victory.

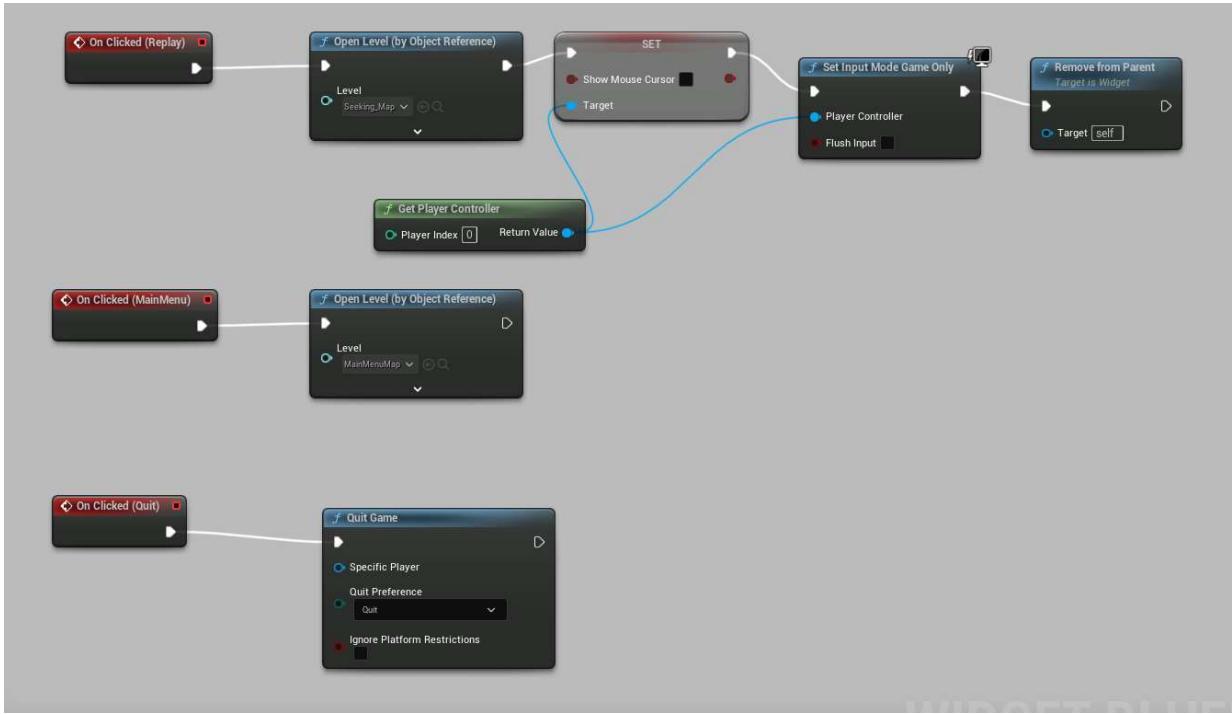


Fig 3.c: Winner Widget Logic

- **Game Over Screen:** Shown when the player fails a level or is caught by a seeker. Key elements are:
 - Final Score Display: Displaying the final score and tips for improvement.
 - Retry Option: Option to retry the level or return to the main menu.
 - Consolatory Animations: Animations to encourage players to try again.

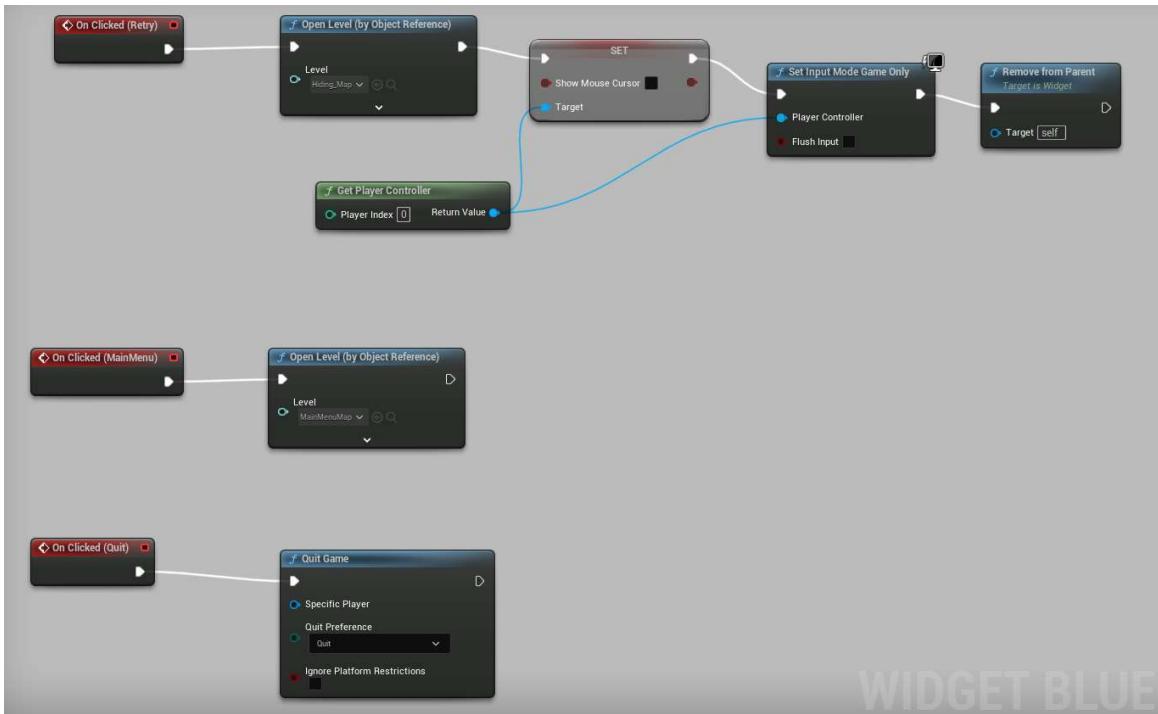


Fig 3.d: Game Over Widget Logic

3. Creating Player Character:

The player character is central to the game's interactivity and immersion. Utilizing Unreal Engine's visual scripting system, Blueprint, we built all playable aspects.

- Movement and Animation: Implemented smooth movement controls and realistic animations for walking, running, and jumping.
- Idle Animations: Added idle animations to bring the character to life when stationary.
- Interaction Animations: Created specific animations for interacting with objects and hiding spots.
- Camera Switching: Allowed players to switch between third-person and first-person perspectives seamlessly.
- Interaction Controls: Included controls for interacting with game elements, such as hiding spots and objects.
- State Management: Managed different states like alive, dead, and invincible,

ensuring smooth transitions between states.

- Health System: Implemented a health system to track the player's well-being.
- Inventory System: Developed an inventory system for players to collect and use items.

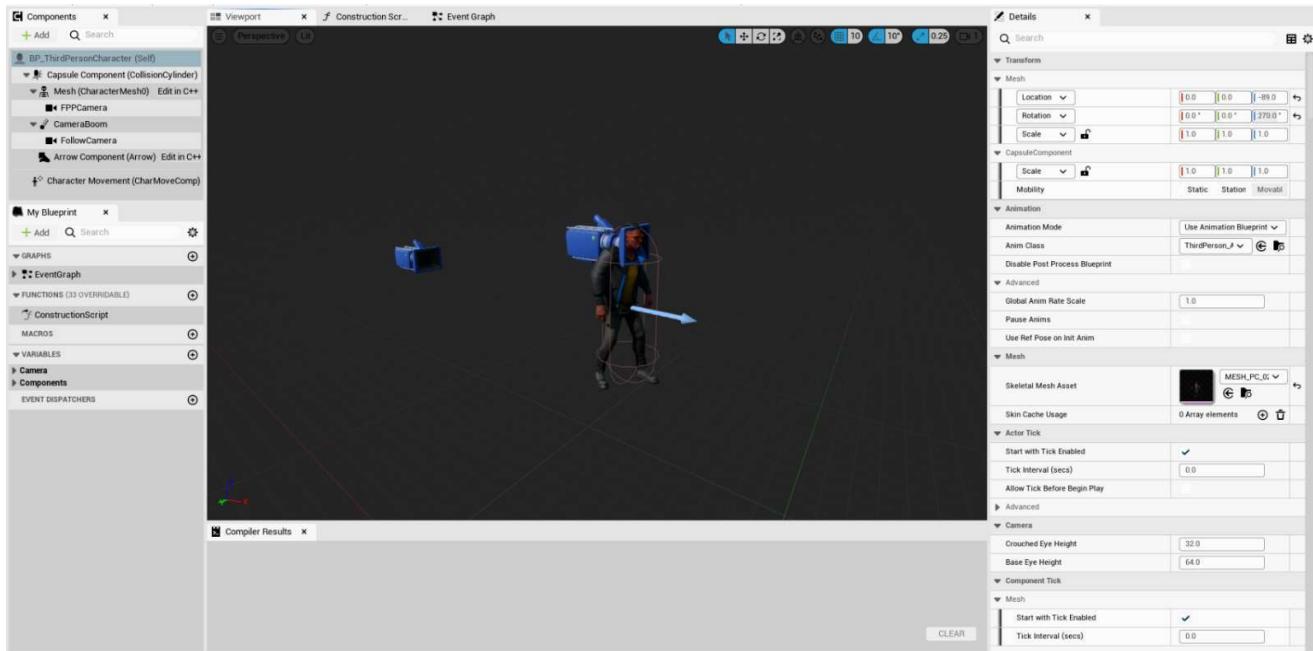


Fig 4.a: Player Character Preview

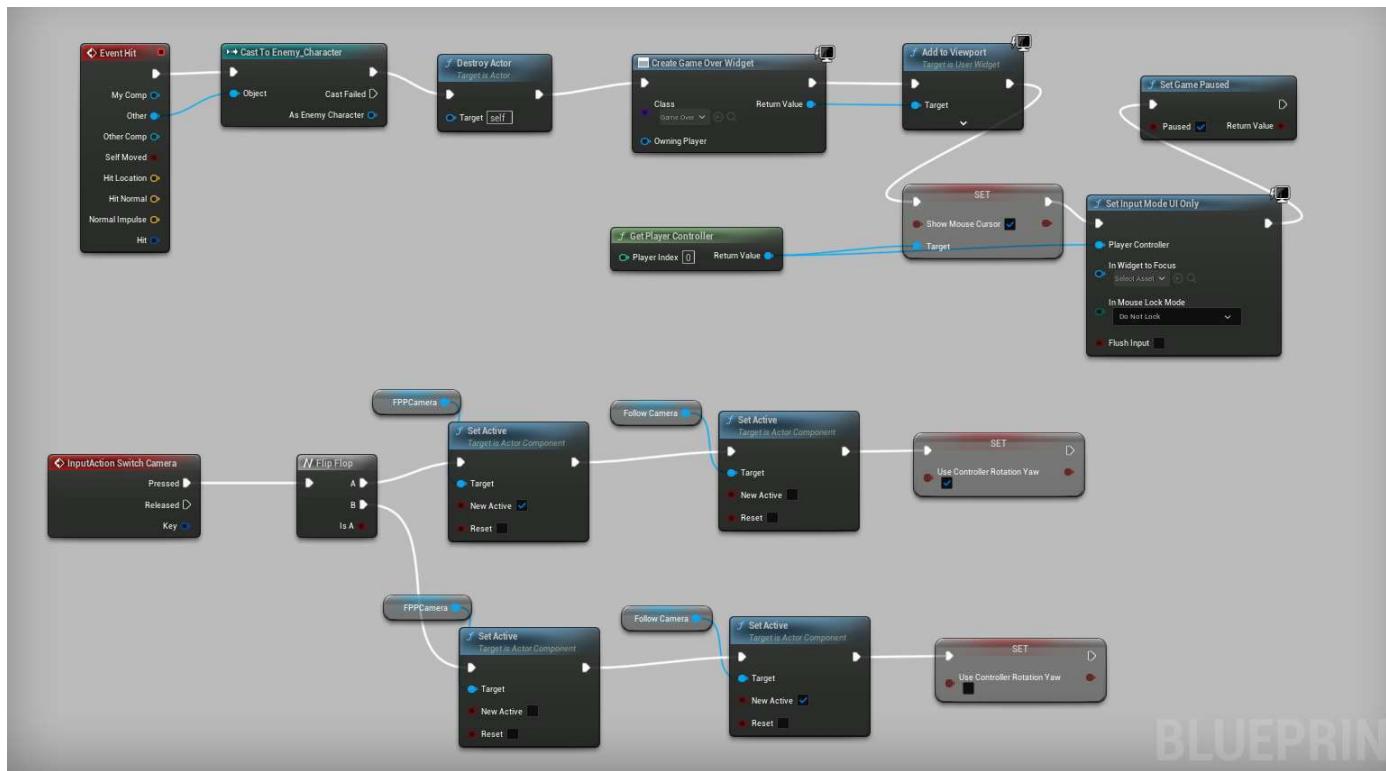


Fig 4.b: Player Character Logic Blueprint 1



Fig 4.c: Player Character Logic Blueprint 2

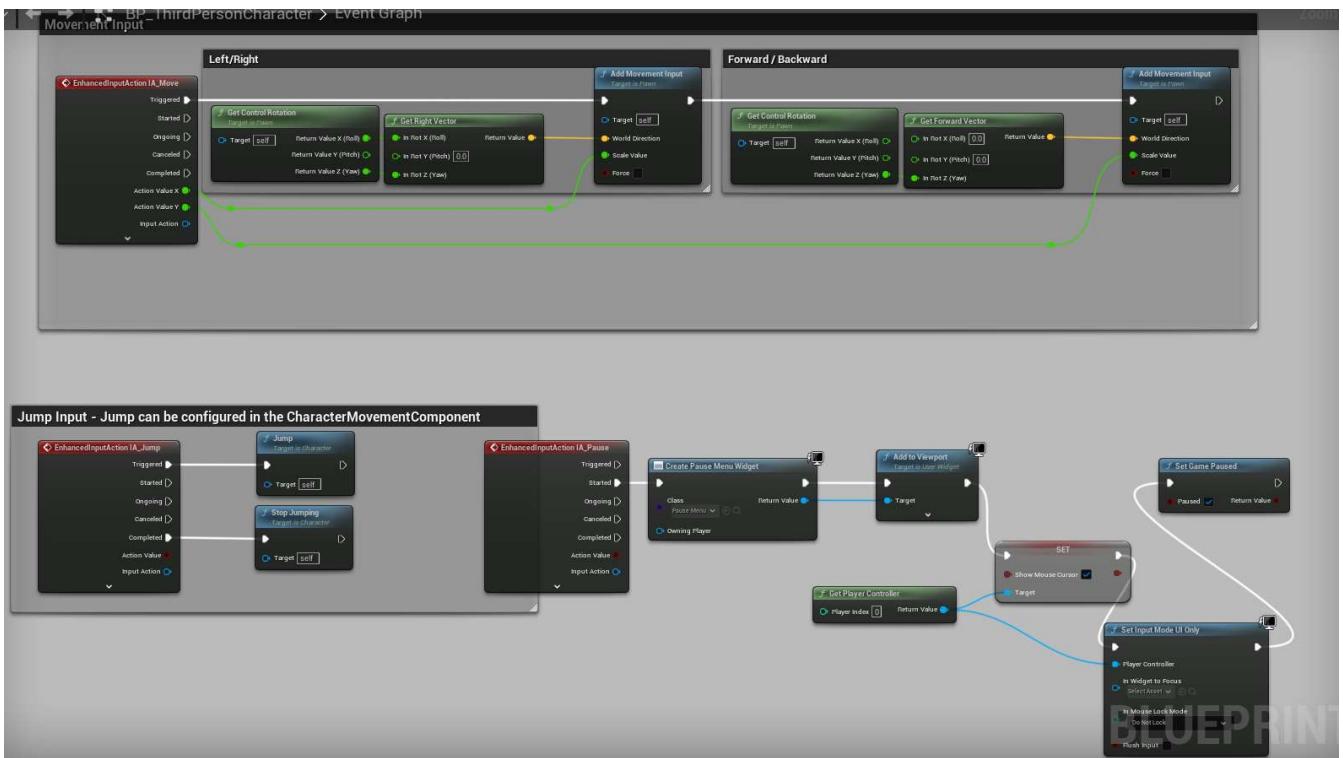


Fig 4.d: Player Character Logic Blueprint 3

4. Hiding AI_BOT:

The hiding AI bot emulates a character that players can interact with during the hide-and-seek game mode. It uses Blueprint and Behavior Tree Function for dynamic behavior.

- Movement and Animation: Implemented realistic movement animations for hiding and running away.
- Idle Animations: Added idle animations for when the AI is stationary.
- Hiding Animations: Specific animations for hiding and staying hidden.
- Behavior Tree Logic: Developed complex behavior patterns for hiding, including decision-making based on player proximity.
- Environmental Query System (Eqs): Used to determine optimal hiding spots by evaluating environmental factors and player visibility.

- Stealth Mechanics: Integrated stealth mechanics to make hiding more challenging and realistic.
- Sound Detection: Enabled the AI to react to player-made sounds.

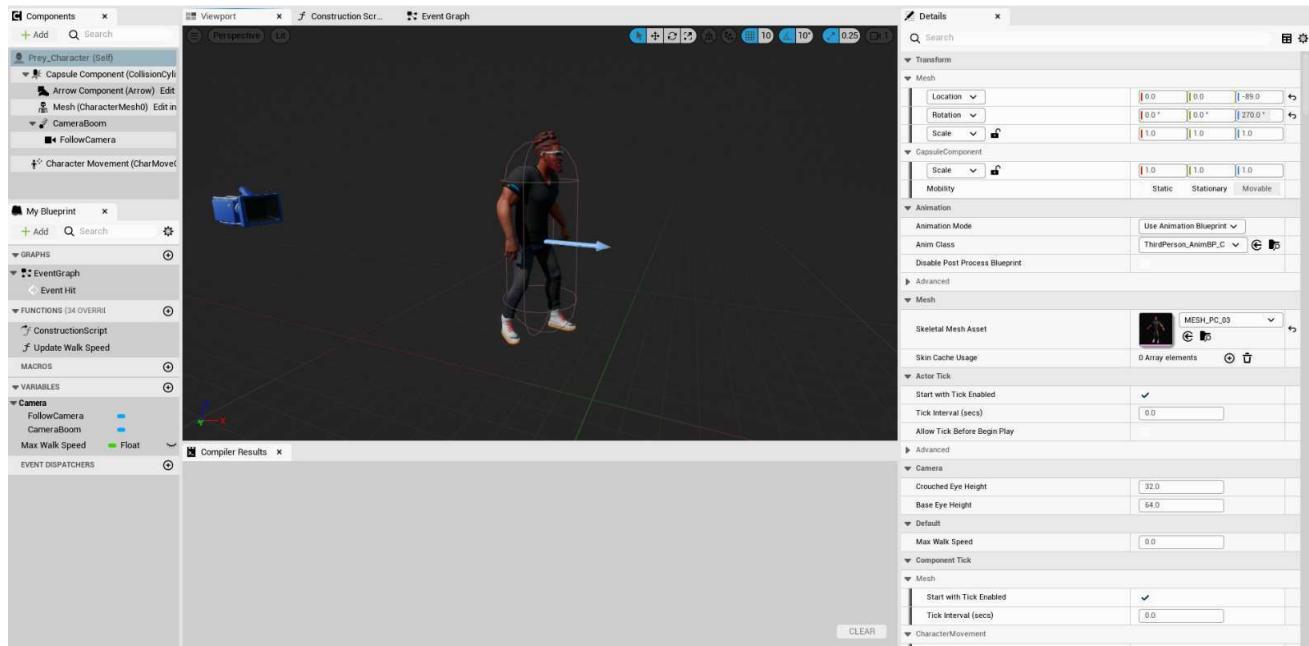


Fig 5.a: Hiding AI Character Preview:

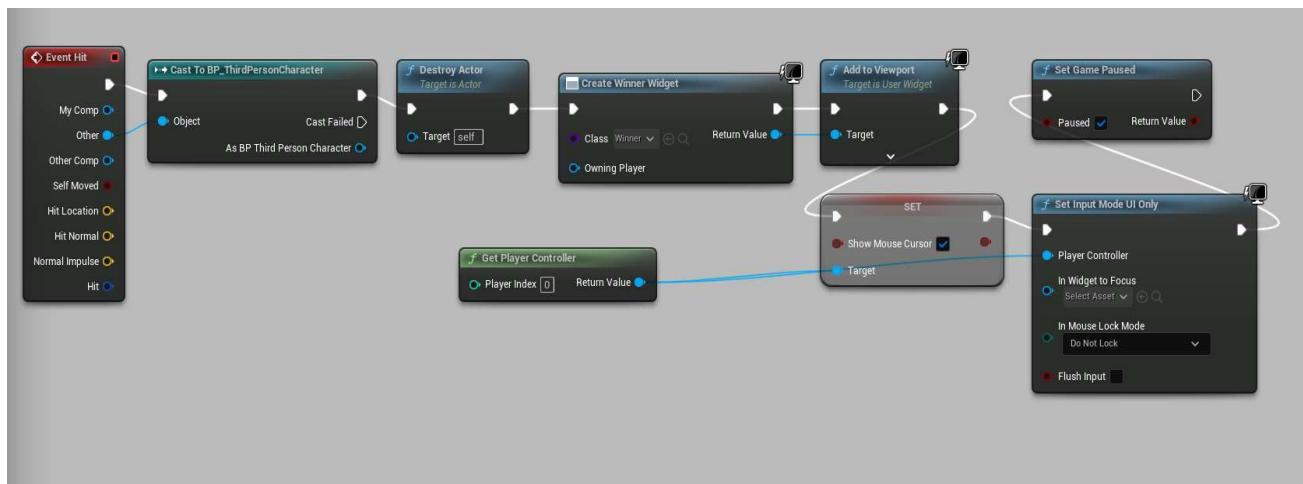


Fig 5.b: Hide AI Character Logic Blueprint

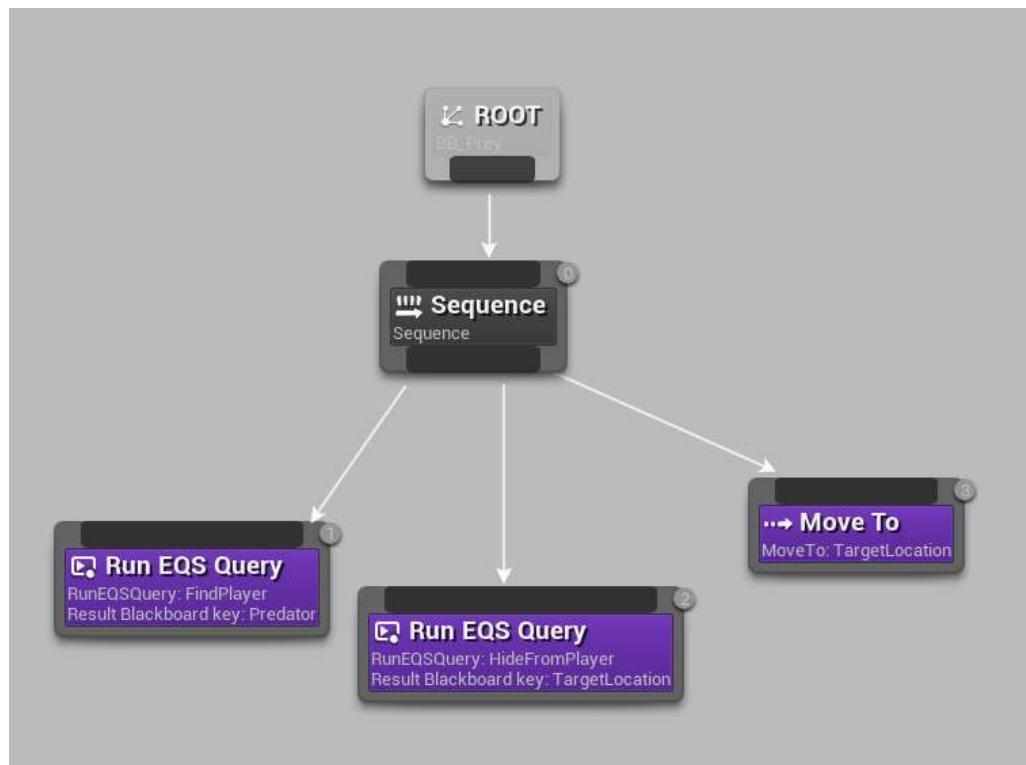


Fig 5.c: Hide AI Character Logic Behaviour Tree

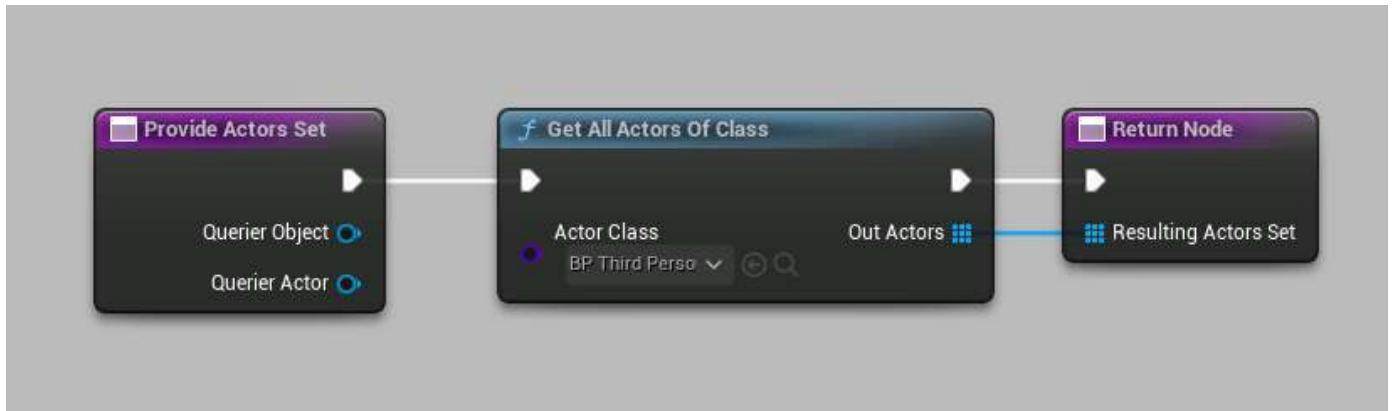


Fig 5.d: Hide AI Character Getting Player Actor Logic Blueprint

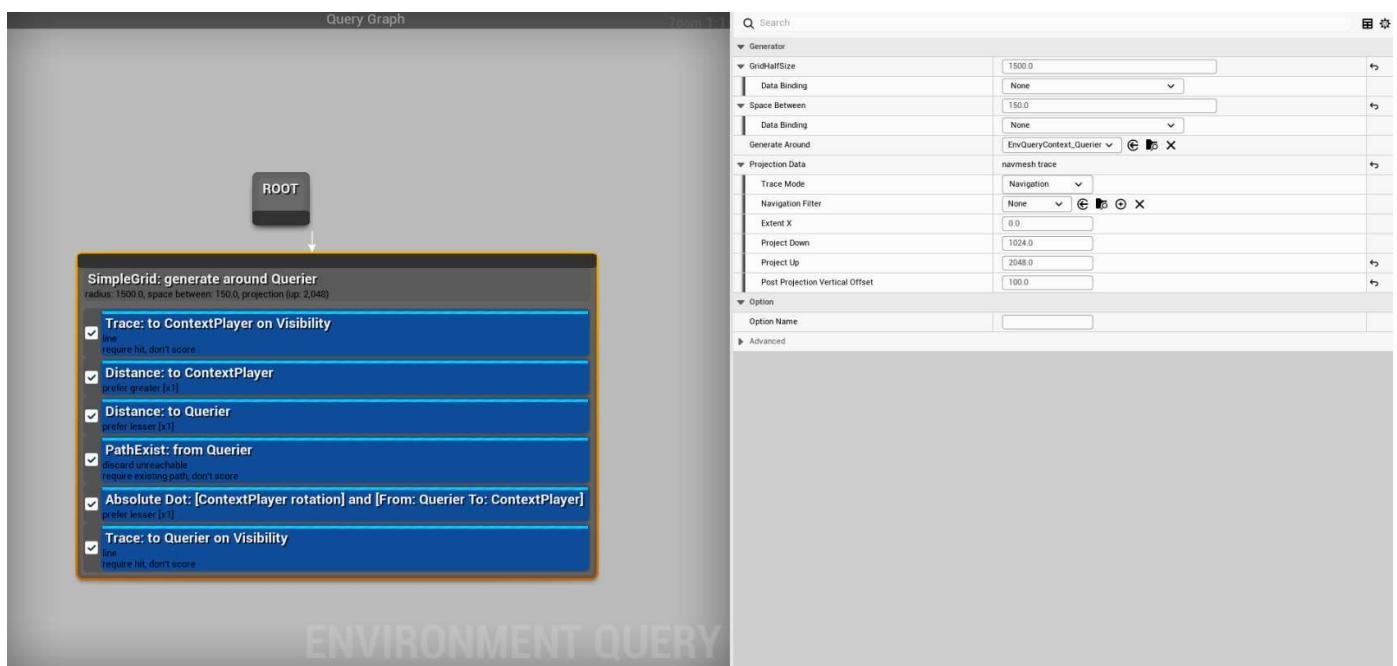


Fig 5.e: Hide AI Character Environmental Querry to search for Best Hiding Spot

5. Seeking AI_BOT:

The seeking AI bot is designed to find and chase the player. It uses similar Blueprint and Behavior Tree functions but focuses on seeking behavior.

- Chasing Logic: Developed behavior for the AI to chase the player when spotted, including pathfinding algorithms.
- Pathfinding: Implemented efficient pathfinding to ensure the AI can navigate the environment.
- Speed Variation: Adjusted AI speed dynamically based on distance to the player, adding challenge to the game.
- Random Patrol: Implemented random patrol patterns when the player is not in sight, enhancing realism.
- Detection Mechanisms: Integrated visual and auditory detection mechanisms.
- Alert States: Created different alert states to vary the AI's behavior based on its level of alertness.

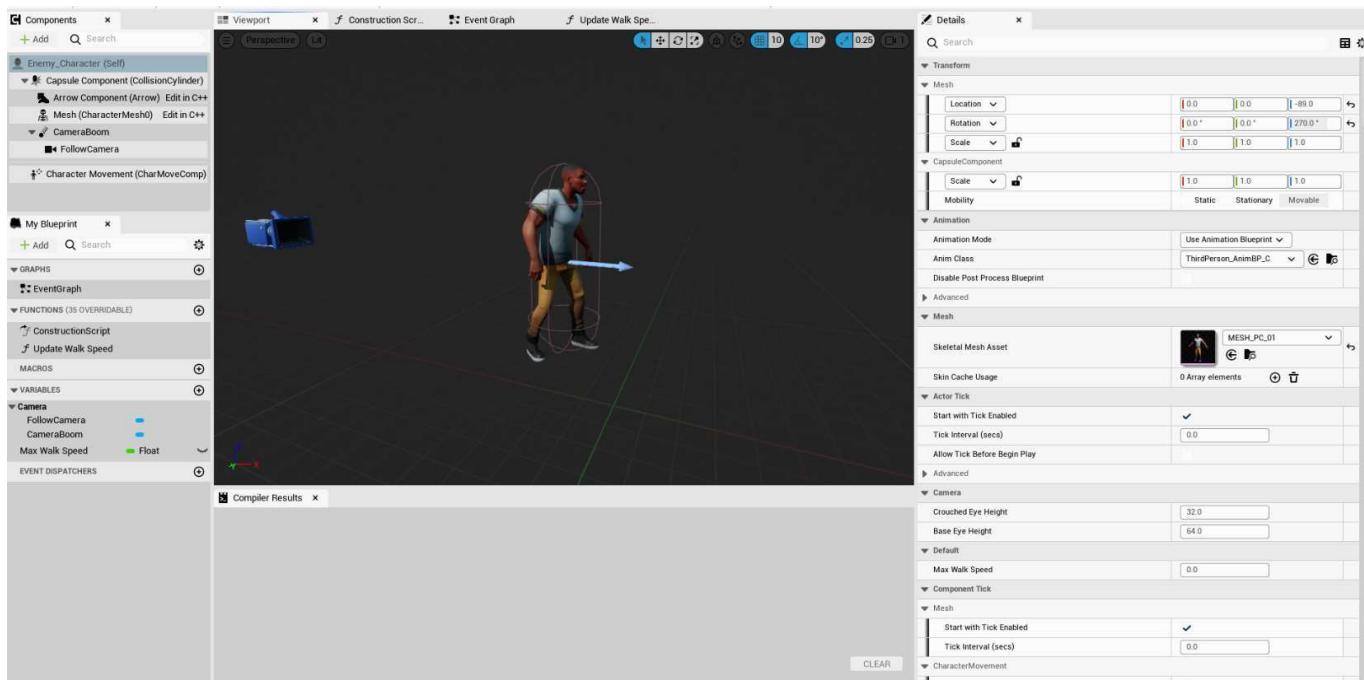


Fig 6.a: Chasing AI Character Preview

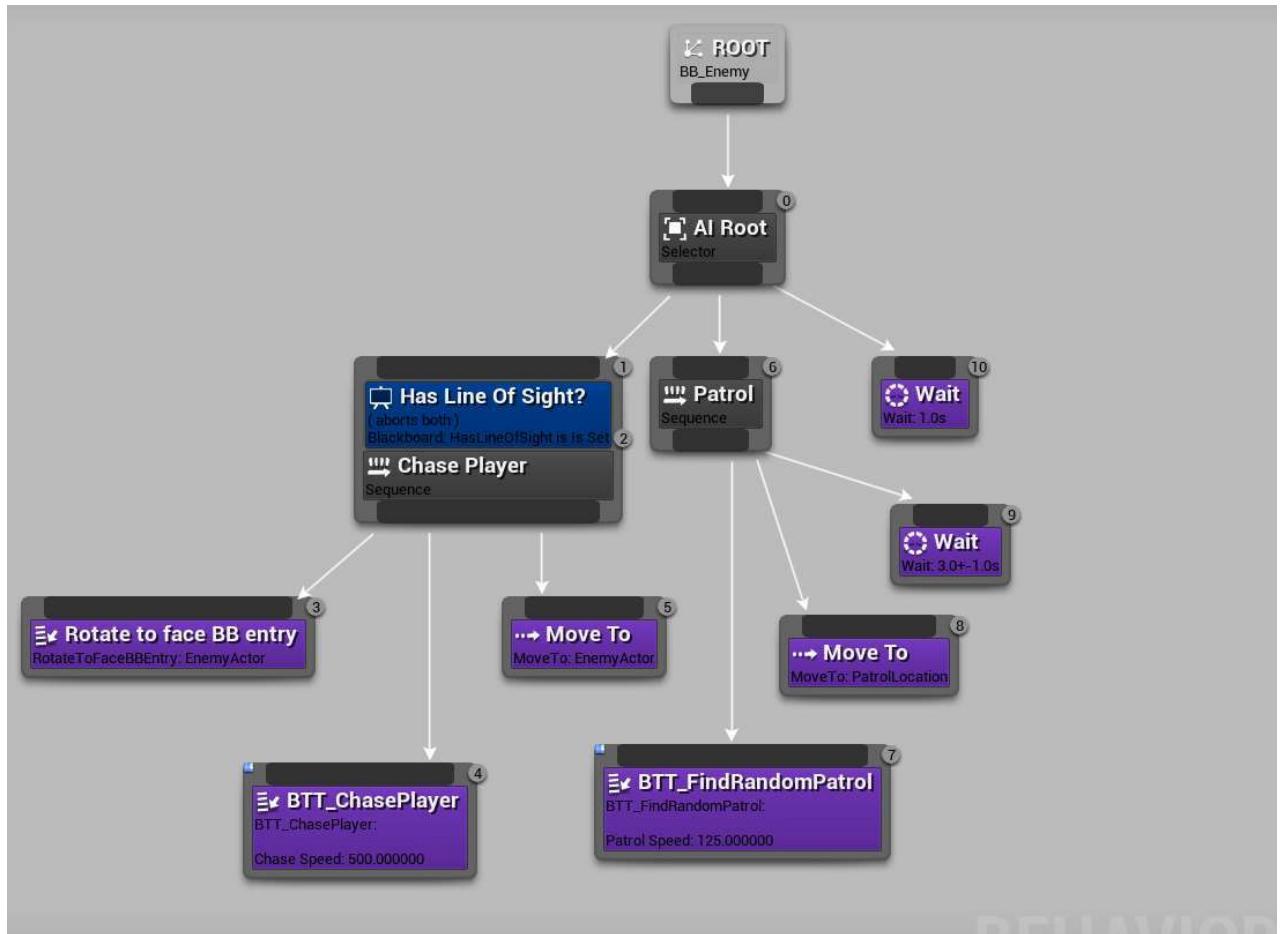


Fig 6.b: Hide AI Character Logic Behaviour Tree

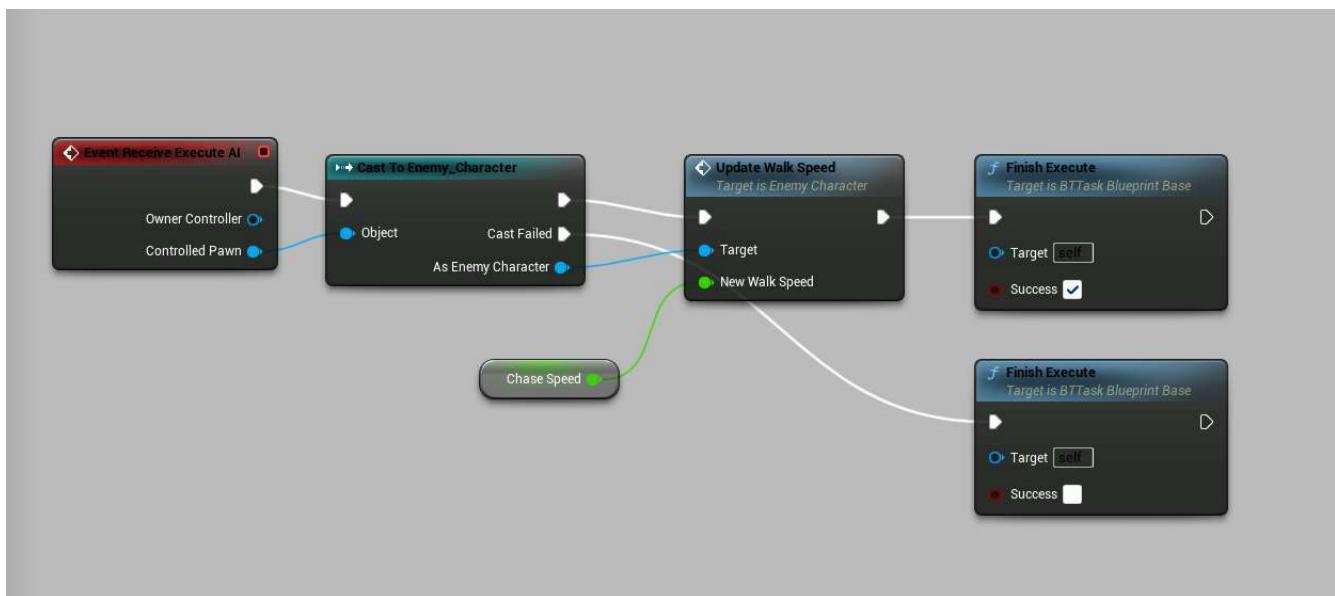


Fig 6.c: Chasing Character Speed Logic Blueprint

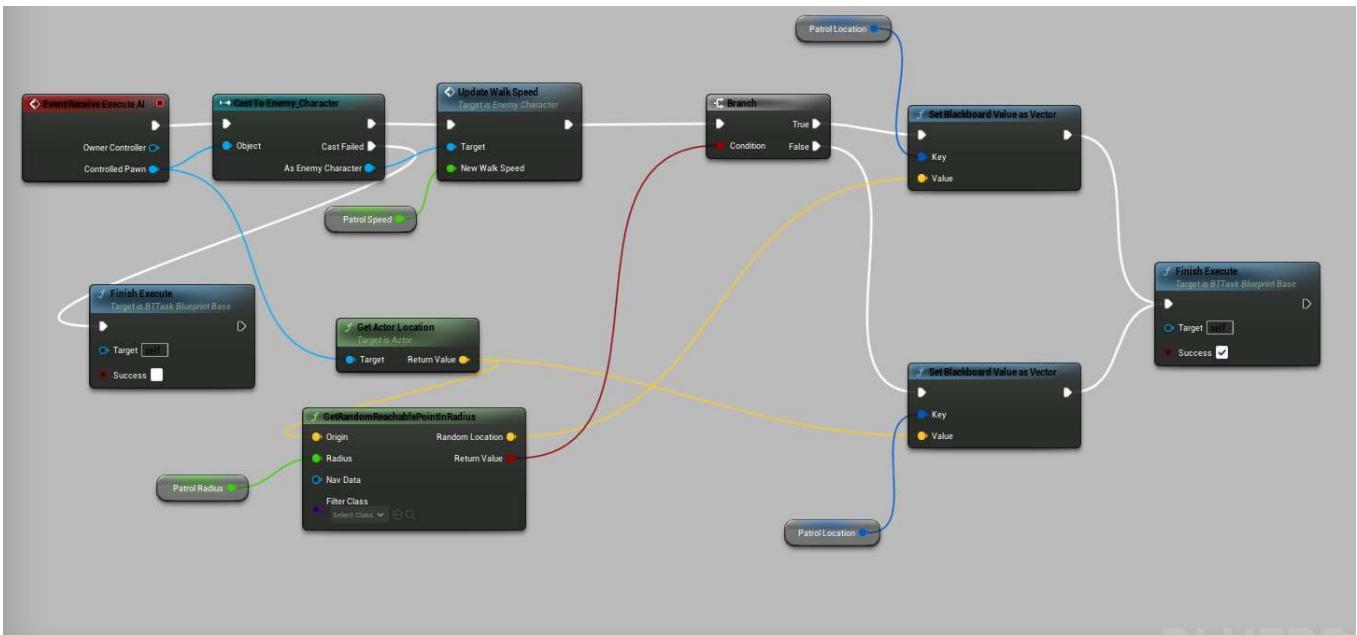


Fig 6.d: Chasing Character RandomPatrol and Chasing Logic Blueprint

6. Created Different Maps and Levels:

Different maps and levels provide varied environments and challenges, enriching the gameplay experience.

- **Hiding Maps:** Designed with numerous hiding spots and complex terrains to make the game interesting and challenging.
 - Directional Lights: Used to create realistic lighting effects that change dynamically.
 - Atmospheric Volume: Added to enhance the visual aesthetics of the maps.
 - Dynamic Weather: Integrated dynamic weather effects to add variety and challenge.
 - Interactive Environments: Created environments that players and AI can interact with, such as destructible objects.

- **Seeking Maps:** Created with open areas and obstacles to balance the difficulty of chasing and hiding dynamics.
 - Interactive Objects: Included objects that can be interacted with or used strategically by players and AI.
 - Varied Terrain: Designed varied terrains to challenge the player's and AI's navigation skills.
 - Obstacles and Hazards: Added obstacles and hazards to increase the challenge.

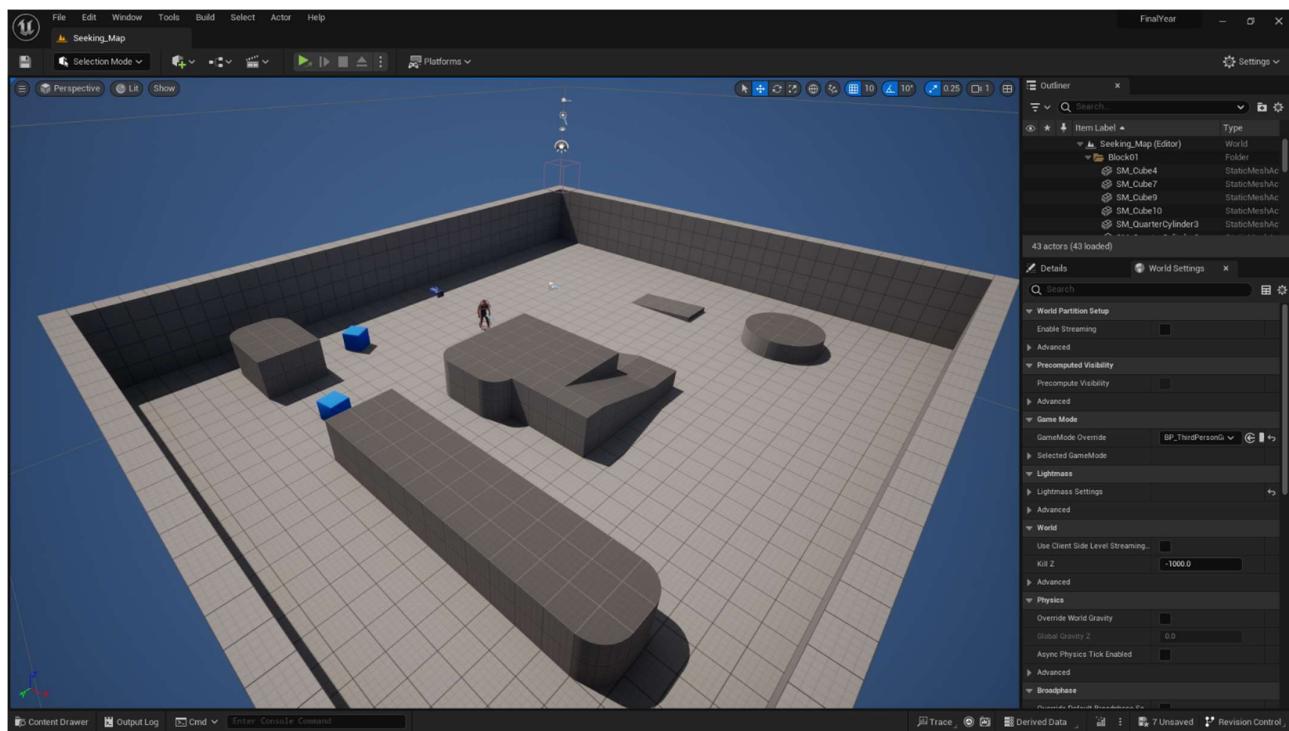


Fig 7.a: Hiding Level Map Angle 1

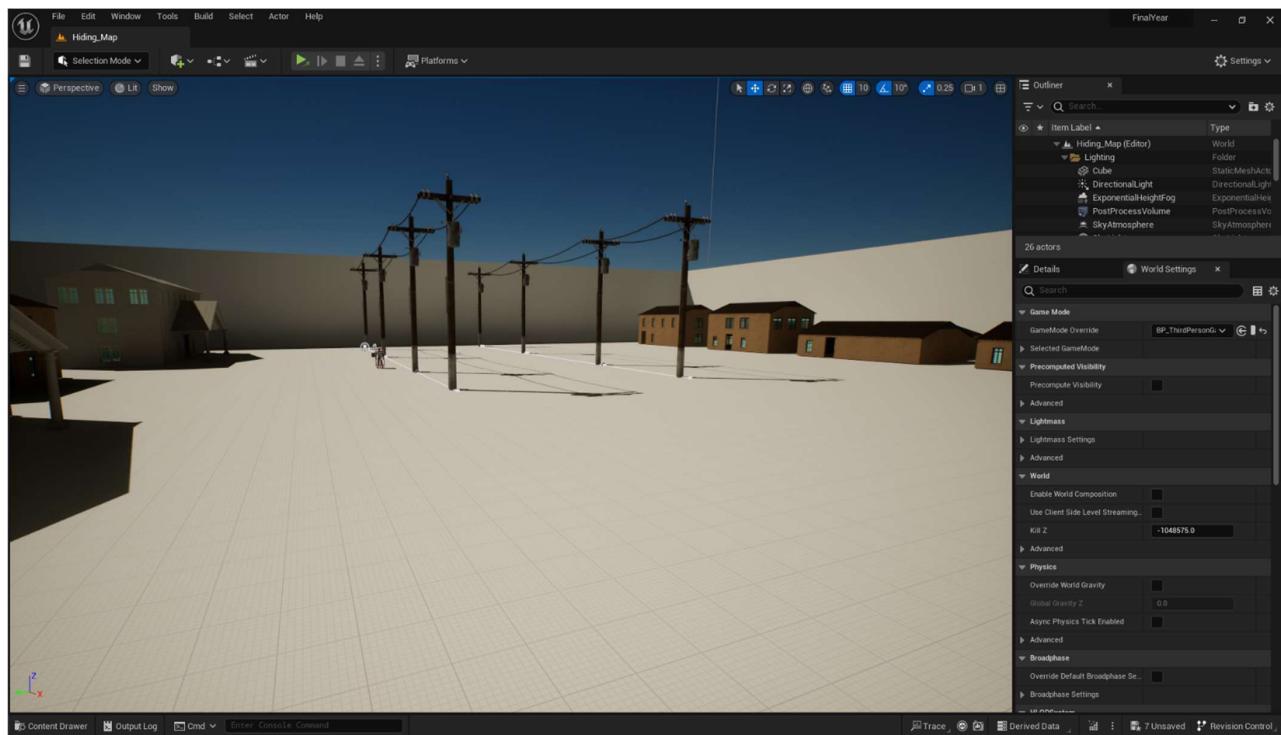


Fig 7.b: Hiding Level Map Angle 2:

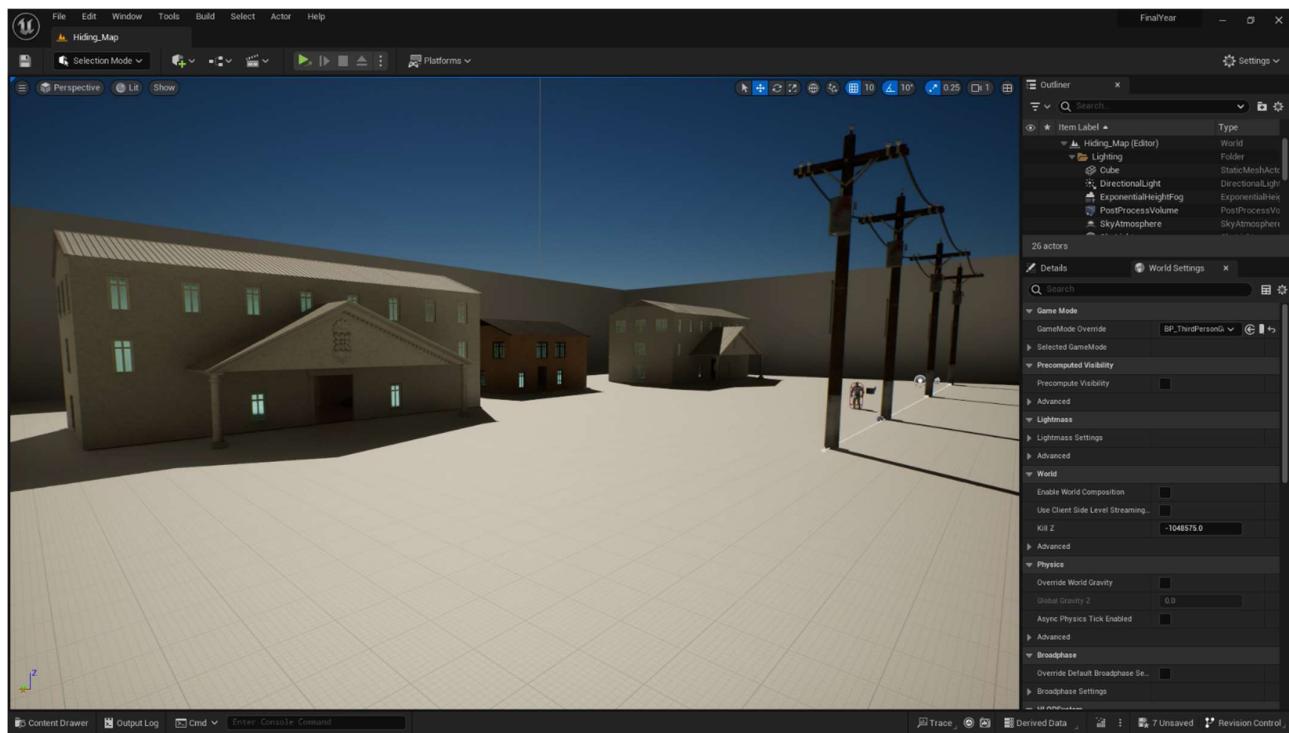


Fig 8.a: Chasing Level Map Angle 1

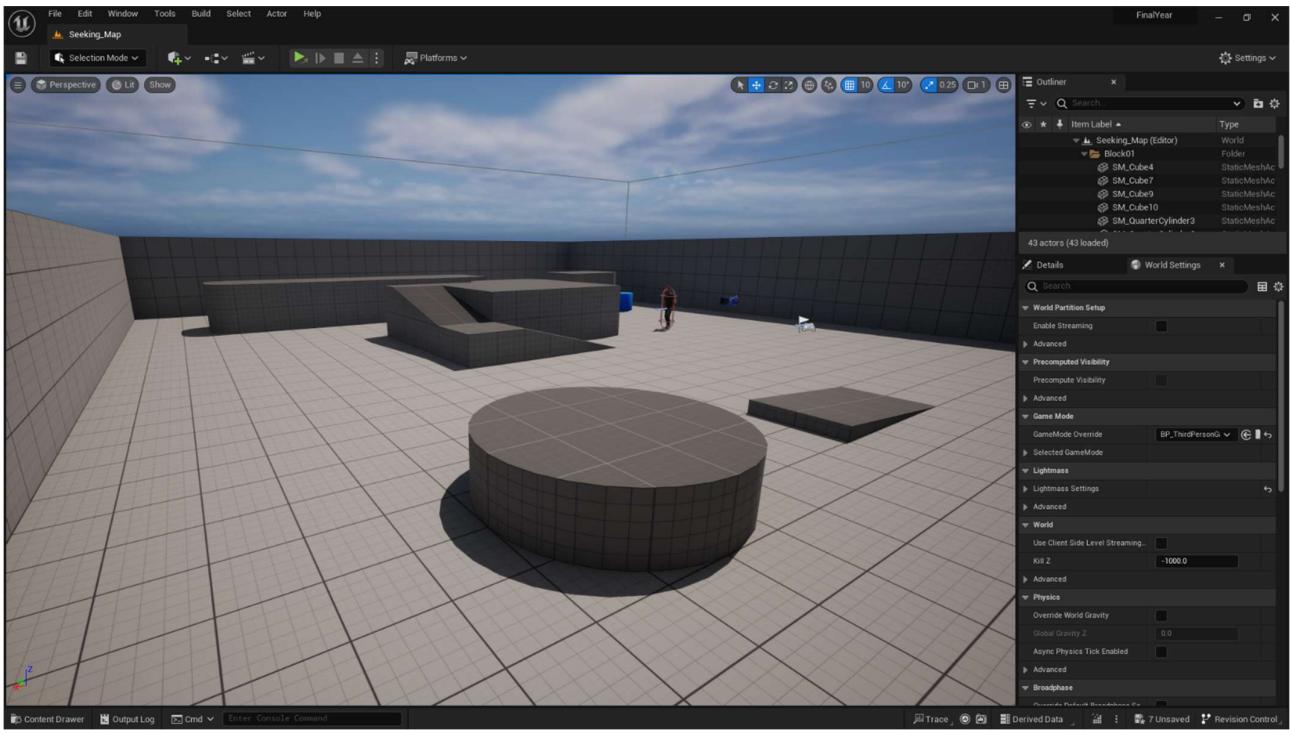


Fig 8.b: Chasing Level Map Angle 2

4. Deployment and Implementation:

Based on the above we developed a Game using Unreal Engine 5 and below are the few screenshots of deployment of the game.



Fig 9.a: Loading Screen



Fig 9.b: Main Menu



Fig: 10.a, 10.b: Running the Level on Hiding mode

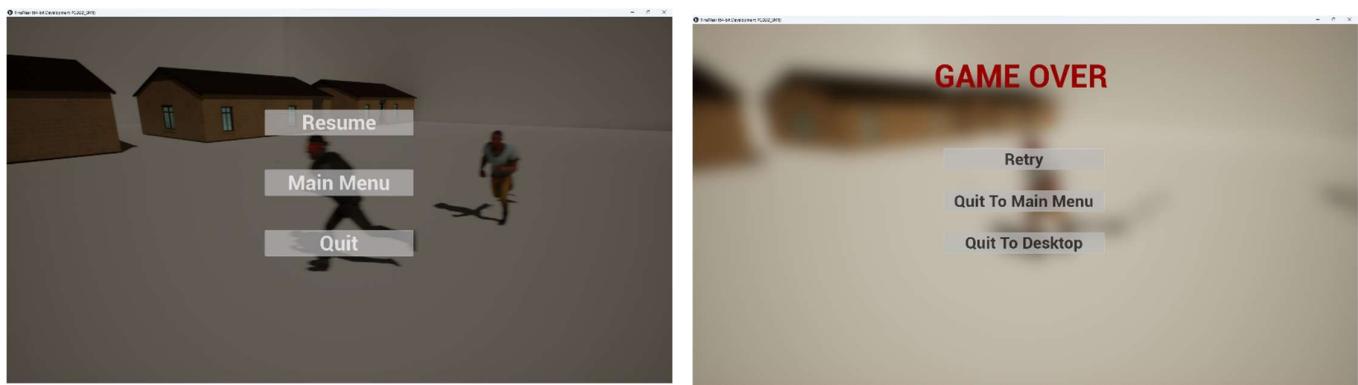


Fig: 10.c: Pause Menu

Fig: 10.d: Game Over Menu

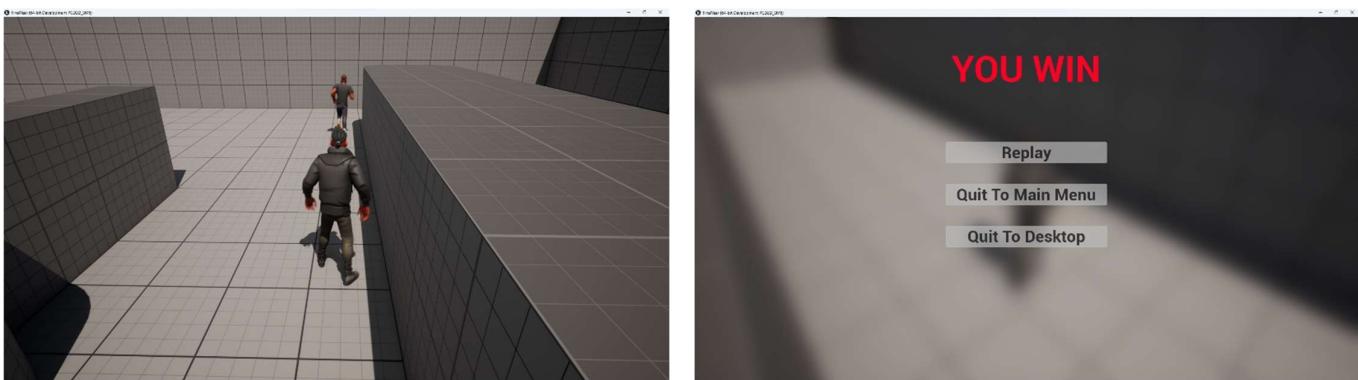


Fig: 10.c: Running the Level Seeking Mode

Fig: 10.d: Winner Menu

5. Results and Discussions:

5.1 The Obstacles:

1. For us, using the game engine was an entirely new experience. Typically, we work with several DBMSs, Object-Oriented languages, etc.
2. We learned about these aspects using the tool's instructional videos, written lessons, online resources, and learning guides. It takes quite a lot of time, patience, and hard work.
3. Because gaming engines strive to make connections between the virtual and physical worlds, it is a very sensible task that takes a lot of time.
4. Because you must work with every single point of the model, creating a 3D model is incredibly challenging.
5. Comprehending the attributes, parts, and sub-sections of the game engine requires extensive knowledge.

5.2 The Achievements:

1. We now have extensive knowledge of gaming engines. Its characteristics, objects, and other aspects.
2. We now understand how a model is built and animated.
3. It helped us in developing a higher capacity for imaginative and innovative thought.
4. It helped us in acquiring new knowledge in visual scripting language coding.
5. A successful deployment of the logics after a hard time of brainstorming.

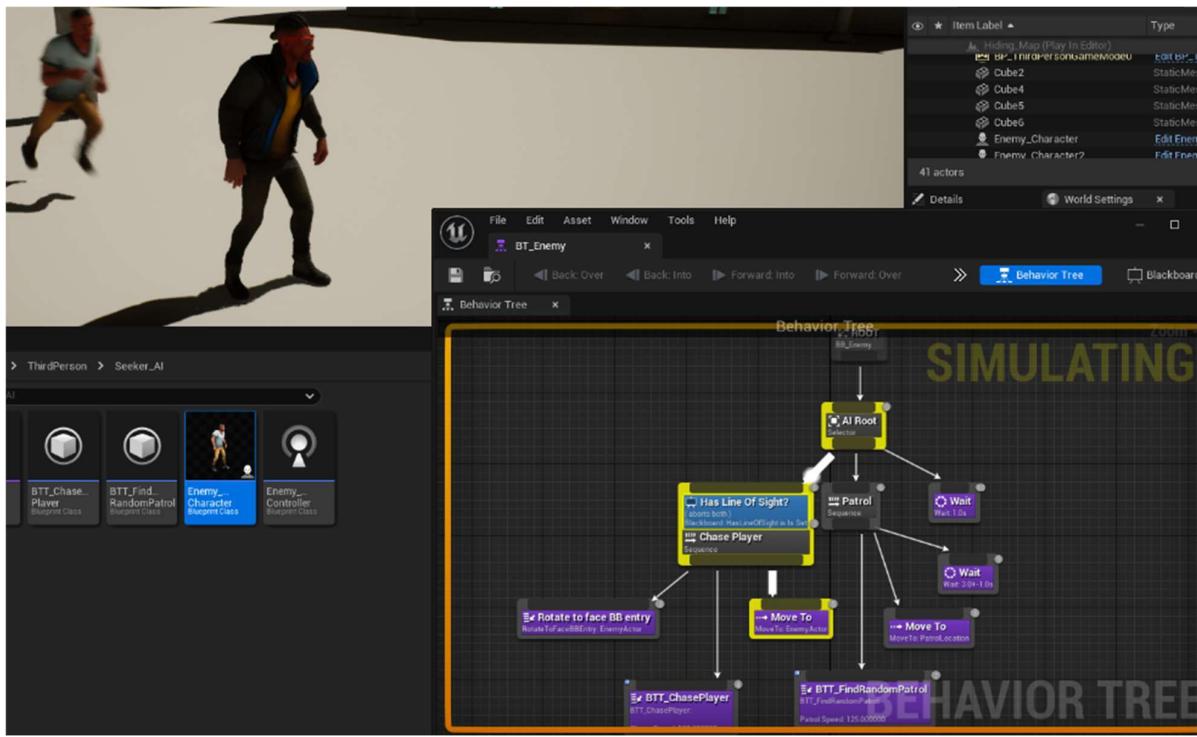
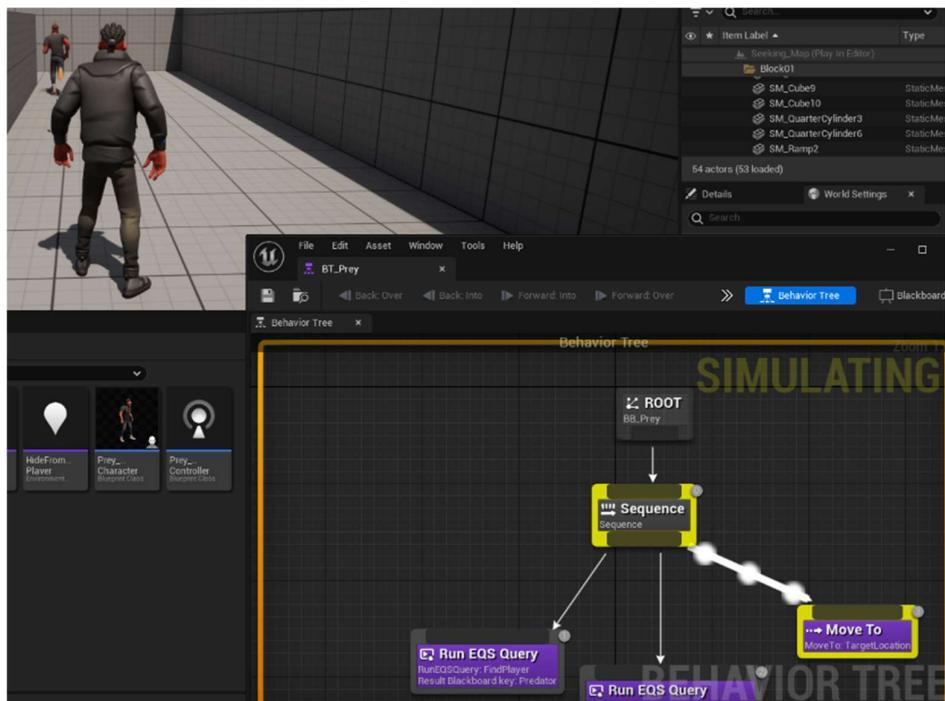


Fig: 11.a: Running Behavior Tree of Seeker_AI

Fig: 11.b: Behavior Tree of Hiding_AI



6. Conclusion and Future Works:

6.1 Conclusion:

"Khel-Dhemali" is a perfect example of how culture and technology can be successfully combined, thus next steps could include bringing the game to more platforms and working with academic institutions to do more cultural outreach. To ensure that "Khel-Dhemali" continues to be a dynamic and changing depiction of Assamese cultural history, ongoing upgrades and additions could further enhance the game experience.

In conclusion, the findings and analysis highlight how well the project's goals of fusing tradition with innovation were accomplished. In addition to being a fun computer game, "Khel-Dhemali" also acts as a cultural ambassador, touching players emotionally and personally and demonstrating the power of digital media to celebrate and preserve cultural heritage.

6.2 Future Works:

1. Multiplayer Functionality: will integrate a multiplayer option in "Khel-Dhemali" so that users can play the classic Assamese childhood games, "Luka Bhaku" and "Sua-Sui," in a competitive and social setting. To improve the multiplayer experience, include features like competitive leaderboards, cooperative play, and online matchmaking.

2. Platform Diversification: We'll look into ways to modify "Khel-Dhemali" for a range of gaming systems, such as consoles, mobile devices, and virtual reality setups. The game's accessibility and appeal to a larger audience may both be enhanced by this expansion.

3. Integration of Emerging Technologies: In order to improve gameplay dynamics and storytelling components, we will investigate the integration of cutting-edge technology like augmented reality (AR) and machine learning. This might make the player experience more dynamic and immersive.

4. Proximity Chat Function: We intend to improve the multiplayer feature of "Khel-Dhemali" by adding proximity chat functionality. Provide a means of communication for players to connect with one another in real time.