'Saudade'

Exploring Immersive Boundaries: Expanding Player Engagement through Horror Environments and Heuristic-Based AI in VR

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I.   Abstract

'Saudade' is a virtual reality (VR) psychological horror game designed to elevate player immersion by integrating adaptive artificial intelligence (AI) and meticulously crafted atmospheric design. This project investigates the boundaries of the horror genre by exploring the psychological tension between the player and an adaptive antagonist. Set in a mysterious, unsettling, yet oddly familiar facility, the player must complete a series of tasks to escape. The facility, filled with cryptic clues and challenging puzzles pointing to its forgotten past, evokes a sense of dread and curiosity. Each task/puzzle completed brings the player closer to understanding the sinister demise of the facility.

A central feature of the game is an antagonist that dynamically responds and adapts to the player's actions, learning from the player's behavior and developing new strategies to hinder their progress of escape. The antagonist observes and analyzes player actions, forming strategies based on observed behavior patterns. For instance, if the player frequently uses certain evasive methods or hides in specific locations, the antagonist adapts by altering its patrol routes or how it attacks the player. This constant adaptation heightens the psychological tension of the player experience, as the player cannot rely on predictable adversarial behavior. The project explores

the potential to revolutionize horror engagement and immersion in VR by creating an AI antagonist that adapts to the player's actions.

II.   Project Overview

The VR experience explores the extent of immersion in the horror genre by establishing a more intimate relationship between the user (the player) and a *figure of horror*. To define a figure of horror in the video game context: an entity designed to antagonize and scare the player, typically seeking to prevent the player from accomplishing their goals. The project utilizes a virtual reality headset as the primary mode of user interaction instead of a PC to emphasize the sense of immersion.

Within digital media, particularly video games, the horror genre tends to elicit higher levels of engagement between the user and the content. Nothing establishes a greater display of user experience than witnessing someone jump out of their chair, throw off their headset, and scream as if they felt the danger in real life—a startle response, or in other words, a 'jump scare.' The body reflexively acts to protect itself from the sudden appearance of apparently dangerous stimuli. The eyes go wide and repeatedly blink, and the arms and hands attempt to deflect harm from the body's vital parts. However, jump scares are a relatively straightforward method of accomplishing horror, often regarded as cheap, reducing the artistic buildup of momentum and tension. Traditional horror games rely heavily on jump scares; however, atmosphere, suspense, and adaptive threats can achieve a more profound sense of fear.

The goal is to implement a horror antagonist relying on a set of heuristics to respond and adapt to the player's actions. While the player attempts to escape a facility (theme undecided), the antagonist tries to 'hunt' the player before the player fulfills a series of tasks that would grant their survival. The player will have a range of methods to evade or avoid the antagonist (can

never kill/eliminate it). However, suppose the player tends to rely on a particular method or two (e.g., hiding under a desk). In that case, the antagonist will develop counter-strategies (e.g., searching underneath desks) to challenge such repetitive behavior. The result is a highly interactive, replayable, and engaging experience.

The player wakes up in a mysterious facility containing eerily familiar artifacts of nostalgia. An inexplicable and pervasive sense of unease disturbs the player, motivating them to desire to leave the building as soon as possible. To escape, the player must complete a series of tasks/puzzles while discovering the unsettling history of the seemingly abandoned facility. The player finds that they are not alone— some entity seeks to prevent their escape. Whenever the entity subdues the player, they suddenly reappear in the room where they wake again.

III.   CPSC 490 (Fall 2024)

A. Technical Description

- Game Engine: Unity

- VR Headset: Meta Quest 2

Before concluding CPSC 490 in Fall '24, the antagonist's heuristics-based functionality will be complete, including the interaction between the player and the antagonist. A rough layout (no texturing and minimal models and objects) of the in-game map will accompany this submission, as needed in testing the accuracy of the antagonist's behavior relative to the player's behavior.

The final submission will include a playable prototype without extensive texturing and modeling—enough to allow a testable and observable interactive experience with the antagonist.

B. Timeline

Phase 1: Research and Planning [also conducted during the preceding summer]

- Conduct a literature review and gather sources of inspiration from artists + other video games/VR experiences.

- Define game mechanics and AI behavior.

Phase 2: Development [bulk of time spent]

- Build the game environment prototype and necessary assets.

- Implement AI behavior and adaptive mechanisms.

- Implement the player mechanics and methods to thwart the antagonist.

- Implement the features of game progression and its conclusion.

Phase 3: Testing and Iteration

- Conduct playtests (using myself and others) to refine AI responses and the gameplay experience.

- Iterative development based on feedback.

Phase 4: Polishing and Presentation [in conjunction with Phase 3]

- Final adjustments to the gameplay experience.

- Prepare for final presentation and submission.

C. Deliverables (submitted to the Zoo in accordance with CPSC 490 policy)

- .apk file (installed on the VR headset to run on startup)

- Unity package file (to launch on a computer)

- Source code as C# scripts (also included in the Unity package file)

IV. ART 496 (Spring 2025)

A. Technical Description

Before concluding ART 496 in Spring '25, the following will be completed:

- A textured antagonist model equipped with polished animations and sound effects

- A detailed in-game environment with high-quality textures, models, and atmospheric sound design

- Interactive elements within the environment (e.g., picking up items)

- Dynamic lighting

- Environmental storytelling via objects and interactive elements

B. Timeline

Phase 1: Antagonist Modeling, Texturing, and Animation

- Complete the 3D model of the antagonist.

- Create and apply detailed textures to the model.

- Rig the model for animation and interactions with the environment and the player.

- Develop idling, walking, running, attacking, and successful subduing animations.

- Integrate the animations into the game environment.

Phase 2: Player Modeling, Texturing, and Animation

- Complete the 3D model of the player.

- Create and apply detailed textures to the model.

- Rig the model for animation and interactions with the environment and the antagonist.

- Develop animations for interactions with interactive objects and the antagonist.

Phase 3: Environment Modeling and Texturing

- Model main areas of the facility (e.g., hallways, rooms).

- Model major environmental assets.

- Create and apply detailed textures to the modeled environment and its assets.

Phase 4: Object Modeling, Texturing, and Animation

- Complete the 3D models for the interactive objects (e.g., flashlights).

- Create and apply detailed textures to the objects.

- Rig the models for animations and interactions with the environment, the player, and the antagonist.

Phase 5: Audio Design

- Create and implement ambient sounds, sound effects, and dynamic music (e.g., when chased by the antagonist).

- Implement positional/spatial audio to emphasize the VR experience.

Phase 6: Polishing and Presentation

- Conduct extensive playtesting to resolve any issues or bugs.

- Refine and finalize all elements to ensure a smooth in-game performance.

- Construct the physical presentation for the undergraduate exhibition.

C. **Deliverables**

'Saudade' will be available to play at the undergraduate senior project exhibition at the Yale School of Art.

- project's .apk file (to run on the VR headset)

- the Unity file (to launch on a computer)

- Documents and renders of the storyboarding/design process, including models