System Requirements

“Immersive Escape Room Video Game”

Sean Brandon, Matthew Wood, Robert Avery, David McVittie

CS 461-400 Fall 2023

Oregon State University

Revisions

ROW #	REVISION #	REVISION DATE	REVISION DESCRIPTION	REVISION TRACKING NOTES
1	v1.0	10/26/2023	Initial Specification	

Introduction

Escape room games have surged in popularity in recent years, captivating players with immersive, challenging, and teamwork-driven experiences. The transition from physical escape rooms to virtual environments through video games has opened up exciting possibilities. In this Technical Requirements document, we embark on a journey to create an enhanced version of the escape room video game that promises to be even more engaging, immersive, and thrilling for players.

The rapid growth of the escape room market highlights a global enthusiasm for these captivating adventures. According to a recent report [Yahoo, 2023], “the global escape room market generated $7.9 billion in 2022, and is anticipated to generate $31.00 billion by 2032.” It is evident that escape room experiences have become a significant part of the entertainment landscape. This burgeoning interest underscores the potential for innovative and immersive

escape room video games to cater to an ever-expanding audience.

The authentic excitement of real-life escape rooms lies in the immersive puzzles, intricate narratives, and the exhilaration of working as a team to unravel mysteries and unlock hidden secrets. These experiences leave a lasting impact on players, fostering a sense of accomplishment and teamwork. Our primary goal is to encapsulate these qualities in our escape room video game, offering players an opportunity to embark on thrilling adventures and enjoy the unique blend of problem-solving and immersive storytelling that escape rooms provide.

This Technical Requirements document outlines the specific parameters, standards, and objectives that will guide the development of our escape room video game. By adhering to these requirements, we will ensure that the game is not only technically sound but also capable of delivering a truly remarkable and unforgettable escape room experience.

Research

In order to properly research the requirements for this project multiple potential users were interviewed to determine the most important features and systems that we should consider (besides what is already pretty obvious to the escape room game genre such as timers, puzzles, different rooms, etc.) For example, some people thought that it would be fun to include a success animation everytime a puzzle was solved, some wanted there to be a build in note taking system where they could pull up a notebook and write in it, and others thought it was important to have a glowing outline for all objects that are able to be interacted with (given that not every object in a room can be interacted with).

We also interacted with a number of employees at a local escape room to establish what the pain points of running the games were. This helped us to better anticipate the things we should have hard coded into our game so it can run smoothly without someone actively watching over the players. The most important takeaway from this was the hints system. Normally employees watch the players move through the game and give hints based on how far through they get but since this game will not be able to do that we will instead create a checkpoint system that tracks what the players have completed, discovered, and are currently interacting with so that we can use logic to assess what pre-written hint will best help the player figure out how to get through a puzzle they are stuck on and are requesting help with.

Analysis

Our research informed the technical specifications we created for our escape room video game. Insights gathered from user interviews emphasized the importance of several features to improve the interactivity and immersivity of the game. For example, our research led us to specify a rewarding animation upon solving a puzzle, an integrated note-taking system, and glowing outlines for interactable objects to improve discoverability and accessibility. These features directly influenced design decisions for gameplay mechanics and the game's user interface.

As alluded to in the Research section, one roadblock to a successful escape room video game is the offering of hints. In a physical escape room, employees provide hints to players when they get stuck. Without human observation, our game must adapt and leverage a system designed ahead of time to dispense pre-written hints.

Furthermore, the specifications must provide a high-quality, immersive game environment. We learned from players that detailed and realistic environments would greatly enhance their experience. Due to this insight, we decided to base our game upon the industry-standard Unreal Engine 5, which will permit detailed, lively graphics with features such as Nanite and Lumen. Sound design is also paramount to an immersive experience; to that end, our specifications include features such as spatial audio.

In conclusion, our research led us to emphasize an engaging, accessible, and immersive gaming experience. Players expressed a desire for a storyline to motivate the escape room experience, which drives development of a dialogue & NPC system. Additionally, accessibility considerations received attention (in the form of adjustable text size, a colorblind mode, and subtitles) as we aim to provide a full and enjoyable experience to players of all capabilities. The following technical specification takes these research-based considerations into account.

Detailed Specification

1. Game Environment

1.1 Unreal Engine 5

The game must be developed exclusively using Unreal Engine 5. This choice of engine is motivated by Unreal Engine 5's state-of-the-art capabilities and features, including the Nanite virtualized geometry system and Lumen global illumination, which will allow for breathtakingly detailed and realistic environments. The engine should be kept up to date throughout development to leverage the latest advancements in the Unreal Engine 5 ecosystem.

1.2 3D Models and Textures

All in-game objects, rooms, and interactive elements should be meticulously crafted with high-quality 3D models and textures. The 3D assets should be optimized for efficient resource usage without compromising visual quality. To achieve this, proper LOD (Level of Detail) models should be implemented to ensure optimal performance based on the player's viewpoint.

1.3 Lighting and Shading

Leverage Unreal Engine 5's advanced lighting and shading features to create a visually stunning and immersive gaming environment. Utilize the Lumen global illumination system to dynamically render realistic lighting and shadows. Implement ray tracing to achieve highly accurate reflections and refractions. Pay special attention to fine-tuning materials and shaders to ensure that the game's visual aesthetics align with the intended atmosphere and style of the escape rooms.

.

1.4 Sound Design

The sound design should be a vital component of the game's immersive experience. Utilize Unreal Engine 5's built-in audio capabilities to create spatial audio, ensuring that sounds are accurately positioned within the game world based on the player's position and actions.

Moreover, consider the use of Unreal Engine's Chaos physics system to enhance audio interactions, such as the sound of objects falling or breaking, adding to the overall realism.

2. Gameplay Mechanics

2.1 Puzzles and Interactions

The gameplay mechanics should revolve around a diverse and intellectually stimulating set of puzzles and interactions. These challenges should demand a combination of problem-solving skills, logic, and creativity. Each puzzle should be logically connected to the game's overarching narrative, and solving them should yield a satisfying sense of progress.

2.2 Inventory System

The game should feature an intuitive and user-friendly inventory system, allowing players to collect, manage, and use items found within the escape rooms. Inventory items should have meaningful interactions and provide logical solutions to puzzles. Consider the possibility of item combinations, ensuring that players can use their inventiveness to uncover solutions.

2.3 User Interface (UI)

Design a minimalistic and intuitive user interface that seamlessly integrates with the game environment. The UI should include an on-screen inventory display, providing players with quick access to their collected items. Additionally, the UI should be unobtrusive and allow for

easy navigation, keeping players focused on the game's immersive experience. Inclusion of hints and clues should be discreet, promoting exploration and critical thinking.

2.4 Player Movement

The player character's movement controls should be designed for both responsiveness and smoothness. The first-person perspective should be finely tuned to maximize immersion. Implement a control scheme that allows players to interact with objects in a natural and intuitive manner, such as opening doors, manipulating objects, or solving puzzles.

3. Story and Narrative

3.1 Narrative Elements

The game's narrative should be an integral part of the player's experience. Craft an engaging storyline with a clear beginning, middle, and end, providing a satisfying sense of progression and resolution, create rich backstories for characters and rooms, to enhance the overall depth of the game world.

3.2 Dialogue System

Incorporate a dialogue system that enables players to interact with non-playable characters within the escape rooms. These interactions should not only provide hints and information but also contribute to the game's narrative and character development. The dialogue system should be intuitive and context-sensitive, ensuring that conversations feel natural and

engaging.

3.3 Endings and Outcomes

The game should offer multiple possible endings based on the player's decisions and actions. These endings should be intricately woven into the narrative and reflect the choices made by the player throughout their escape room experience. Each ending should provide a unique and satisfying conclusion, encouraging replayability to explore different narrative paths.

4. Performance and Optimization

4.1 Frame Rate

Maintaining a stable frame rate is paramount for a seamless and enjoyable gaming experience. The game should target a frame rate of at least 30 FPS on recommended hardware configurations. Continual performance testing and optimization should be conducted to ensure the game's frame rate remains consistent, even during more demanding scenes.

4.2 Loading Times

Optimize level loading times to be as short as possible. Utilize Unreal Engine 5's streaming and asset management systems to minimize loading screens, ensuring that players experience a fluid and uninterrupted transition between different game areas.

5. Compatibility and Platforms

5.1 Platforms

The primary platform for the game's release should be Windows PC, leveraging Unreal Engine 5's capabilities to provide a visually stunning and responsive gaming experience. Additionally, consider the possibility of releasing the game on other platforms, such as popular gaming consoles, after the initial PC release to expand the player base.

5.2 Input Devices

Support a variety of input devices to enhance accessibility. The game should seamlessly integrate with both keyboard and mouse input as well as game controllers. Ensure that control schemes are intuitive and customizable, allowing players to choose the input method that best suits their preferences.

6. Accessibility

6.1 Accessibility Features

Incorporate accessibility features to make the game is as inclusive as possible. These features should encompass options like adjustable text size, colorblind modes, and subtitle support. Playtesting should involve individuals with disabilities to identify any barriers or issues and rectify them during development.

6.2 Playtesting

Conduct extensive playtesting with diverse groups of players, including those with varying degrees of gaming experience and accessibility needs. The feedback gathered from these playtesting sessions should be carefully considered and integrated into the game's design to ensure that it is both engaging and accessible to a broad audience.

7. Testing and Quality Assurance

7.1 Bug Testing

Thoroughly test the game to identify and resolve any bugs, glitches, or game-breaking issues. Maintain a comprehensive bug tracking system to ensure all reported issues are addressed in a timely manner. Engage in regression testing after each update to prevent the reoccurrence of resolved issues.

7.2 Playtesting

Playtesting should be an ongoing process throughout development. This involves gathering feedback from a range of testers, from internal team members to external playtesters. Then carefully analyze this feedback to refine gameplay elements, improve puzzle design, and enhance the overall player experience.

8. Documentation

8.1 Technical Documentation

Create detailed technical documentation that encompasses asset lists, scripts, and guidelines for future updates or maintenance. This documentation should be organized, well-structured, and easily accessible to team members and potential collaborators to facilitate efficient development and future

Conclusion

These requirements outline our initial ambitions for this software's first version. By utilizing an agile development methodology we can ensure customer satisfaction by offering frequent communication with the customer and developer team members to adapt with the ever changing requirements for this software, as well as maintain a momentum of quality working software that can be delivered to the customer on a regular basis by focusing on our strengths and collaborating on the areas that lack the quality illustrated in this document.

This document provides us with a great reference to return to in development to ensure the quality of the software delivered and to weigh our priorities, and to further define the software's requirements. So far it hasn't even been discussed what minimum hardware requirements this software will require, which will greatly influence how we will maintain our goal of keeping the game operating at a minimum of 30 frames per second. This brings to question details such as what level of quality our environments and textures will appear in game, and what the tolerance is for our load times.

Question / Answer

1. Do the Game Environment details represent what can be expected from the minimum hardware requirements?

   1.1 Likely not, as many of these details are quite demanding on many graphics cards in use today.

      1.1.1 Details such as these will be addressed as we continue to communicate with the customer and undergo the development process.

2. How many environments will be offered?

   2.1 So far, one environment is proposed, with at least 10 different puzzles.

3. Will multiple players be able to play in a single game?

   3.1 Multiplayer has been identified as a stretch goal.

   3.2 It is currently unclear how multiplayer may affect other requirements proposed in this document for example, what type of network will be used to support this feature such as P2P, or local multiplayer.

      3.2.1 How network latency is handled may affect the decision if it is tolerated in comparison to our performance requirements.

Works Cited

Yahoo, Global escape room market to reach $31.00 billion, by 2032 at 14.8% CAGR: Allied market research (no date) Yahoo! Finance. Available at:

https://finance.yahoo.com/news/global-escape-room-market-reach-085200922.html

(Accessed: 20 October 2023).