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TITLE:

Design with skeuomorphism or not: An Investigation of
Immersive Experience Based on the Escape Room Game within the VR Framework

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Abstrast

Since the outbreak of the COVID-19 pandemic, there has been a noticeable shift towards telecommuting and online entertainment, which has created novel prospects for future employment and recreation. Furthermore, with the continual advancement of artificial intelligence (AI), it is expected that a significant number of models can be easily generated in the near future. In this context, the realization of a meta-universe that offers extraordinary immersive experiences may become a tangible possibility. This paper aims to investigate whether virtual reality (VR) games are more suitable for “simulating reality” or “deviating from reality” by focusing on VR Escape Room, a typical example of an immersive experience. Through multiple rounds of experiments and analysis, this study will compare the effects of “skeuomorphism” and “beyond skeuomorphism” in the game.

Keywords:

Escape Room, Immersive Experience, VR Environment, Game Development, Skeuomorphism

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1. 1 Skeuomorphism

Skeuomorphism and immersive experience are the two foundational ideas upon which this thesis is constructed. Skeuomorphism existed prior to this concept's introduction. As mention in "Artful Crafts: Ancient Greek Silverware and Pottery", When the ancient Greeks shifted from wooden to stone architecture, they retained many of the characteristics of wooden structures.[1] In addition, Manby, T.G. also stated in his "Unbaked Urns of Rudely Shape: essays on British and Irish pottery for Ian Longworth", Stone components used as decorations in Greek temples are considered to have been taken from actual structural and functional aspects of the oldest wooden temples. This argument is reinforced by the fact that all of these characteristics are present in ancient Greek temples. [2] This highlights the skeuomorphic propensity that designers and manufacturers have to appeal to the intuitive understanding that individuals have of the products that they produce. You can create a sense of comfort and familiarity in your audience by using terminology and design components that are linked to those that you have used in the past.

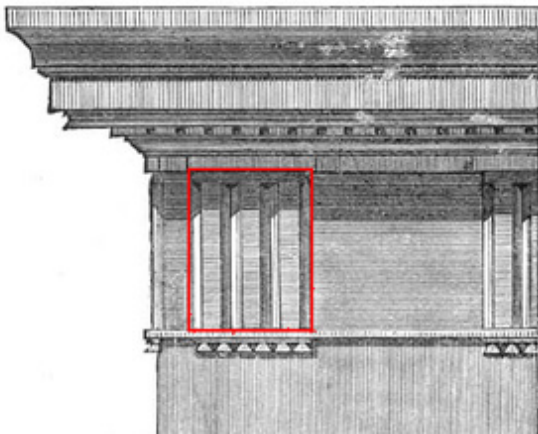


Figure 1. Triglyph centered over the last column in the Roman Doric order of the Theater of Marcellus.



Figure 2. Archaic Doric order Greek temples at Paestum.

In 1982, engineers in the field of digitization produced a study titled “Designing the Star User Interface.”[3] When they were working on the very first user-centered design, it is clear that they committed to the idea that the user interface should be made up of easily recognizable features that were derived from the environment around it. This is evidenced by the fact that this concept is evident. These designers have demonstrated a strong commitment to adhering to this guideline. It is much simpler for users to comprehend how to operate the system as a whole when they are able to rapidly understand what the various icons are attempting to convey. Skeuomorphism has a number of benefits, one of which is that it can reduce the amount of complexity that a product presents to a customer. This is particularly beneficial in this instance.

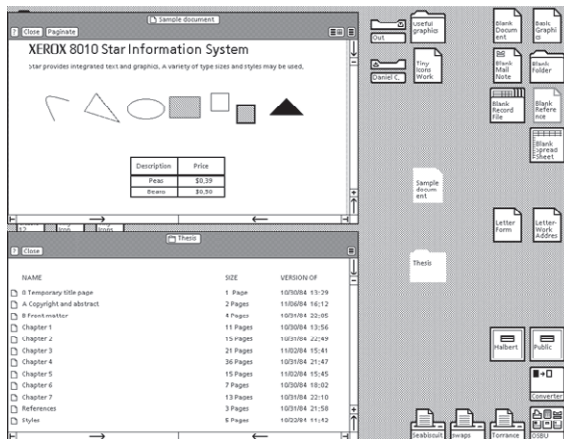


Figure 3. Xerox Star's interface.

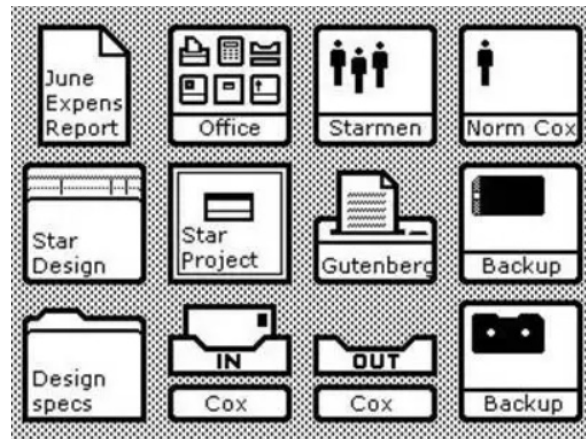


Figure 4. Xerox Star's system icons.

The departure of Apple from skeuomorphic design began in earnest with the release of iOS 7 in 2013, which served as a watershed moment for the firm. During that time period, skeuomorphic design was phased out in favor of visual designs that focused on primary colors and shadows. The skeuomorphic design process reached its climactic phase as a direct result of this crucial turning point in history.



Skeuomorphism

VS.



Flat design

Figure 5. Skeuomorphism and Flat design.

On the other hand, skeuomorphic design is not even remotely devoid of any possible advantages or advantages in any way. The skeuomorphic design technique that was applied works very well with the virtual reality scenario that was chosen to serve as the target environment. Skeuomorphism is able to help users become more familiar with settings or interfaces that are foreign to them, which is helpful given that the purpose of a virtual reality (VR) environment is to immerse the user in an environment or interface that is foreign to them. Skeuomorphism is able to assist users in becoming more familiar with settings or interfaces that are foreign to them. Skeuomorphism is able to help people become more familiar with settings or interfaces that are new to them. It does this by mimicking the appearance of familiar elements. Users can reap the benefits of the utilization of skeuomorphism by becoming accustomed to unfamiliar circumstances or interfaces due to the application of this design principle. Applications such as employment training, an educational virtual reality project, a virtual reality game, and fitting software are some examples of the kinds of things that are already being utilized in many different kinds of organizations. Other examples of these kinds of things include: Additional examples of this type of thing include the following: When it comes to this particular setting, skeuomorphism is a strategy that corresponds precisely to the goal of providing clients with an immersive experience. This is because skeuomorphism mimics the appearance of real-world objects. This is because the primary focus of skeuomorphism is on resembling real-world objects, which explains why this result occurred.

1. 2 Why Immersive Experience

“An immersive experience describes the perception of being surrounded by and being a part of a different environment than our normal day-to-day. This could be facilitated with technology like virtual reality goggles or a physical environment like a theme park attraction with multi-media components.”[4] Typically, immersive experiences provide viewers with a one-of-a-kind opportunity for interaction across a variety of different channels. The channels include integrating screen-based media, physical space mixed with sound, light impact, customized narrative contexts, and extended reality (including VR, AR, or MR).

For instance, the exhibition at the Dal Museum demonstrates how various channels can be employed to offer visitors an engaging and informative experience. The decorating of one of the rooms was motivated in part by the idea of cloud formations. That room’s ceiling is covered with a vast array of cloud models that are suspended from it in a variety of configurations. In the meantime, in order to give the impression to the guests that they are surrounded by clouds that are present in multiple dimensions, a blue sky and white clouds have been painted on the wall and projected onto the floor. This is being done in order to give the guests the impression that they are surrounded by clouds that are present everywhere. This setup immerses visitors in an environment that feels like they are genuinely surrounded by clouds, thereby providing a spatially immersive experience.

Skeuomorphism is manifest in the interior design of the room. The cloud-shaped embellishments on the ceiling, the figurative depictions on the walls, and the projections of blue sky and white clouds on the floor. The designers attempted to transmit the sensation of being surrounded by clouds by means of these concrete elements.



Figure 6. The Cloud Room.

Another section of the museum uses augmented reality technology to allow guests to preview how their likeness will be portrayed on canvas and how the artist will capture their image. As Rene Magritte said, “Everything we see hides another thing, we always want to see what is hidden by what we see.” The audience is provided with the opportunity to perceive the world from the perspective of the artist, which is something that they would not have been able to achieve in any other context. This opportunity is made possible by the immersive experience.



Figure 7. Surreal Selfies.

A simple and unremarkable exhibition or performance that lacks originality and creativity is unlikely to satisfy today's ever-expanding and discerning audience. Immersing the audience in the performance's traditional setting, location, and environs is one way to enhance their sensory experience. Immersive experiences frequently elicit in spectators unanticipated and novel emotions that were not anticipated before the occurrence of the immersive experience. It functions as a means of illustrating how people react when placed in an environment that is drastically different from their usual surroundings. Individuals will experience a sense of being engulfed and assimilated by the environment's atmosphere, and they may begin to feel as though they are a part of nature. This experience imparts the impression of becoming an integral part of one's surroundings.

You can experience immersive design in many different places, such as theme parks, restaurants, hotels, pubs, technical museums, events, shows, exhibitions, virtual reality games, and mobile applications, to name just a few of the available options. The expression of thoughts via an assortment of different sorts of media is accorded a great deal of significance in the realm of immersive design, which places a significant emphasis on the subject. As indicated by Tzvetan Todorov in *Grammaire du “Decameron”* [5], the relationship between time and location is established to construct not only a narrative but also an immersive and evocative spatial experience.

1.3 The Future Possibility of Immersive Experience with VR

Since the outbreak of COVID-19, the prevalence of telecommuting and online entertainment has increased. Telecommuting has been shown to increase productivity and flexibility. On the other hand, online entertainment, particularly virtual reality entertainment, enables individuals to socialize with friends in the virtual world and provides a more immersive, authentic, and engaging social experience. This trend will create new employment and leisure opportunities in the future. In addition, advancements in artificial intelligence (AI), such as GPT-4 and midjourney, have enabled the generation of images based on user descriptions. In the next iteration or two, AI may also be able to aid in the production of a large number of models. Designers and 3D artists can create and refine new environments and models swiftly and efficiently. In such circumstances, a meta-universe that offers extraordinary immersive experiences may become a reality in the future.

VR will likely continue to increase in prominence and potential applications in the future. Therefore, I desired to investigate particular aspects of VR gaming. This paper uses VR escape room games as an example to investigate whether virtual reality games are more suited to “simulate reality” or “deviate from reality.”

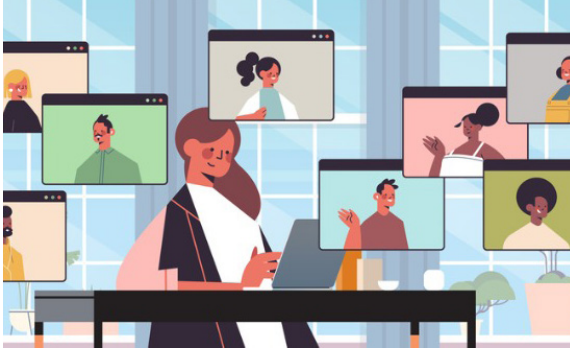


Figure 8. Online Discussions.



Figure 9. Online Party Game.



Figure 10. GPT-4.



Figure 11. Image Generated by Midjourney.

1. 4 Research Question

What are the benefits of utilizing virtual worlds when it comes to the development of experiences that are meant to fully immerse the user? What are some of the potential new avenues that the environment of virtual reality could open up for the immersive experience? What kind of cutting-edge immersive experience might be made available by the virtual environment, considering that the immersive environment is similar to the real world in terms of mechanics, noises, shadows, and textures, among other things? Which strategy will give users a more pleasant experience while using a virtual reality setting: one that attempts to duplicate reality as precisely as possible, or one that purposefully deviates from it in terms of the aspects and features that it contains? The aim of this thesis is to investigate which approach functions better in the context of making the most of the advantages offered by the VR environment in order to provide consumers with a satisfyingly immersive experience.

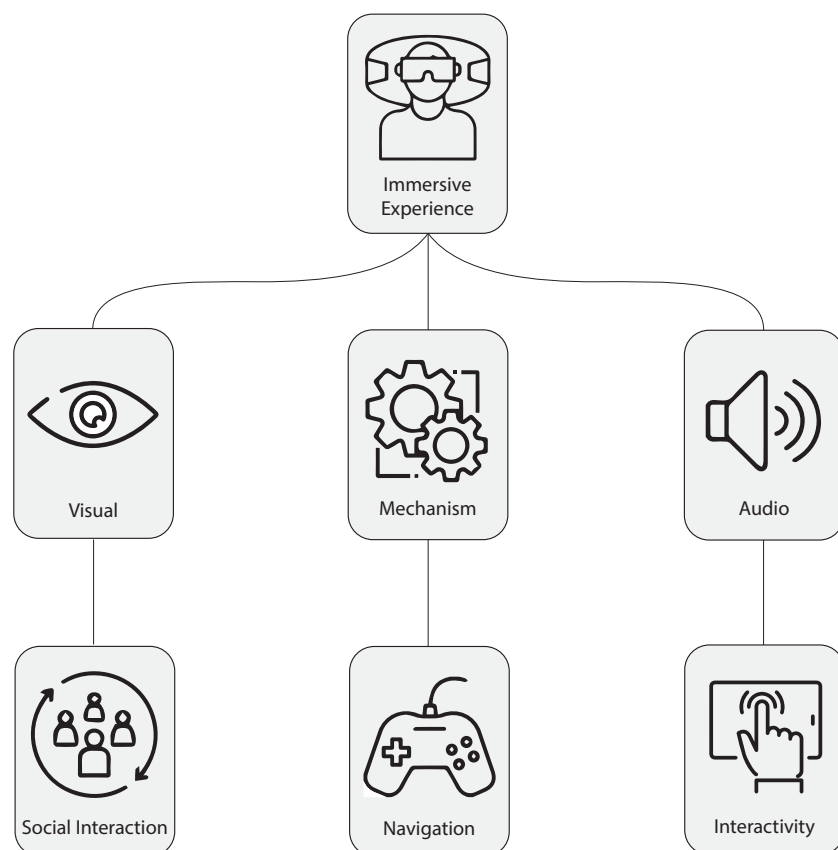


Figure 12. Features of Virtual Environments Mimic Real World.

1.5 Escape Room and VR Framework

As the subject of investigation and experimental platform for the accompanying research, the “VR Escape Room Game” was chosen due to its highly representative and typical characteristics of immersive experiences. The intricate design of environments and rooms, cooperative mechanics between players, and the pressing time constraints all contribute to a heightened sense of immersion. Building upon a Virtual Reality (VR) Escape Room Game, which served as the foundation for this research methodology, a series of experiments were conducted to compare and analyze the implementation details of the game, ultimately leading to conclusive findings.

In point of fact, the Escape Room Game in reality originated in Japan in the year 2007, with several years development, it gained popularity across Europe, Asia, North America, and Australia.[6] For example, the number of escape room facilities has increased dramatically in the United States in recent years.[7]

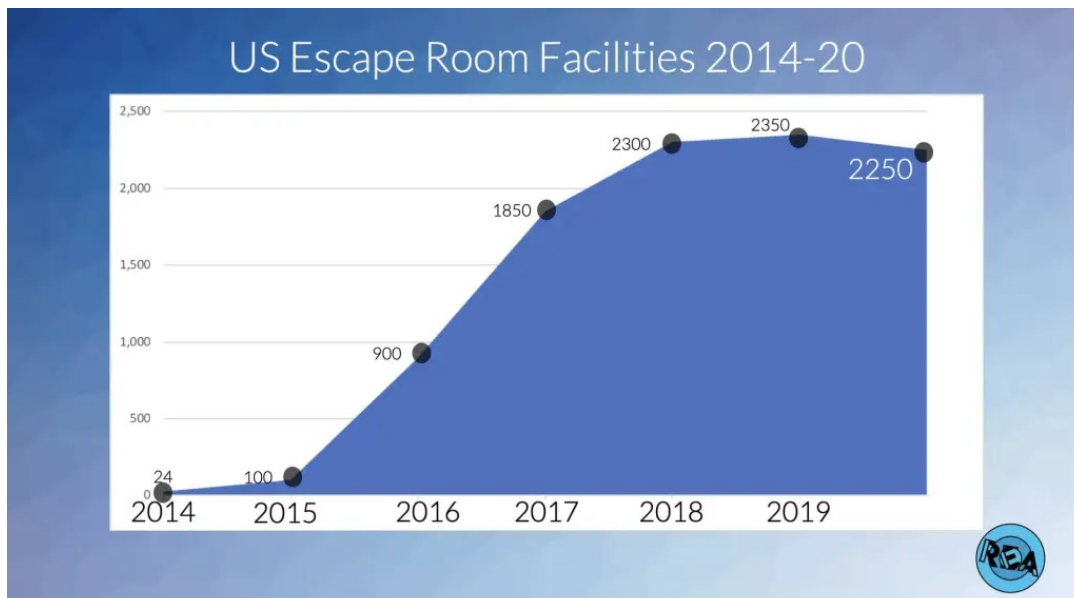


Figure 13. The Growth Trend of US Escape Room Facilities. [7]

The players are often locked in the facility for the duration of the game, and their objective is to work together to find a way out of the room by searching for clues and solving riddles. Frequently, the game would consist of more than one room, and in order to make the game more attractive to the players, the game would often take place within a certain story setting.[6] Participation in escape rooms is often done in groups, whether those groups consist of family members, friends, or colleagues. Because they are already familiar with one another, they are able to build a team that is incredibly efficient.[6] According to the findings of a study, escape rooms offer participants an additional opportunity to develop their communication skills by locating and resolving challenges in a manner that is both enjoyable and challenging.[8]



Figure 14. Escape The Room.

In addition to the escape room facility, which operates in the real world, there are many escape room games, including PC games and multi-user VR games.[9] It should come as no surprise that the player has more leeway in the online edition of the escape room game. Online games are more convenient for situations in which the

participants live in different locations, such as when they are playing with family or friends, or when it is impossible to schedule a proper time to meet up in person that works for everyone.[10]

The entire game will be developed with Unity, and it will run on Meta Quest 2. The existing library and toolkit for the game's essential components will be utilized in order to perform data transfer and synchronization amongst users as this is a multiplayer game.[11] On the other hand, multi-user functionality is not the primary focus of this thesis. In the future, research will focus mostly on the perspective of individual users. Some of the model and audio parts of the game will come from the existing Unity assets library.



Figure 15. Meta Quest 2.

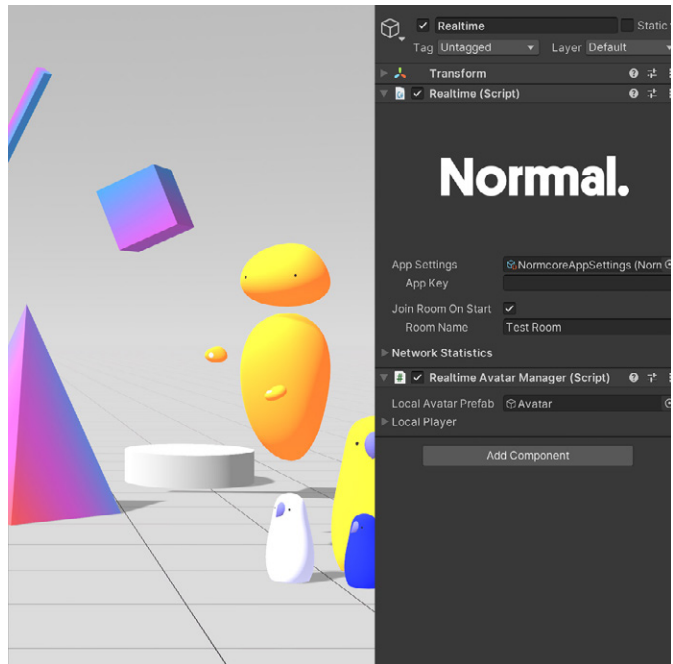


Figure 16. Normcore Seamless multiplayer for Unity.[11]

1.6 Intended Contributions

Using the virtual world as a platform and escape room games as the subject of this study, we will analyze the potential of the VR platform in the field of immersive design, drawing a conclusion by contrasting “skeuomorphic” and “beyond skeuomorphic” in detail. The practice of simulating physical objects and materials in virtual environments is referred to as skeuomorphic design. While this design approach can provide participants with a sense of familiarity, it can also limit the immersive design potential of virtual reality as a platform. Beyond skeuomorphic design, on the other hand, entails the creation of virtual environments that are not constrained by real-world physical constraints. This strategy allows for more imaginative and immersive experiences, as designers are free to construct environments and interactions that are impossible in the real world. Ultimately, I hope this study will provide new possibilities and opportunities for players to engage with immersive gaming experiences on VR platforms.



Figure 17. Top View of the Escape Room Game.

Related Works

2.1 Sleep No More

The play “Sleep No More” is based on “Macbeth” and is played within a dimly illuminated old structure which is filled with elaborate scenes. The audience will not get any instructions from the management once they have entered the building, with the exception of the rules that they are not permitted to speak and are encouraged to engage in individual acts while they are watching. They are free to choose the path they want to take through the program based on their individual preferences, as there is no predetermined order in which to view the content. [12] When actors perform, they do it without interacting with the audience and without uttering a single word.

Contrary to conventional drama, the audience independently navigates the many rooms of diverse drama performances. They can move freely, engage with props, and witness the performers’ performance. The audience comprehends the drama from a first-person perspective, as if they were “ghosts” inhabiting the story they are watching. Observing a performance like this is similar to amassing a collection of hints in order to piece together a story that the audience can comprehend based on what they hear and see throughout the performance.



Figure 18. Audiences of Sleep No More. [12]

When attending a performance at a traditional theater, the audience members do not have the choice to make their own decisions. They have the option of doing nothing more than sitting in the chair and attentively taking in all of the information that is being presented by the performers. The audience's level of self-awareness is increased to the maximum possible amount in the performance "Sleep No More", and the knowledge that they receive is entirely dependent on which room they choose to enter.

Positives:

- Non-linear storytelling
- Unique interaction
- Unique interpretation

Negatives:

- Accessibility
- Clarity of narration



Figure 19. Watch the actors perform at close quarters. [12]

2.2 Project AMELIA

Project AMELIA is an immersive and interactive theater production. Examines and presents discussions regarding the ethics of artificial intelligence and the technology sector. The theater is approximately 20,000 square feet in size and is designed to give the impression that it is part of a technology company. This sector is home to a number of rooms that serve a variety of purposes, such as offices, meeting spaces, and more. In this play, members of the audience are asked to participate. As a direct result of this, people are given diverse knowledge and are given varying responsibilities. Clearly, the primary objective is to determine the origin of the occurrence.[13] [14] The audience is more like a participant in a game, obtaining information and completing tasks through discussions with performers playing a variety of characters. This encounter happens while the show is taking place in its overall setting. The outcome of the show will be determined, to a large extent, by the choices and actions taken by the audience in a number of different situations.



Figure 20. Audiences participate in the show. [13]

2.3 Immersive Van Gogh

“Immersive Van Gogh” is a new interpretation of Van Gogh’s paintings based on an immersive experience, first held in France at Atelier des Lumières. The exhibition presents visitors with a completely new experience of Van Gogh’s masterpieces by utilizing virtual interaction that encompasses 360 degrees, as well as music and light effects. As a result of the paintings being projected on all of the space’s walls, visitors are afforded the opportunity to perceive the artwork in a new dimension. They are given the impression that they have been transported into a Van Gogh-created dream when they experience immersion, which heightens their perception of lines, colors, music, and light and shadow. This exhibition interprets famous paintings with modern technology. The visitors are given the opportunity to view the paintings from within the structure, which offers a creative perspective on the artwork.



Figure 22. “Immersive Van Gogh” runs at Pier 36 through Jan. 2
Photographer: Nina Westervelt/Immersive Van Gogh.



Figure 23. “Immersive Van Gogh” runs at Pier 36 through Jan. 2
Photographer: Nina Westervelt/Immersive Van Gogh.

Positives:

- Engaging experience
- Accessibility
- Entertainment

Negatives:

- Lack of authenticity
- Crowded

2.4 Universe of Water Particles on a Rock where People Gather

The carrier of the project is a 7,000-square-meter space with a 10-meter-high ceiling on which a three-dimensional virtual space is projected.[16] In this area, guests can experience the simulated effect of water cascading on rocks in the form of a waterfall. The project estimates the interactions of a vast number of water particles to depict the impacts of water flow. When visitors use their hands to interact with the waterfall or stand at a place without doing anything, they are able to change the flow of water just like any other rock. Because of the interactions of different people, the flow of water is always being reshaped in the here and now. Previous visual states cannot be recreated and will never reappear again. This project focuses on the interaction between visitors and virtual environments. It increases people's feel of immersion by giving them the opportunity to change the virtual environment with their actions.

Positives:

- Engaging experience
- Technology-driven
- Accessibility

Negatives:

- Limited interaction
- Passive engagement



Figure 24. teamLab, Universe of Water Particles on a Rock Where People Gather_1 , 2018 © team-Lab. [16]



Figure 25. teamLab, Universe of Water Particles on a Rock Where People Gather_2, 2018 © team-Lab. [16]

2.5 Wracky Mini-Golf Game

This is one of my previous works. It is intended to be a fun, immersive, and fast-paced mini-golf game, and it arouses inquiry through the use of unusual settings and unexpected physics. The player faces difficulties in the form of unanticipated mechanics of the obstacles, variations in the terrain, and limited opportunities. In each new level, not only is the environment altered, but also a new gameplay element is introduced. The player advances through the game's three levels by utilizing the knowledge and skills acquired in earlier levels.

Within the context of this initiative, we are investigating uncommon physical mechanisms. Given that the first level is a tutorial designed to familiarize the player with the environment, the second level marks the beginning of the investigation into the peculiar mechanics' process. The second level is comprised of a grassy, relatively uniform environment with a variety of elements. There are several obstacles to overcome: In a manner comparable to the game "whack-a-mole," banana ducks are used. In order to make things more difficult for the player, they rise and descend randomly from the holes beneath them. When it is the banana duck's turn, the ball is thrown with erratic force and in multiple directions while producing a "boing" sound.

Banana ducks serve as barriers and move upward and downward depending on the hole they are in; nevertheless, there are a far greater number of them on level three. In addition to this, the land is divided into a number of floating parts that are linked together by bridges. If a player is unable to hit the ball directly through one of these bridges, the ball will go back to where it began. Another new difficulty component has been added to this level in the form of the Trampoline, which can be found on the third floating land mass. The only way to ensure that the golf ball makes it to the target area is to strike it in the appropriate position and angle.

This project investigates the physical principles of production, which are fundamentally distinct from those in the actual world, as well as the experiences engendered by this approach. Depending on the level, the player will encounter a variety of alterations to the physical physics of the game. (except for the introductory level). The element of surprise in the game is defined by the fact that, in addition to unexpectedly difficult challenges, the player may be presented with relatively simple challenges. According to the results of user testing conducted at the time, players were more enthusiastic about and relished the later levels compared to the first level, which replicated the physical rules of the real world except for the environment. They are fascinated by the difficulty of attempting something and failing, as well as the bizarre paths that golf balls take after colliding with various obstacles.

Positives:

- Unique experience
- Accessibility
- Expandability

Negatives:

- Motion sickness
- Limited social interaction



Figure 26. Mini-Golf Level 2.



Figure 27. Mini-Golf Level 3.

3.1 Overview

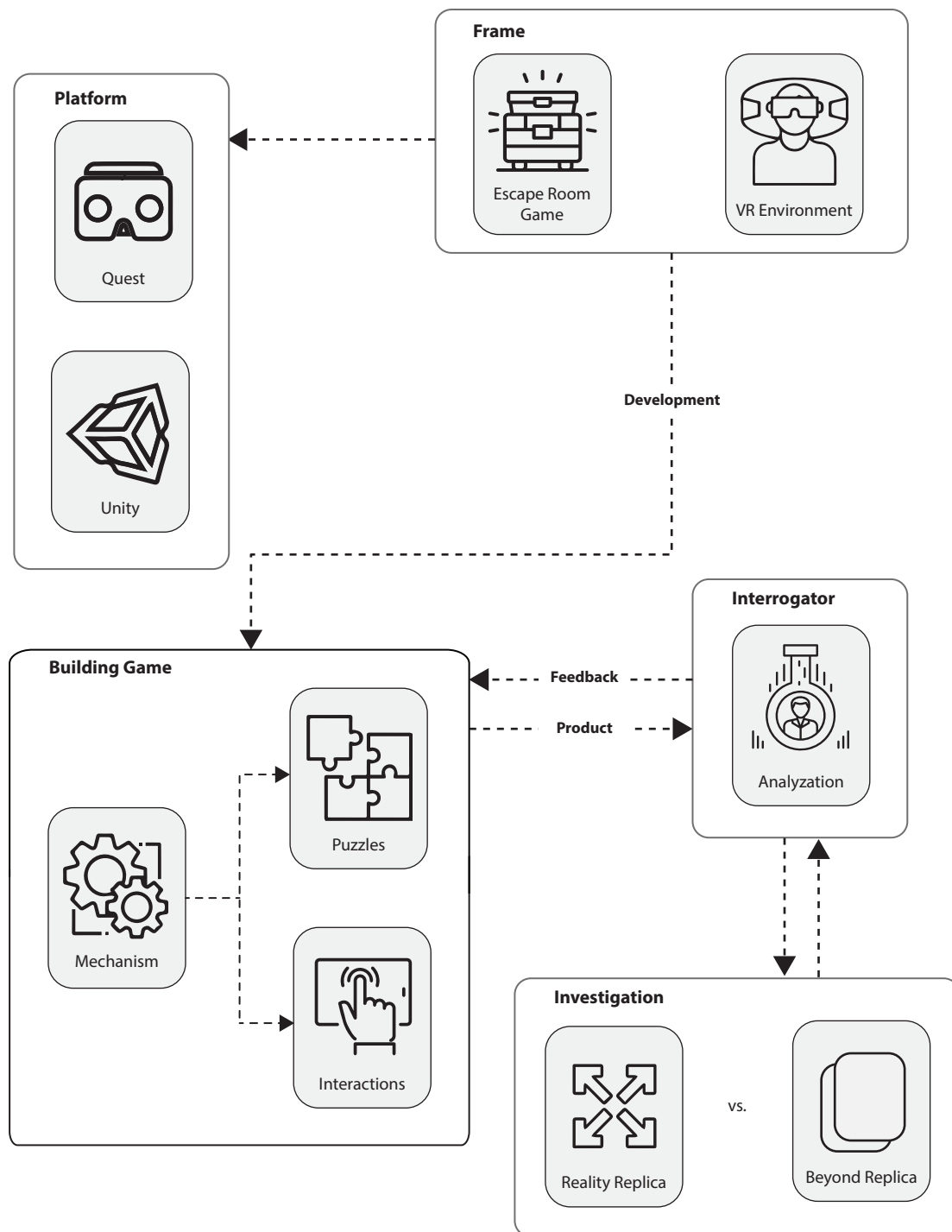


Figure 28. Method Diagram.

The majority of the endeavor will be conducted through a game based on a virtual environment. The virtual reality environment provides an immersive experience that is surrounded by numerous puzzles, each of which can be used independently to explore and test out new paths. The following interactions have been tested in a virtual reality environment: ray, poke, grip, palm, snap, pinch, pinching with one or both hands, toss, contact, and push. The setting of the riddle in this game is related to the mechanism's implementation during the game's development. I strive to make the in-game puzzle experience as robust as feasible, as the number of points that can be explored for future research is also important.

Testing the user experience is also an integral part of the initial phase. I was able to obtain user feedback and fine-tune the game logic, user interface, and other aspects of the game by having individuals test paper prototypes prior to implementation and during game development. In the second phase, I intend to test out various categories. After implementation, a self-evaluation is conducted to identify problem areas and determine whether the various details of the virtual secret room game should mimic reality as closely as possible or utilize the unique features virtual reality can bring to the game to enhance the player experience.

3.2 Game Prototype

3.2.1 Introduction

The starting point for the investigation is a horror-themed escape room game for two players. Similar to previous escape room games in real or virtual worlds, the game begins with a storyline that creates a frightening and stressful environment so that the player is drawn in more easily. This is done in order to maintain a level of gameplay familiarity with other types of escape room games. The initial concept of the game was to explore the opportunities available for the immersive experience with asymmetry in the escape room game. In this case, the two players must collaborate and complete separate objectives to solve the puzzles and get out of the space which locks them up. This form of separation of rooms greatly strengthens the players' willingness to cooperate because they share a common goal, and the escape room becomes their "co-working" space.[17]

3.2.2 Design and Initial Exploration

Before the designing and implementing stages of the game, I first explored the way the player interacts with objects and with the player's character. In this experimental environment, we tested various interaction modes, including pinch grab, palm grab, combination grab, touch, poke, scroll, hover, and so on. At the same time, we also tested object translation, rotation, mass, and transfer between players. These tests formed the basis for the logic of in-game interaction.

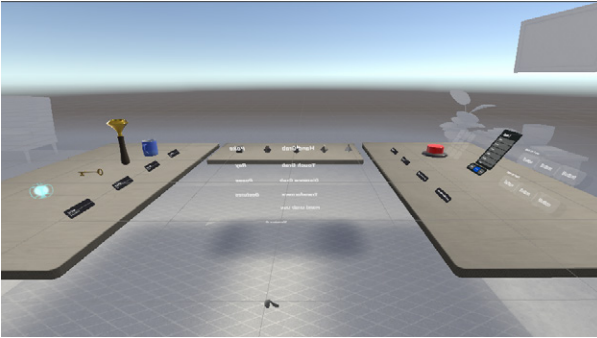


Figure 29. Experiments with Integrations.



Figure 30. Part of the Experiment.

At the outset of the game, players would discover that they were imprisoned in a cell, but had no knowledge of what had occurred beforehand. In this scenario, a sound file titled “But what happened previously?” will be played. “It appears that I was kidnapped by a crazed bartender...”, “The only thing we know for sure is that it appears I’m not the only victim...”, “Who are these victims? Why were they executed? Why... me? Wait, is another person present?” It is difficult for me to escape on my own; we must begin collaborating!” The players will begin their exploration of this space in an ambiance that is so terrifying that it helps them become immersed in the game. [18]

The initial concept for this project was to emphasize asymmetrical experiences, which means that in this game, two players are simultaneously performing separate tasks to solve the same puzzles. Each puzzle incorporates the study of asymmetrical experience. Two participants will initially be segregated and confined to separate rooms. They need to communicate with the audio system used throughout the expedition to transmit information between the rooms. The clue that will assist the player in completing the challenge in either of these two separate prisons is located in their teammate’s cell, and as players typically prefer to be in the same location as their teammates, they will work closely together. [19] After the two players have solved the puzzles in their respective chambers, they will proceed to a larger area where they will

Figure 32. Parts of Clues in the Game.

After launching the game, the user will enter an empty room. Here, the player will find a “Start Board” and the title of the game. The user can progress to the next scene by placing a hand on the “Start Board.” In the second scene, the player’s location is fixed, and their perspective is the only variable that can be altered. At this time, an NPC victim will ask for assistance outside the room and explain what transpired before her arrival, after which the player will hear the victim’s cries and the killer’s approach. The scene concludes with the murderer killing the victim and dragging her corpse away. After this audio concludes, the game will officially begin.



Figure 33. Start Scene.



Figure 34. Background Story Scene.

First, player A can locate a compartment in his prison that contains a nine-key keypad. Drawings and a poster on the wall of another prison indicate that player B can draw the four rows of numbers on the keypad to obtain the correct password. Then he can give his teammate a four-digit password. By entering the correct password, player A is able to open the drawer and retrieve a diary containing hints for the next stages.

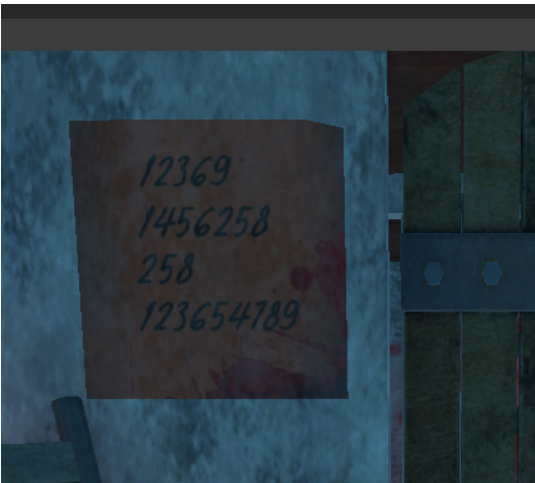


Figure 35. Poster with Hints for 9 keys keypad.



Figure 36. Drawing on Wall of Seperate Jail.



Figure 37. Drawer in Seperate Jail.



Figure 38. Dairy in the Locked Drawer.

The player is instructed by one of the hints in the diary to decipher the Caesar cipher that is printed on the poster in Jail 1 in order to solve the puzzle in Jail 2. If the player in Jail 2 inputs the correct password, they will be able to access a save file and obtain a hammer. The participant can then use the hammer to smash the bust of Caesar, where they will discover a key. With the key, they can unlock the door to the main chamber of the prison and enter. The player, in order to save a teammate, discovers another mallet buried beneath a corpse in the main area.

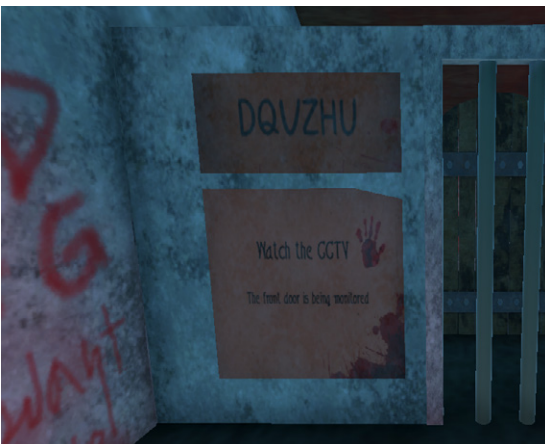


Figure 39. Poster in Jail 1.



Figure 40. Save in Jail 2.

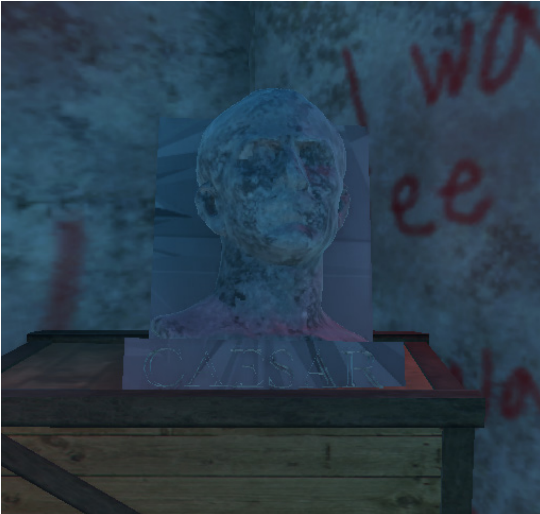


Figure 41. Caesar Bust in Jail 2.



Figure 42. Corpse and Hammer.

Photographs of previous victims are displayed on the walls of the main chamber, which the players can discover as they explore. Following the player's approach to the wall, these "haunted" photographs warn them not to stand near doors because these areas are being monitored. In addition, the "ghost" of a victim will alert the players to watch out for a wire attached to the wall and a footprint in the area. In order to solve this puzzle, players must perform a variety of duties. If only one player stands on the footprint while the other connects the wire, a previously concealed room will become visible to both players.

In addition to various posters that are attached to the wall, players can locate a control panel in the hidden room. After completing a series of experiments, they will discover that two knobs on the console can be used to adjust the image and sound of the television in the living room. In this scenario, one player is responsible for rotating the knobs, while the other player must remain by the television to ensure that the correct music is paired with the correct poster on the television screen. Finally, the monitor begins to rotate, indicating that both players may now pull the levers on either side of the main entrance to depart the room.



Figure 43. Photo of Victims.

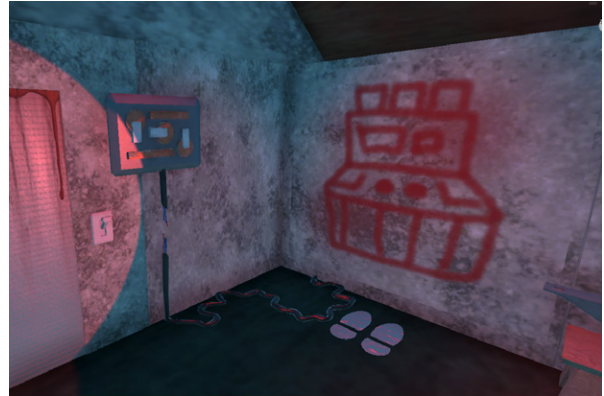


Figure 44. Wire and Footprint.

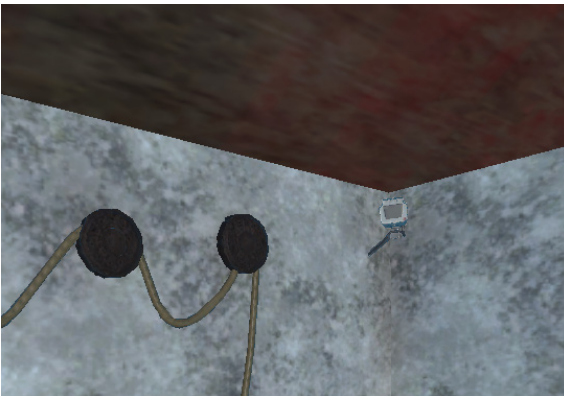


Figure 45. CCTV Camera.



Figure 46. Secret Room.



Figure 47. TV in Main Room.



Figure 48. Door of Main Room.

3.2.4 User Test & Expert Interview

In a campus-wide gaming event, many students participated in the activities. They provided insightful feedback. For instance, adding more diary excerpts, posters, or even videos could aid the player in comprehending the story's context. On the UI side, providing the player with a new experience by implementing a large keypad, scroll bar, etc. Additionally, various interaction modes, methods of providing hints, and ways of devising asymmetric puzzles can be investigated in depth.

I conducted interviews with two experts in the immersive design and escape room design industries at the end of the semester. I gathered their input after introducing them to the entire game design procedure and future development plan. First, utilizing VR's immersion gives players the advantage of being in any environment, allowing them to transition between various scene types within a single game. Second, spatial scale and the perception of an object's dimensions are researchable topics. A variety of items can be added to the setting to surprise the players if the narrative is captivating.



Figure 49. User Test 1.



Figure 50. User Test 2.

3.2.5 Journey Map & PainPoints

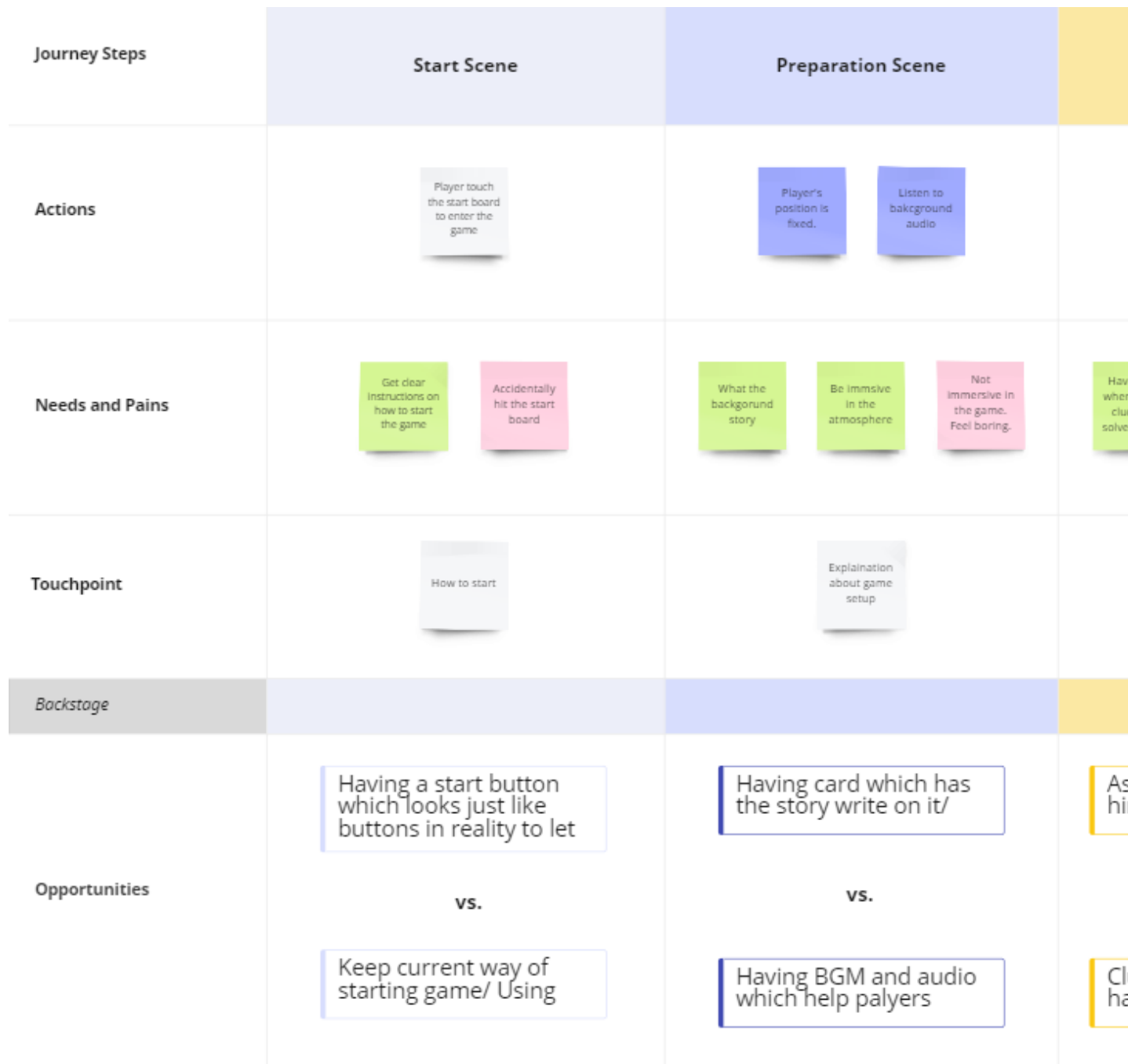


Figure 51. Journey Map and Painpoints.

Game Scene					End Scene	
Find the puzzles and clues in the room.	Interact with objects	Interact with the host (Asking for help)	Effects and Animations	Punishment in the game	An End Scene	
ing fun n search es and puzzles	Solve the puzzles too easy or too hard	Intersting way of interacting with oject	Don't have much to interact with	Got some little pushnishment when doing sth wrong	The punishment make player feel frustrated	Celebrate after finish the game Nothing happens after win
Have hint about how to find clues?	How to interact with objects in scenes	Effects in game	Punishment in game	End scene		
Ask to host for hints about how	The interaction between player and object is the	Effects and punishments in game are the	A voice of host or board show the end of game.			
vs.	vs.	vs.	vs.			
clues in the game have a shinny	The interaction between player and object is	Effects and punishments in game are	Having a end scene to celebrate after players			

3.2.6 Next Steps

After constructing a journey map and conducting an in-depth analysis of the game's problematic areas, I classified the game's details into three categories: "In-game feedback," "Host-player interaction," and "Environment and effects." As the contents of the preceding three categories are too exhaustive, I will focus my investigation on the category "Interaction between host and player" regarding puzzle hints in the following chapters.

One of the metrics is the simplicity with which the object with the clue could be located, along with how realistic they were. This ranged from no hints at all to extremely explicit hints, and from being possible only in the virtual world to simulating real-world situations. The manner in which suggestions are provided will be the focus of the subsequent phase.

3.3 Way of Giving Hints

3.3.1 Introduction

First, when playing an actual escape room, the room's owner will typically communicate the next clue via a walkie-talkie. There are a number of methods for providing hints in virtual reality. Examples of game design strategies include highlighting the edge of an object containing a clue, altering the size of the object repeatedly to attract the player's attention, and activating an instruction board at a predetermined time to instruct the player on what to do next. Following the implementation of the aforementioned, the next phase of my investigation will be to assess the efficacy of various approaches in order to determine the next course of action.

3.3.2 Implementation

In the first round of investigation, I want to explore a variety of methods for providing hints and hoped to choose the most fruitful approach for future rounds.

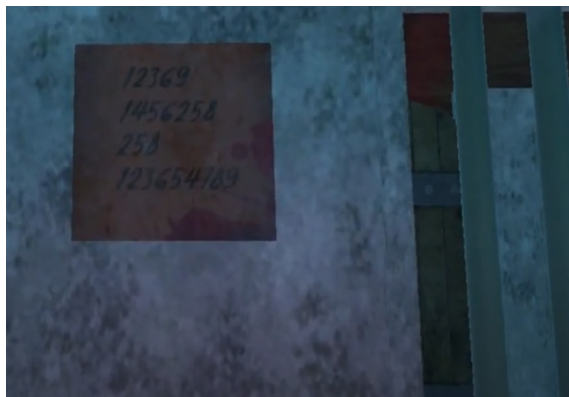


Figure 52. Sound Instruction.

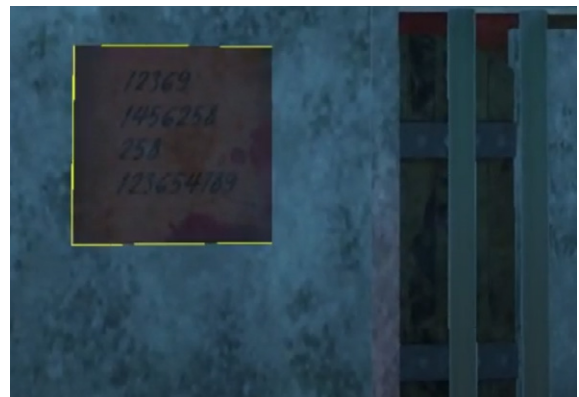


Figure 53. Highlight Outline.

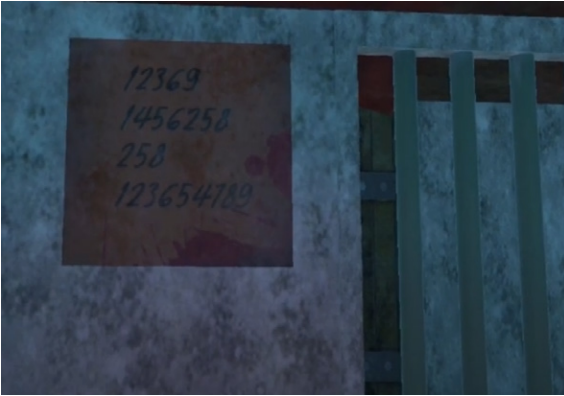


Figure 54. Changing Size.

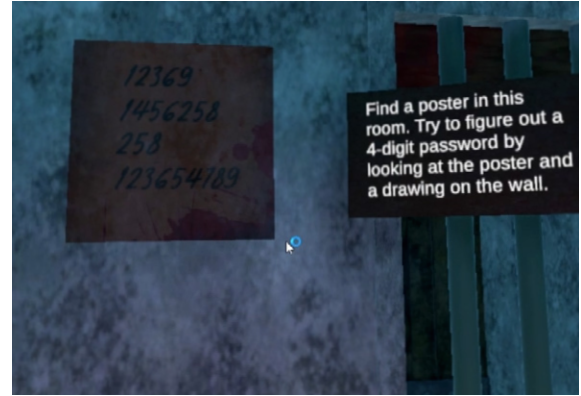


Figure 55. Instruction Board.

3.3.3 Analysis and Next Step

Due to the simplicity of voice prompts and instruction boards, it can be challenging to conduct in-depth and nuanced research on them. Changing the size also alters the size of the hints displayed on the poster, making them more difficult to comprehend for the player. In contrast, emphasizing the boundaries will attract the player's attention and make subsequent studies much simpler. For example, the color, width, and thickness of the outline, as well as the manner in which it is displayed.

Even though the general illumination and tonality of the developed game environment are dim, the color palette is relatively diverse. Poorly contrasting edges of different colors do not function well in this environment. The direction of the outline's breadth is restricted to a test of various border widths, leaving little room for a thorough examination. In conclusion, I chose to continue investigating the outline display method. I will evaluate the presentation of the outline based on two criteria during the subsequent investigation: simplicity of detection and realistic fit. Both of these elements will be taken into account.

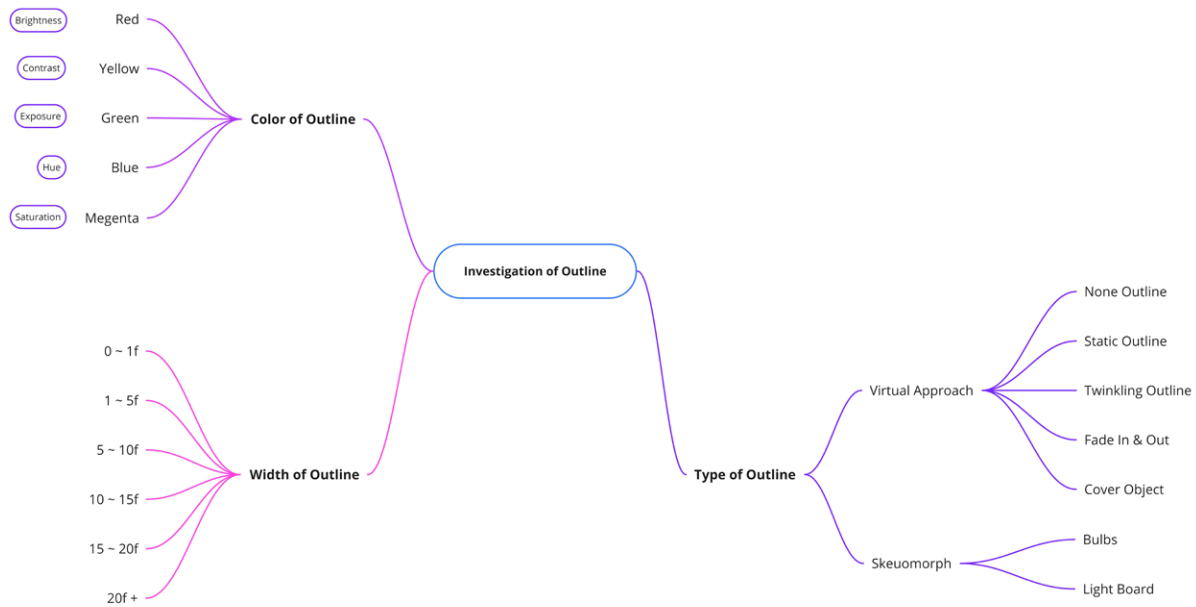


Figure 56. Investigation of Outline.

3.4 Type of Outline

3.4.1 Introduction

In this investigation, the relationship between the form of the outline and the degree to which it is noticeable will be analyzed. In this case, the following types would be implemented: none outline, outline that is consistently bright, outline that flashes constantly, outline that alternately and gradually brightens and darkens, and the entire object is surrounded by a bright area. After the phase of implementation has been completed, comparison and evaluation will occur.

3.4.2 Implementation

The current round focus on exploring different styles of outlines. The upcoming round is expected to include the selection of various experimental methods for further investigation.

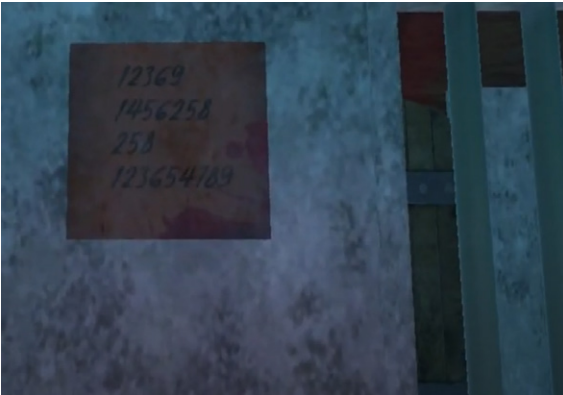


Figure 57. None Outline.

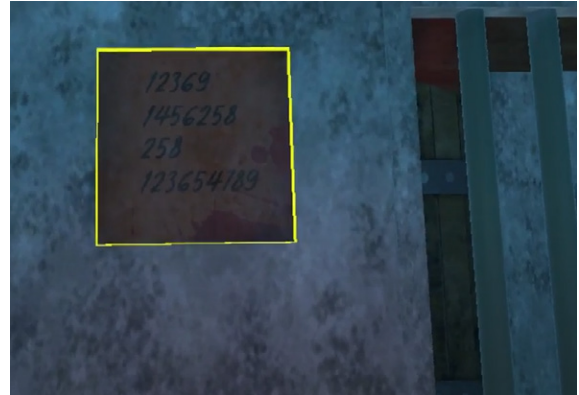


Figure 58. Static Outline.

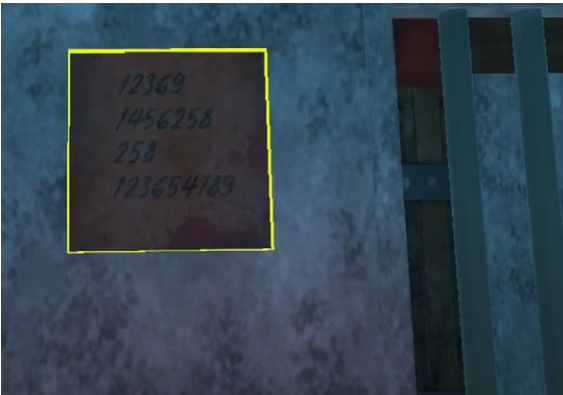


Figure 59. Twinkling Outline.

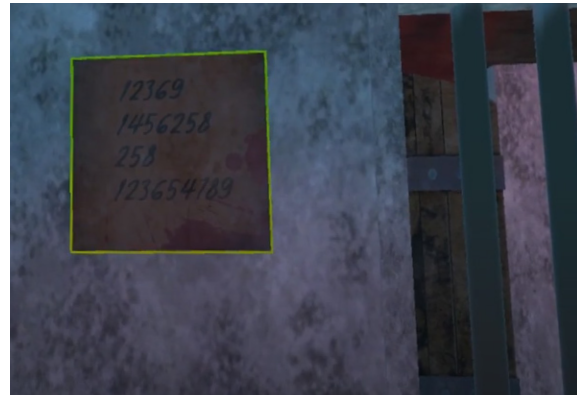


Figure 60. Fade In & Out.

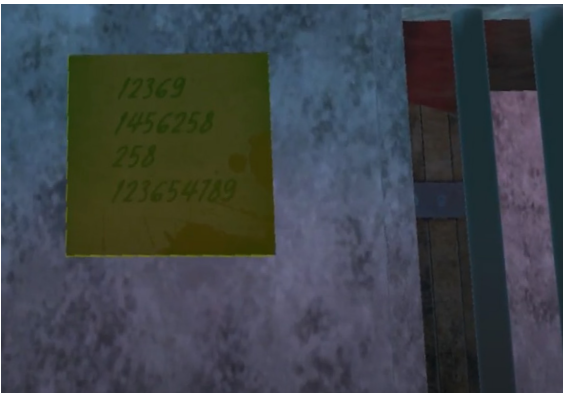


Figure 61. Cover Object.

3.4.3 Analysis and Next Step

Because it contains the least quantity of information, I will avoid the “None outline” strategy. “Fade In & Out” is preferable, but because the outline’s opacity transitions slowly between complete transparency and full opacity, the outline is not always distinct enough to serve as a hint at certain points in the animation. Although the “Cover Object” strategy is effective at attracting the player’s attention, it is not a sound strategy because the bright cover makes it difficult for the player to read the poster’s information.

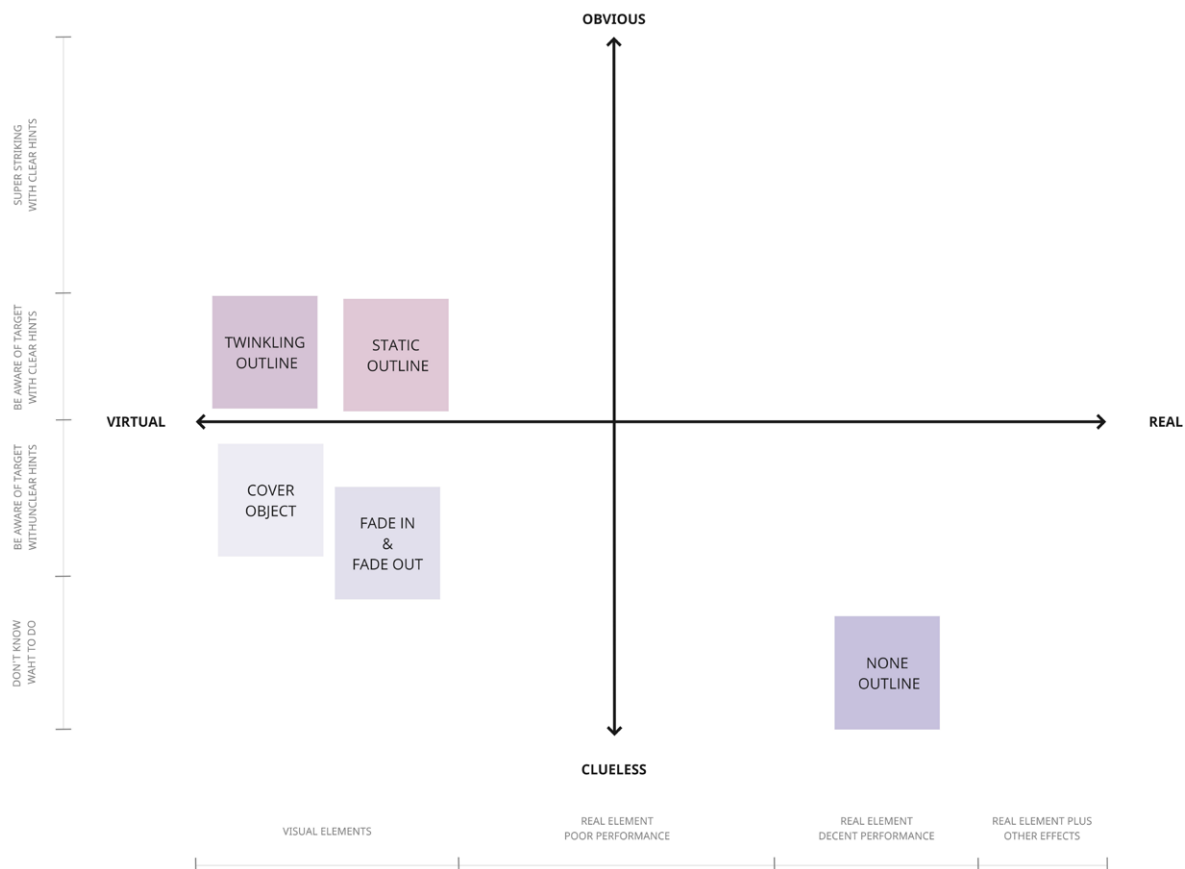


Figure 62. Type of Outline.

In contrast, “Static Outline” and “Twinkling Outline” perform exceptionally well. First, the luminosity of “Static Outline” captures the player’s implementation without interfering with their ability to read the poster. Alternatively, “Twinkling Outline” is a very enticing method of conducting business. The blinking effect conveys a sense of urgency and draws the player’s focus to the presently highlighted item in the game.

If any of the aforementioned methods of dropping hints were used, the participants would be reminded that the world they are in is a simulation. I chose “Static Outline” and “Twinkling Outline” for the next round of testing so that I could determine whether or not simulating reality is the best approach.

3.5 Skeuomorphic Endeavor

3.5.1 Introduction

In the preceding subchapter, I emphasized the significance of a particular object by highlighting its outline. This method cannot be implemented in the real world because it is a form of prompting that can only exist in the virtual world. What happens if I replace the outline element with a pre-existing element? Will this enhance the player’s awareness of the poster? In this series of experiments, I supplanted the edge lines with light bulbs in order to observe and evaluate the impact of implementing this strategy.

3.5.2 Implementation 1

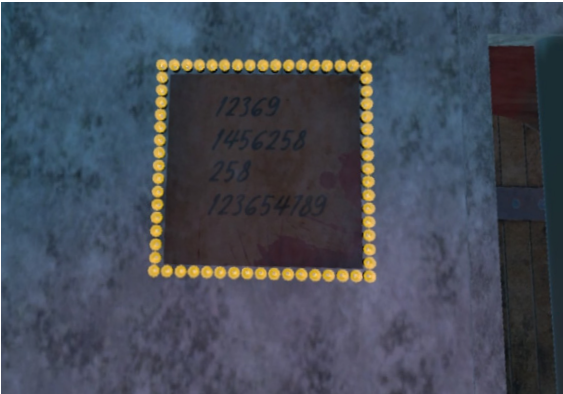


Figure 63. Static Bulbs.

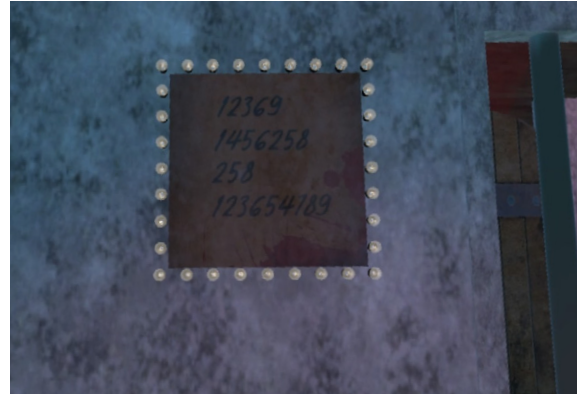


Figure 64. Twinkling Bulbs.

3.5.3 Implementation 1 Analysis

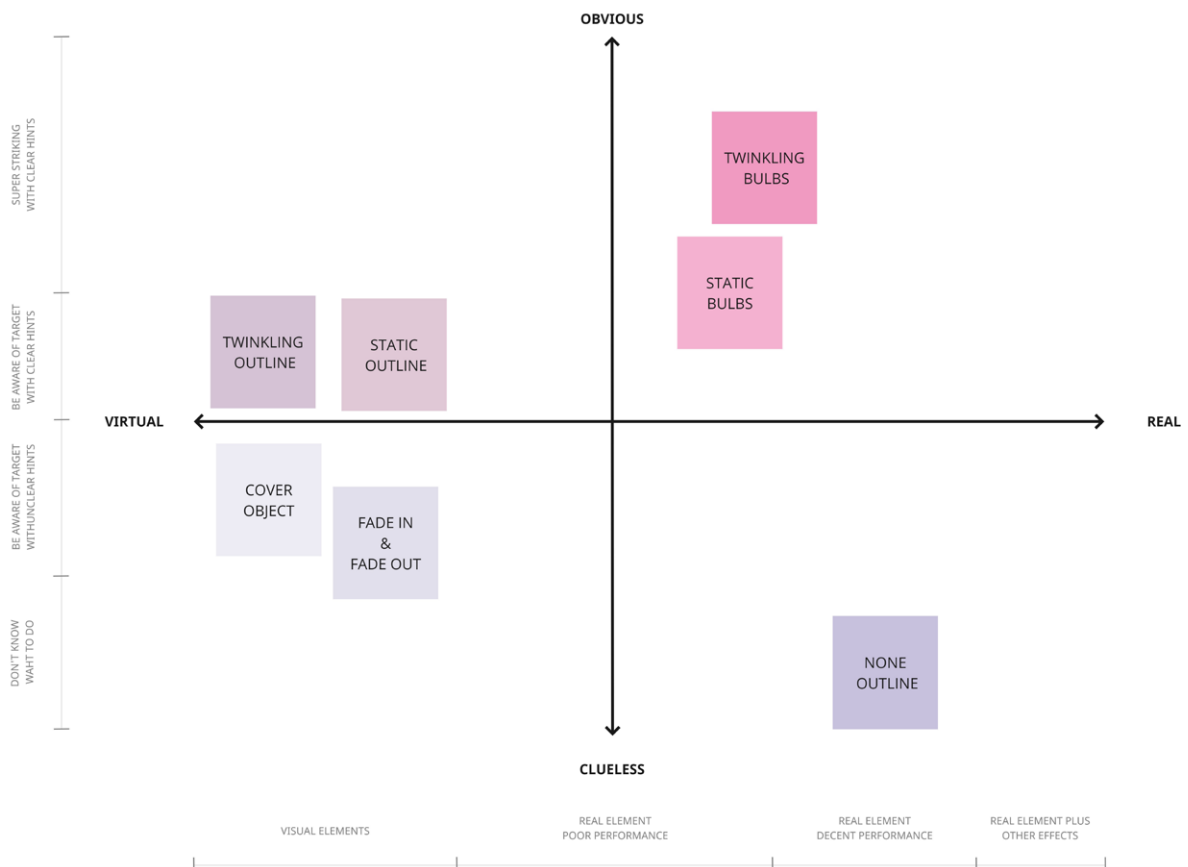


Figure 65. Experiment with Real Element 1.

Initially, the overall effect appeared substantially more realistic after I replaced the bright outline with a light bulb. In addition, because light lamps have volume, the emphasis effect is more effective than the outline effect. However, a new issue has emerged. Whether or not the bulbs are lit, their presence is incongruous with the surrounding environment and functions as an attraction. Instead of winding light bulbs around the poster, it may be preferable to use them to arrange the numbers on the poster.

3.5.4 Implementation 2

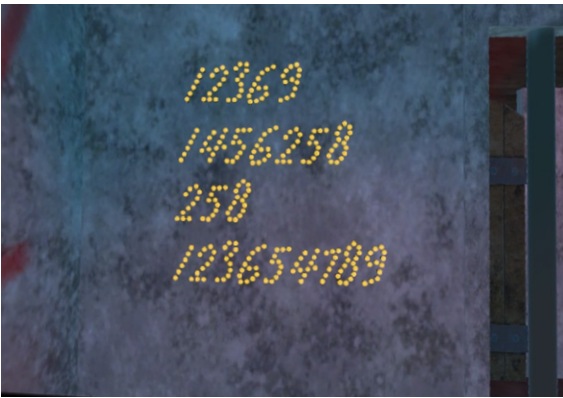


Figure 66. Static Number Bulbs.



Figure 67. Twinkling Number Bulbs.

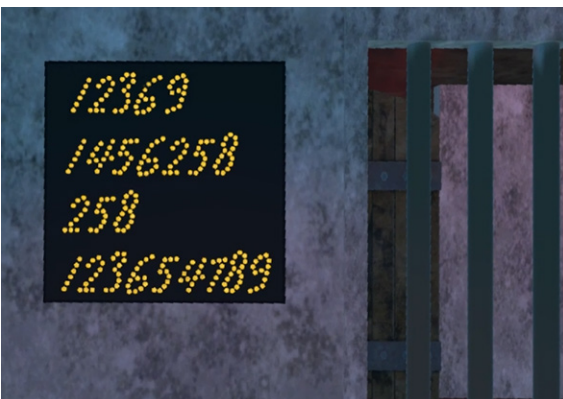


Figure 68. Static Light Board.

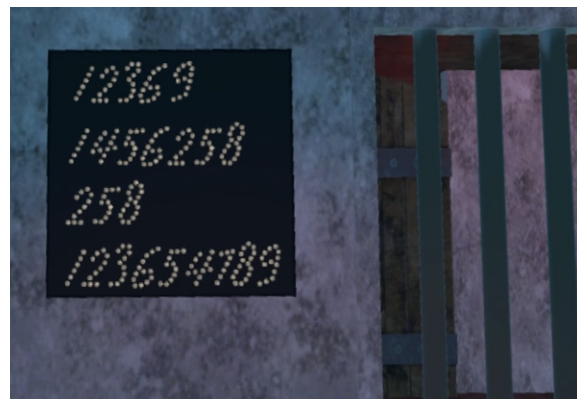


Figure 69. Twinkling Light Board.

3.5.5 Implementation 2 Analysis

I implement the “Static” and “Twinkling” variations, as I did in the previous session. The use of light bulbs to outline numbers not only makes the information readily identifiable but also does not hinder the player’s ability to read. However, a light fixture that is directly attached to a wall seems a bit odd. To make it seem more acceptable, I decided to use a light board as an alternative. By employing the “Light Board” method, I believe it is realistic so that the participant does not feel out of place, as well as engaging and effective.

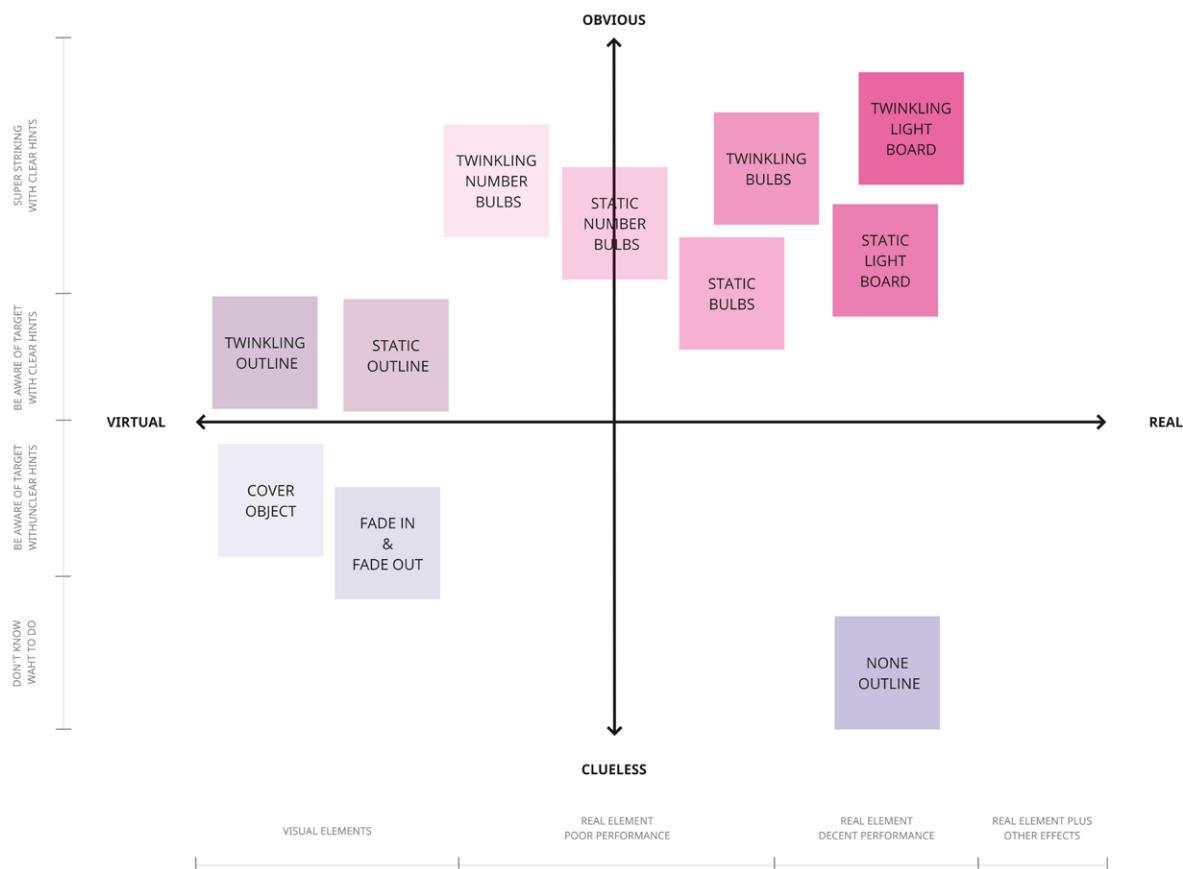


Figure 70. Experiment with Real Element 2.

Based on previous research, I anticipate that the next round of experimentation will include some techniques for bringing the “Light Board” closer to reality. For example, the degree of realism of the light bulb, the addition of diffuse light to the light bulb, the addition of a flickering sound effect, etc. I will compare the outcomes after implementing these strategies to ascertain if they made a difference.

3.5.6 Implementation 3

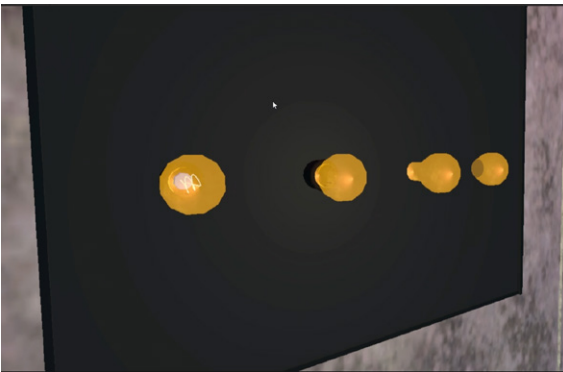


Figure 71. Degree of Bulb in Game Resembles Reality.

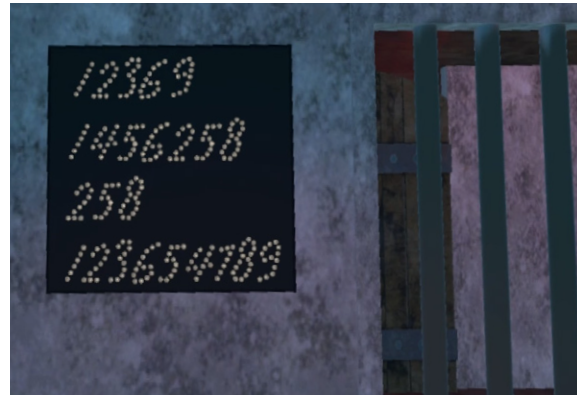


Figure 72. Add Flickering Sound.

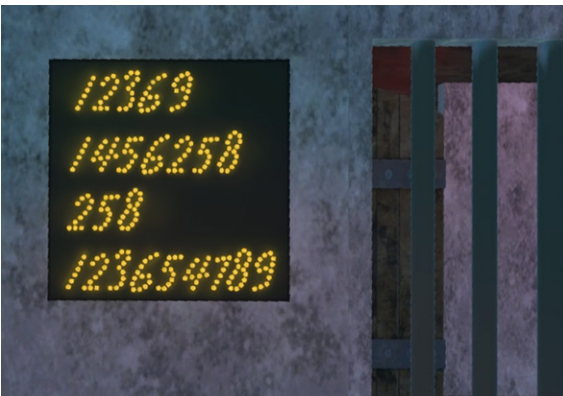


Figure 73. With Diffuse Light.

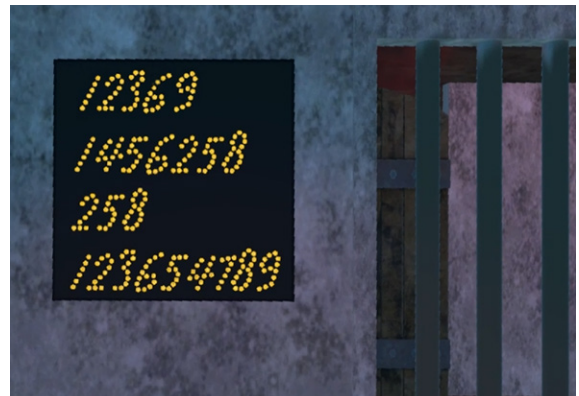


Figure 74. Without Diffuse Light.

3.5.7 Implementation 3 Analysis

First, I analyzed the impact of various bulb model types (ranging from simple to complex). Four categories are examined in this study:

1. An uncomplicated glowing spheroid.
2. Bright object in the form of a bulb.
3. Add housing to the filament.
4. Insert the fastener and filament.

Clearly, the complexity of the model will increase its realism. The experiment with a solitary bulb made this evident. Due to the scale of the bulb on the light board, however, the distinction between these four scenarios is not readily apparent from the player's vantage point in the current scenario.

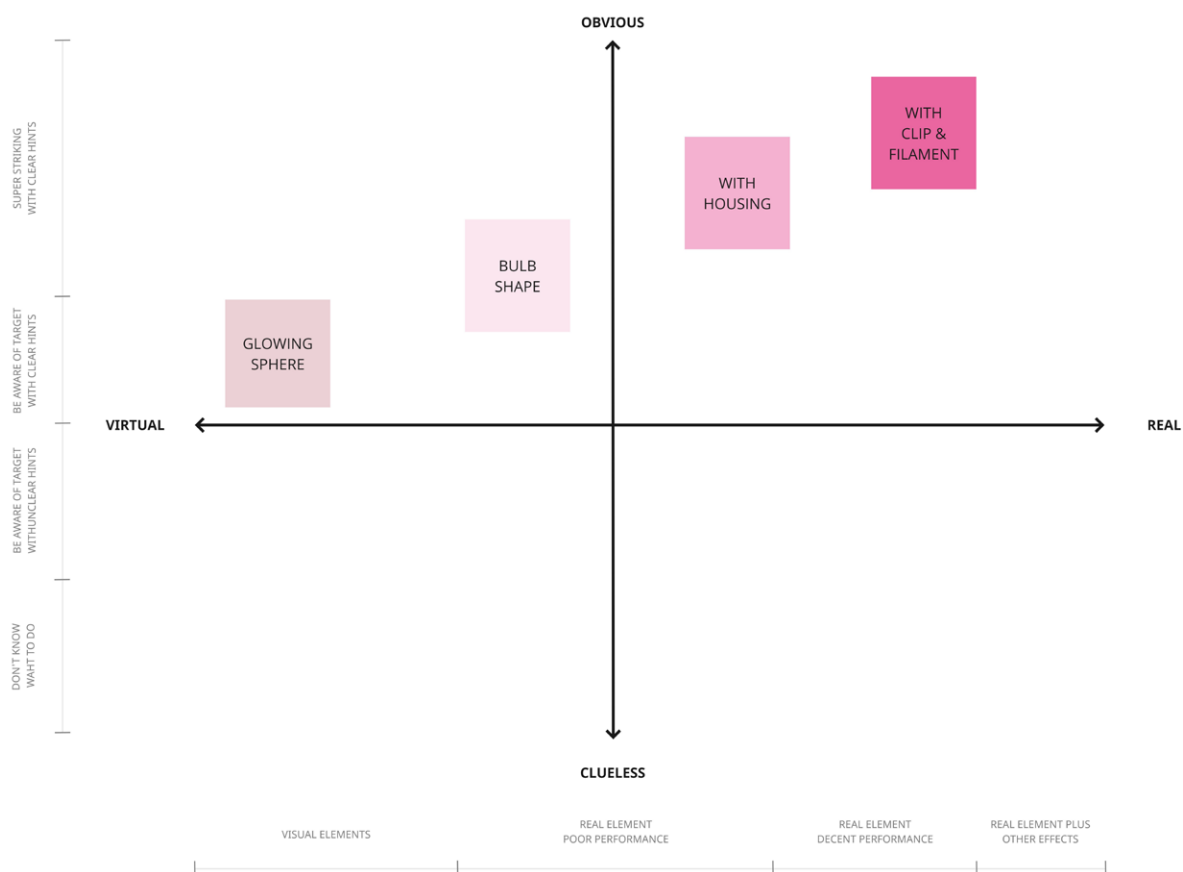


Figure 75. Realism of Bulbs.

During the sound test, I added a flickering sound to the twinkling light board to mirror its effect. Due to the fact that all previous tests have focused on visual effects, this is merely a preliminary endeavor; future tests may examine the sound-related elements in greater depth. A final attempt to replicate the effect of the bulb before it provided unadulterated illumination. In actuality, the light bulb's halo was not reflected. Due to time constraints, I have not yet discovered an appropriate method for achieving this effect in the game, so I am currently evaluating the desired effect in Photoshop. It's possible that adding a halo effect would enhance realism, but I'm concerned that it would hinder the player's ability to comprehend the light board's information. Clearly, future experiments should observe the actual effect.

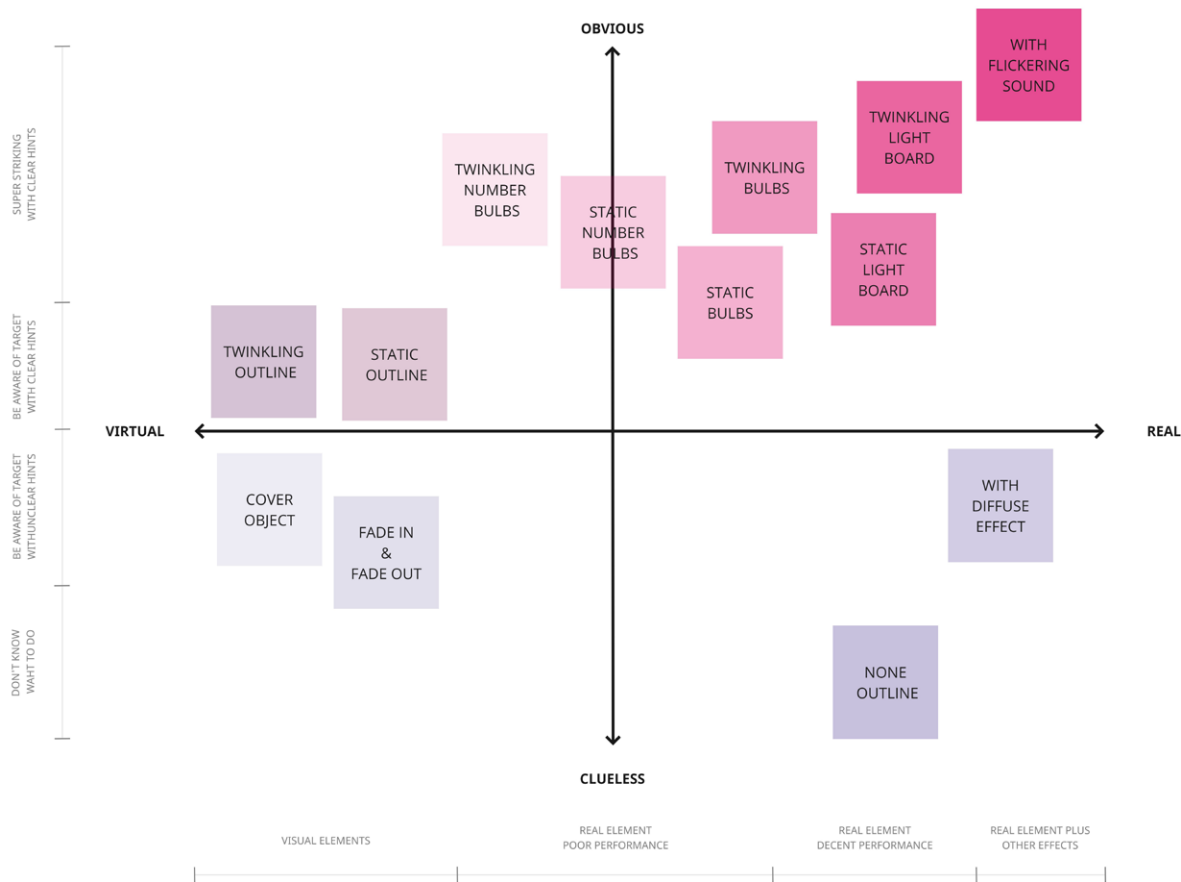


Figure 76. Experiment with Other Effects.

Conclusion

4. 1 Contribution

This paper seeks to incorporate the perspectives of game programmers and game designers in order to investigate effective methods for directing players in a virtual reality room escape game to the location of the item that provides a clue. This study utilized the “Clueless to Obvious” and “Virtual to Real” metrics. Following multiple cycles of experimentation and analysis, the research focuses on examining alternative methods for emphasizing the outline of the target object. The following are the primary contributions of this paper:

- Evaluating the impact of hints’ realism on the game experience.
- Examining the potential of VR escape games by exploring objects’ virtual effect.
- Analyzing various methods for providing hints in outline form.
- The working process can be a reference for other game designers and developers.

4. 2 Limitation

Throughout the various rounds of investigation, I have undertaken trials ranging from clueless to obvious and from virtual to actual for the same item. In the final set of studies, we can see that there is a possibility of deeper exploration into the realism of items in the game. For instance, by using other gaming engines with more realistic effects, the influence of adding different sound effects on the player experience, the relationship between the size of items in the game and the degree of realism, etc. Moreover, if more time is available, it is possible to select representative samples for user testing at each stage following additional cycles of experiments. The following are some limitations of this research:

- Realism degree of game objects in the “Skeuomorphic Endeavor”.
- The investigation of factors besides visual factors.

4.3 Future Prospect

Currently, VR headsets are not sufficiently portable. Nonetheless, the experiences that VR devices can provide are inadequate. However, it is possible that VR devices will become lightweight and more portable in the near future. If this occurs, the number of people using VR headsets could substantially increase, as they will be more comfortable, convenient, and able to be worn for extended periods of time. Based on this condition, demand for VR escape room games may also increase. Escape room games are already popular in the real world, and the immersive and interactive nature of virtual reality makes it an ideal platform for this genre. Players can move more readily and interact with virtual objects in a more natural manner, whether in person or remotely. Simultaneously, it will supplant the realistic escape room facility that requires a significant investment. Overall, lightweight and more portable VR devices and increased consumer adoption of VR technology are likely to have a substantial effect on the popularity and design of VR escape rooms.



Figure 77. Future lightweight VR glasses.

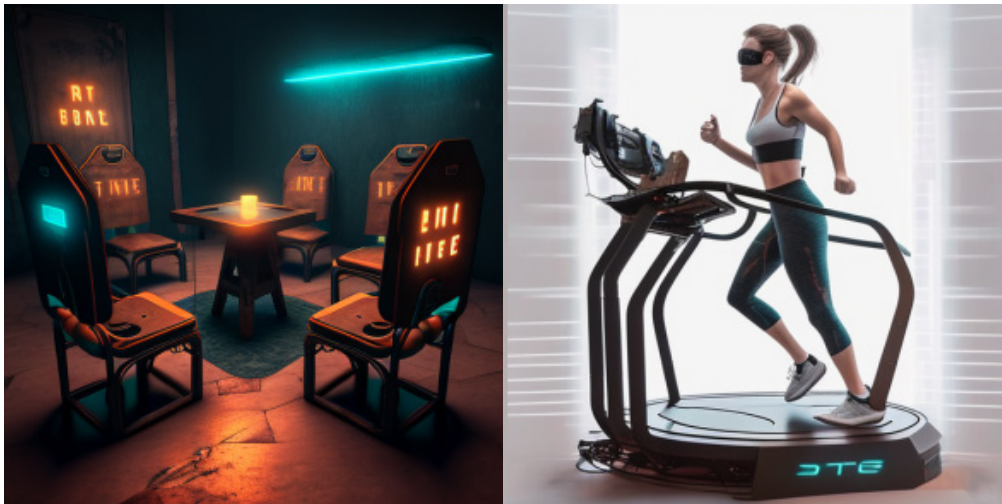


Figure 78. Furture escape room game.

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