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ReCapture: A VR Interactive Narrative Experience Concerning Perspectives and Self-Reflection

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Abstract

This project presents a virtual reality (VR) Interactive Narrative aiming to leave users reflecting on the perspectives one chooses to view life through. The narrative is driven by interactions designed using the concept of procedural rhetoric, which explores how rules and mechanics in games can persuade people about an idea, and Shin's cognitive model, which presents a dynamic view of immersion in VR. The persuasive nature of procedural rhetoric in combination with immersion techniques such as tangible interfaces and first-person elements of VR can effectively work together to immerse users into a compelling narrative experience with an intended emotional response output. The narrative is experienced through a young woman in a state between life and death, who wakes up as her subconscious-self in a limbo-like world consisting of core memories from her life, where the user is tasked with taking photos of the protagonist's memories for her to come back to life. Users primarily interact with and are integrated into the narrative through a photography mechanic, as they have the agency to select "perspective" filters to apply to the woman's camera from which to view a core memory through, ultimately choosing which perspectives of her memories become permanent when she comes back to life.

Introduction

Today, virtual reality (VR) is one of the most emergent technologies being explored in the realm of storytelling, whether it is through VR film, VR games, or VR interactive narratives. The focused goal of VR storytelling is "to tell a story that will stimulate emotions that will influence action" [1]. Concepts such as immersion, presence, empathy, and embodiment are often assumed to be inherent to VR technology, and in the context of VR storytelling, the driving forces stimulating a user's emotions and consequently actions. Immersion, in particular, is a defining term used to describe fully immersive systems such as head-tracked displays, or headsets. "With novel affordances such as multisensory inputs and naturalistic control of point of view, immersive virtual environment technology (IVET) allows for a literal demonstration of climbing into another person's skin to embody his or her experiences first-hand" [2].

While VR devices do allow users to visually, audibly, and sometimes even tangibly enter another world, Hamari and Trentini suggest that immersive interfaces alone do not necessarily enhance a user's sense of engagement or satisfaction [2]. When designing and developing a story experience for a VR platform, the narrative elements and intentions of storytelling bring another dimension into the creation and design of the VR story. Defining features of VR such as immersion or empathy need to be further explored and reconsidered within the context of VR storytelling, especially if the story has a desired emotional output, intent, or underlying message.

What, however, makes a story told in VR truly immersive? And what role does immersion play in influencing how users experience the VR story? In recent years, key findings have established the importance of immersion in VR story experiences mainly comes from user cognition, rather than being pre-embedded within technological properties or existing entities [3]. Essentially, the value a user places on a VR story, and thus how strongly users immerse themselves in a VR story, is largely dependent on the individual trait's users bring to the VR experience. These individual traits can be referred to as cognitive processes that occur or appear when experiencing a VR story, and ultimately how users empathize and embody VR stories [1]. Shin (2017) derived a cognitive model that can be applied to VR stories that are specifically directed at user motivations and attitudes [1].

In tandem to Shin's cognitive model, the game design concept of procedural rhetoric can also be used to address the challenge of making immersive VR stories users value. Procedural rhetoric explores how rules and mechanics in games can persuade people about an idea [5]. The concept ties directly into Shin's cognitive model, which supports that effective immersion is largely dependent on the individual traits users bring to the VR experience. Using the concept of procedural rhetoric in parallel to Shin's cognitive model, ReCapture was designed- a VR interactive narrative motivating users to recapture a protagonist's core forgotten memories using camera and with the expressive goal to influence users to reflect on the way we choose the perspectives we carry through life, and that often define our character and actions.

Related Work

Design Challenges and Recommendations for Storytelling in Virtual Reality

One of the most significant challenges in VR storytelling is understanding how users feel about the stories they experience in VR and the role immersion plays in influencing the value a user places on a VR story. A lack of understanding user experiences and the role immersion plays in VR stories results in less effective user-focused interaction and interface designs that could trigger users' sense of empathy and embodied experience [1]. Embodiment in VR creates the sensation of personally having the VR experience [1], while empathizing can "help to more strongly combine VR and physical reality, thus producing higher credibility" [13]. A number of research has been conducted to address these challenges in VR storytelling.

Shin's cognitive model is a theory that provides key design considerations addressing current challenges in VR story design, particularly that of the ambiguous nature of immersion. Applying the model, Shin found that the importance and definition of immersion in VR story mainly comes from individual traits and

experiences users bring into the VR story, rather than VR technology [3].

The model is a theoretical two-tiered process of immersion comprising presence and flow, which Shin considers are elements generated by the technology, and then empathy and embodiment, which are selectively experienced by users, and based on the quality of experience [1]. Significant to this theoretical model is how flow may link the technological and the emotional individual. Flow is "experienced when an activity's challenges fully engage a user's skills without overwhelming them" [1]. The consequence of the theoretical cognitive model is engagement [1], or the value a user generates for the VR story. Using the model, mindful interactions and narrative can be designed in an open-ended way allowing space for users to naturally bring as much of their individual traits to the experience and interactions.

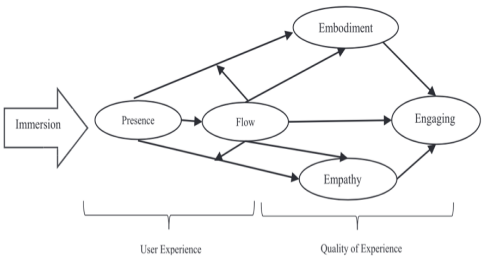

Figure 1. *Memory Orientation Room*

In response to VR storytelling challenges, Laurel also recommends applying the principle of action, or a participant's "ability to take action in the world and perceive the effects" [4]. This principle of action touches on a sense of personal agency that we wish to inspire in users of ReCapture to influence a sense of self-reflection as users carry out the narrative through provided mechanics and interactions.

Procedural Rhetoric and Meaningful Mechanics

Procedural rhetoric is the art of persuasion through rule-based representations and interactions rather than the spoken word, writing, images or moving pictures [5]. In games implementing procedural rhetoric, rules and processes are the primary means by which games communicate meaning. The situation involves a designer that intentionally encodes a system that generates meaning, and it's up to the player to complete this meaning by interfacing with the system.

Teresa de la Hera and Joost Raessens consider persuasion in interactive experiences more broadly, suggesting that "persuasion through digital games is not only reduced to procedural rhetoric and that the persuasive options are multiple" [6]. de la Hera and Raessens propose three persuasive goals they believe games may try to achieve: shaping, reinforcing, or changing the attitudes of players. The goal of reinforcing attitudes in players aligned most with ReCapture's "persuasive" goals. ReCapture aims to trigger a space or sense of reflection of one's perspectives, thus reinforcing established knowledge. Designing to reinforce existing attitudes, de la Hera's and Raessens's recommend designing an experience in which the game goal and the persuasive goal are "somehow related to each other, even though they do not overlap" [6]. ReCapture aims to apply these concepts, with an abstract interactive narrative, non-hyperrealist visuals, auditory cues, and tangible interfaces.

Existing Photography-themed Games in Extended Reality

There are few extended reality games and interactive narrative experiences involving a camera or photography mechanic technically or narratively implemented.

Photogeist is an augmented reality (AR) game in which "users use a physical handheld camera device to take pictures of floating virtual ghosts" [7]. The game focused on tangible interfaces, and how interfaces can be "just as important as the content itself when it comes to creating an engaging, entertaining experience" [7]. The game's camera mechanic interface is developed to be intuitive for first-time players, as photography is considered "common knowledge" to most [7]. Overall, Photogeist promotes utilizing novel interfaces in order to create enjoyable games that will engage users or players to continue playing [7].

Caves RD Interactive also published a series of exploratory VR experiences based on photographing different nature areas around the world. While the experiences focused on realistic and aesthetic environment design [6], the implementation of the camera mechanic was notable. In the Wakarima VR experience, users can use their hands to capture a photo by forming a rectangle with their hands, entering a visual "Hand framing" screenshot mode[8]. The Fushimi Inari VR experience camera mechanic is accessed through a VR headset's hand controllers, where input triggers can be processed in order to take a photo[9].

A majority of extended reality experiences related to photography do not heavily invest in narrative. The intention of a majority of these experiences aim to teach photography skills or provide engaging game experiences with point systems. Through ReCapture, we will be contributing an interactive narrative with unique elements not present in the existing library of Photography-centered interactive experiences for VR or AR platforms.

Conceptual Design

Narrative Overview

In ReCapture, the narrative's protagonist is an 18-year old girl named Luna who has suffered a tragic, unknown accident putting her in a limbo-like state between life and death. The narrative begins with Luna awakening in a limbo world of sorts, neither dead nor alive. This limbo world is representative of Luna's subconscious, housing character-defining memories from her life spread out among the world environment. Luna is welcomed into the world by Astro, an astronaut-looking character guiding Luna (and the user) through the limbo world. Through Astro, Luna realizes she remembers little to nothing about her life, and that in order to come back to life and awaken from this limbo world with her lost memories intact, she must take pictures within the three memory scenes spread out amongst the limbo-like world in order to recapture her memories. Luna is given a special camera containing three sets of emotionally themed filters corresponding to the three memory scenes, accessible only when Luna arrives at a filter set's corresponding memory.

The user, experiencing the narrative as Luna, can shift through this inventory of dedicated filters when in photography mode, effectively altering the rendered memory scene before

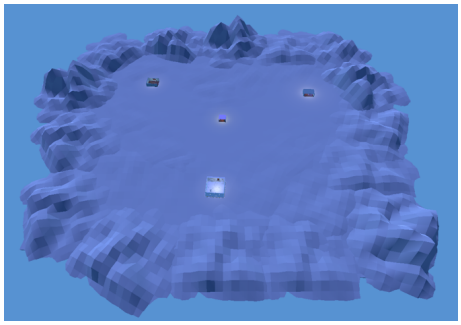

Figure 2. *Aerial view of ReCapture's world environment*

them. The filters will be themed on different emotions and attitudes one can view life through, such as happiness, sadness, ignorance, and more. When a user applies a filter to Luna's memory scene, the memory's subject matter will be rendered differently according to the filter's theme.

With this special camera, Luna traverses the limbo world environment looking for the three memory scenes to take pictures in, using the filters to decide how she wants to remember, or "recapture", her memories. Once Luna visits and takes pictures in each memory scene, she can return to the memory orientation room she woke up in and look through Photo Galleries of the pictures she took, confirming with Astro that those photos are the perspectives of her memories she wants to have become permanent, and ultimately form her character when she comes back to life.

Environmental Design

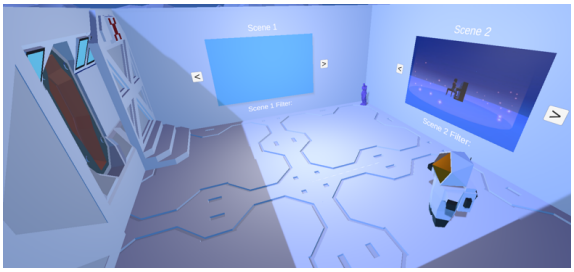

Figure 3. *Memory Orientation Room*

The memory orientation room is the first scene users wake up in and the last scene users complete the narrative in. The room consists four walls; one for entering the limbo world, and the remaining three acting as photo galleries storing pictures the user took throughout the limbo world's memory scenes. This room is an amalgamation of the reflective process the user experiences through Luna as they traverse the limbo world and the character-defining memories from Luna's life. This memory orientation room is where the story begins, initially representative of lost or forgotten memories that need to be recaptured. It is also where the story ends, becoming representative of the outcome of reflection, of taking time to confront the perspectives we can choose to carry through life. As its title bears, the memory orientation room is where Luna's memories are fully re-oriented according to the perspective filters the user chose to remember Luna's memories from and settle as permanent.

The **Lifecycle of Dreams** is a memory scene representing Luna's experiences as a piano player. Through the applied filters, the scene represents the motions one often goes through in life when they fall in love with a dream: the initial discovery, the integration of those dreams as part of their life and character, the trails of committing to achieving the dream's success, and experiencing a dying dream. The first filter is titled "In the Zone", presenting the memory as Luna playing the piano while a ring of glowing particles swirls around her, representing how she's entranced by her newfound dream of playing the piano. Next is the "Living the Dream" filter, representing the integration of Luna's newfound dream as a Piano player into her life. When applied to the scene, Luna's bedroom appears, where Luna is still playing the piano, but the glowing ring that once surrounded her is not as tall or noticeable as it was in the previous filter. The "Lost in a Dream" filter represents Luna's dying dream and how her feelings towards playing the piano has changed because of the pressures of finding conventional "success" in dreams. To represent how burnt out and disconnected she feels to the rest of the world, Luna's room is in disarray, with sheet music all over the floor or overflowing the trash bin. Finally, her piano competition trophy's that were once showcased in shelf cases are now in the trash can, and the shelves they were showcased in now empty. The final filter is titled "A different kind of dream", representing Luna's newfound focus on finding comfort and interest in other parts of life rather than the pressures of solely achieving her dream.

Figure 4. *Lifecycle of Dreams with "In the Zone" filter applied*

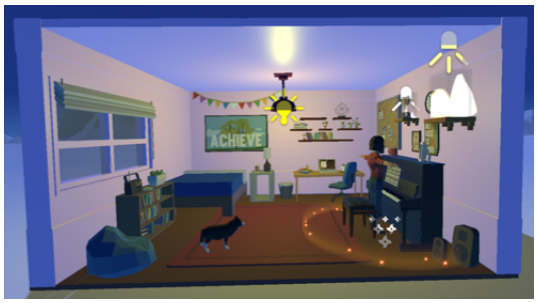

Figure 5. *Lifecycle of Dreams memory with "Living the Dream" filter applied*

The **School Presentation** memory scene represents how Luna deals with attention and confidence in a public-speaking presentation setting. The first applicable filter is titled "Getting Through It", depicting Luna simply getting through the presentation with no visible worries, and is a surface-level view of the situation. The "Nerves" filter speaks to perceiving life through a lens of fear and insecurity in front of others. This filter modifies the scene by applying laughing and yawning animations to

the students in the audience, and a spotlight on a nervous-looking Luna. The "Why So Serious" filter depicts how Luna copes with nerve-wracking experiences through a lens of silliness and taking life less seriously, making her more confident and capable. This is mainly achieved by changing the audience of human students to an audience of plush toys.

The **Family Dinners** memory scene depicts Luna's experiences with her family, and touches on the changing relationships between parents and children over time. The first applicable filter is called "The Adults Are Talking", which depicts Luna's parents sternly talking to Luna and her sister at the dinner table with an allegorical and transparent "fence of protection" surrounding the table. The "Kids Are Alright" filter depicts Luna and her sister living and experiencing outside of the parent's fence of protection, while the parents look onward. The "We Are Family" filter depicts Luna and her family at the dinner table, laughing, talking and supporting each other.

Figure 6. *School Presentation memory with "Getting Through It" filter applied*

Figure 7. *School Presentation memory with "Why So Serious?" filter applied*

System Design

Technical Specifications

ReCapture was designed as a VR Headset experience as it is meant for an individual journey experiencing Luna's subconscous. We used a HTC VIVE Cosmos and hand controllers, as well as Unity to design and experience ReCapture's immersive environment and narrative.

Interactions and Mechanics

Users experience ReCapture's narrative in first-person, through the eyes and shoes of the narrative's protagonist. ReCapture provides users four key interactions and mechanics to experience the narrative:

- the dialogue system
- the traversal mechanics
- camera mechanic
- user interface (UI) interactions

The **dialogue system** mechanic serves to guide the user through the narrative and provide points of context and reflection. In ReCapture's introduction, the dialogue system provides information about the limbo world and Luna's situation through Astro's dialogue. This dialogue is triggered a few seconds after the user begins the interactive experience. In the remainder of ReCapture's narrative, where user's traverse memory scenes in whichever order and the narrative becomes more abstract, the dialogue system serves to provide users context about each memory scene. Users must interact with Astro, located at the corner of each memory scene room, to begin dialogue and get context on the memory scene. Memory scene dialogues also aim to allow users to interpret the presented memory scene on their own before getting context, however the context is also delivered in such a way that users are still motivated to reflect on the memory scenes underlying messages.

The two **traversal mechanics** provided to traverse the limbo world are walking and teleportation, both triggered by interacting with the VIVE Cosmos left-controller joystick and trigger inputs.

To traverse the limbo world and carry out the narrative, users have a **camera mechanic** at their disposal accessed solely through the right-hand VIVE controller inputs. The camera mechanic is central to the narrative, consisting of three different interactions: taking photos, shifting through filters corresponding to specific memory scenes, and selecting a filter. The camera mechanic can only be accessed when the user's right-hand controller is raised to eye-level, mimicking the action of raising a camera to once one's face to take a photo. As long as the right-hand controller is raised to eye-level, the camera UI design appears, signaling to the user they can begin taking photos and shifting through filters. Figure 8 shows the camera UI design, including a familiar viewfinder interface found in most camera applications. Anytime the right-hand controller is below eye-level, the camera UI overlay is removed, and the camera mechanic inputs for taking photos and shifting through filters are deactivated.

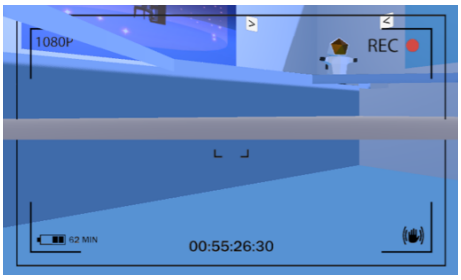

Figure 8. *Camera Mechanic Viewfinder Interface*

Once the user takes their first picture with a selected filter, they will no longer be able to apply the other filters to the memory scene. This rule will be emphasized during Astro's introductory dialogue to motivate users to actively reflect on what each applied

filter reveals about the presented scene's underlying message before permanently selecting a filter to view the memory scene from.

Discussion

Applying Shin's Cognitive Model

The broad and dynamic definition of immersion Shin presents through his cognitive model was a key design influence in ReCapture. Applying the cognitive mode, Shin found that "the intrinsic empathy of users plays a key role in triggering embodiment, which then determines engagement", ultimately meaning how strongly users immerse in a VR story depends on the user's individual traits [1]. In response to this finding, we used procedural rhetoric to develop embodiment and empathy triggers within the camera mechanic based in familiarity. The empathy-based triggers created within the camera mechanic were the relatable and familiar emotionally themed filters users interact with and the motivation for using the camera mechanic in order to bring the narrative's protagonist back to life with her forgotten memories intact. The embodiment-based triggers were the use of familiar body motor movements to access the camera mechanic moving the narrative meaning forward, thus an interaction of the body and the mind.

Another presented finding from Shin's model influencing ReCapture's design was that of flow being the link between what the technology brings to the VR story and what the individual brings to the VR story. Flow is "experienced when an activity's challenges fully engage a user's skills without overwhelming them" [1]. Through the camera mechanic, we engage users' motors skills to access the camera mechanic interactions through the tangible interface of a hand controller. We engage cognitive traits by generating narrative meaning through the physical use of the camera mechanic. Connecting these two findings from Shin's cognitive model to procedural rhetoric we attempt to persuade users to bring in certain individual traits significant to the VR story; guide users to recall their personal and individual traits when interacting with the camera mechanic, both emotionally, through the underlying narrative meaning expressed in the camera mechanic, and in a tangible manner, tangible interface that feels familiar to users.

Besides the design of the camera mechanic, the findings of Shin's cognitive model also give credit to the effectiveness of our narrative and character design. Through a VR story experience study using his cognitive model, Shin sound stimuli are reprocessed by users' own internal cognitive process, which are based on previous experience, intrinsic traits, and context. From that, we concluded if we wanted to persuade users to reflect on perspectives, we needed to focus on bringing in user's intrinsic traits by presenting familiarity not just within the mechanics, but the narrative.

In ReCapture, we do this within the narrative in two ways. The first ways is how Luna's character is presented to users in an open-ended way. Since user's are given minimal context about Luna's background and who she is at the beginning of the narrative experience, they naturally bring more of themselves into the VR story in response to the presented situation of a young girl in a state between life and death who must recapture her forgotten memories before coming back to life. Essentially, we are asking users to bring their experience into the equation by asking them to re-create a part of who Luna is through recapturing her forgotten memories. The second narrative and visual design choice working in tandem with Luna's open-ended character is the presented situation of recapturing forgotten memories in a minimalist limbo-like world space. The limbo world is largely a representation of Luna's subconscious, with moon and space themed environment design, corresponding also to Luna's name translating to "moon". There are minimal to no distractions in the world space (See Figure 1), as most of the visual content is within each memory scene. This sets a tone of reflection within the limbo world space, where focus and interpretation can be placed within the memory scenes and camera mechanic. This connection between the narrative and environmental setting aims to create a space for self-reflection, matching ReCapture's desired emotional response output.

Applying Procedural Rhetoric

In ReCapture, procedural rhetoric was used to design the camera mechanic, which involves two direct interactions: taking photos and shifting through available filters to apply to corresponding memory scenes. Although we afford the user walking, teleportation, and dialogue interaction mechanics, the camera is the core process moving the narrative, and its underlying intent, forward. Without the camera mechanic, ReCapture would simply be an exploration through Luna's surface-level memories, rather than a reflection of the different perspectives her memories could take, revealing deeper feelings and interpretations of those memories. There are three interaction rules within the camera mechanic attempting to persuade the user about a different, but similar idea tied to the overall narrative. When all interaction rules are experienced together, the camera mechanic aims to elicit a desired emotional response of reflection on perspectives.

The first interaction rule is to take photos. The user must use the camera to take photos in each memory scene in order to recapture the protagonist's forgotten memories. This rule attempts to persuade users that the intent and selectivity behind a single photo can reveal elements not just about life and the world at large, but the individual behind the camera. The second interaction rule is shifting through filters. In each memory scene, the user must shift through the filters corresponding to that scene in order to make the "perspective" modifications to the scene. This rule attempts to persuade users that we play a role in choosing the perspectives to view and experience life through, all for different reasons or circumstances. The last interaction rule is confirming a selected filter. Once the user takes their first picture with a selected filter, the applied "perspective" changes to the corresponding scene become permanent and from that point on the user can only take photos with that selected filter applied to the memory scene. This rule attempts to persuade users to actively reflect on what each applied perspective filter is revealing before permanently applying a filter their remaining photos are limited to.

VR technology affords designers different input interfaces than conventional video game consoles or PC mouse keyboards input systems. Making use of the HTC VIVE Cosmos hand controller to design the camera mechanic, we created physical rules using tangible interfaces that take part in a user's meaning-making of ReCapture's narrative. The physical rules users interact with include raising the right-hand controller up to eye level in order to take a photo or shift through filters and clicking button-like inputs on the hand controller to take pictures that are also similarly positioned to buttons in actual handheld cameras.

Tying physically-activated rules familiar to users, such that they mimic the action of taking photos with an actual handheld device, to interactions that are narratively presented and mindfully designed to persuade users about an underlying idea, we generated embodied cognition. Embodied cognition is an interaction of the body and the mind that takes place within the context of a specific environment [10]. In virtual environments, embodied cognition "allow(s) users to gather spatial information about the virtual environment using the same perceptual systems they would use to gather spatial information about the real world", and may also "result in improved cognition due to the additional information users are able to collect through physical movement" [11, 12]. Using procedural rhetoric to design a camera mechanic for a VR storytelling platform, we make both the mind and body interact with each other in order to persuade users to reflect on perspectives, in turn generating a sense of embodied cognition. Thus, meaning making, or persuasion, can be supported by physical means as well as narrative means in VR storytelling.

Conclusion

ReCapture serves as an example of applying VR story design research and incorporating design methods from the game design industry, particularly procedural rhetoric, to achieve desired emotional output responses from users in immersive spaces. In ReCapture, a VR interactive narrative was created that enhanced the intentions and symbolisms behind the use of photography as an interactive mechanic. Integrating procedural rhetoric to design the camera mechanic with findings from Shin's cognitive model related to generating immersion applied embodied cognition concepts. In doing so, users aim to be motivated to reflect on the perspectives one chooses to view life through. The ReCapture experience can be used to determine if the design decisions were successful at achieving certain attitudes and emotions from users, as well as a basis for an examination of what specifically the users brought into the experience, such as if users made decisions in the interactive narrative based on their own perspectives, or rather what they inferred the protagonist's perspective and situation called for. Finally, ReCapture can be a base to further explore how procedural rhetoric can work with immersion techniques, such as those presented in Shin's cognitive mode, to create compelling, persuasive, and immersive VR experiences.

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