Using Environmental Narration to Deliver a Complex Narrative

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***Executive Summary*—This study developed a game level that used its environment to present a complex narrative in order to research the effectiveness of environmental narration. The term Environmental Narration distinguishes the techniques of this thesis from environmental storytelling. The purpose of this level was to analyze the effectiveness of environmental narration and reveal several best practices for game development.**

***Index Terms*—Environmental Storytelling, Detective Game, Environmental Clues, Analyzing Clues in Level Environments, Using the Environment to Tell a Story, Environmental Narration**

I. Introduction

OVER the span of three decades, digital gaming has become a complex interactive experience considered by many as a new medium of art [1]. Digital game elements such as graphics, music, mechanics, and level design have evolved in new and complex ways. Among these elements, the art of telling a story within a game, the narrative, has also gone through several transformations. Due to the visual and audio limitations of early games, written text delivered game narratives to players. With advancements in video rendering and animation, in-game cinematics became another method of delivering story elements. Further advancements made in audio technology allowed for voice-overs cues and character dialogues to relay game narratives [1].

In an effort to make narratives more immersive, designers strive to use the game environment itself to help deliver story elements [2]. Environmental storytelling is about allowing players to construct a narrative through visual, lighting and audio clues found in the game world. The arrangement of environmental elements in the game world reveals clues about what occurred. Like a jigsaw puzzle, the individual elements come together to tell a story. Delivering a story through the environment has proven effective in the past, and assists with keeping players immersed in the game world.

Due to the evolving potential of immersing players into a story, games continue to grow as an art medium. Since digital games draw players within immersive environments, environmental storytelling has come to be a popular design technique among game developers. Having a story delivered through the environment can provide vital information while keeping the player immersed in the game world. However, game development still relies on blocks of texts and dramatic movies as primary methods for delivering game narratives [3].

For the purpose of this study, the definition of environmental storytelling is delivering a game's story elements through its environmental cues. Environmental storytelling mainly delivers simple stories that are not central plots to their game world. The focus of this thesis defines environmental narration as clearly delivering a complex game narrative almost entirely through the game environment. The main difference with environmental narration is how it delivers complex narrative elements and relies heavily on environmental cues.

A game level developed using the CryEngine 3 Mod SDK for the game *Crysis 2* tested the effectiveness of environmental narration. The level represents a mass murder scene that takes place in a science lab experimenting on living human subjects. When one of these human subjects discovers the harmful human experiments, he returns to murder everyone in the science lab.

After developing the level, players found and analyzed specific environmental elements to reveal a complex murder mystery. Each environmental clue explained a piece of the mystery, and by combining various clues, players attempted to discover what had happened. Feedback received from the players allowed for an iterative process to improve the delivery of the level's narrative.

The thesis and level artifact is not for testing the psychology or behavior of players, but instead discover the best practices of developing environmental narration. The main goal of the thesis is to create a list of effective techniques for developing complex narratives into game environments. The thesis level only represents the first level of a full investigative game meaning that a full version would have an introduction sequence before and other levels after it. For the scope of this thesis an opening text message replaces the introduction sequence to establish basic information about the level to players.

At several points during the development process, experienced gamers examined the level and provided design feedback. They were unfamiliar with the level layout and the written story. After each playtest, the players explained what they believed happened in the level. By analyzing the playtesting feedback, new level iterations became more effective at using environmental narration. The success of these iterations were dependent on how well players noticed the importance of certain clues, what information they

discerned from them and what narrative they formed from the environment. Each level's iteration went through modifications to guide players closer to the written narrative.

The main criteria analyzed in each playtest to determine effectiveness of this thesis was:

1. Are players able to determine where the killer entered and exited the level
2. Are players able to string together a plausible story based on the clues provided in the level
3. Are players able to determine the killer's path through the environment

II. Research

Environmental narration heavily relies on principles and techniques already used in environmental storytelling. Environmental narration is simply using environmental clues to convey lengthy and complex narratives to players. Establishing the basic principles of environmental storytelling creates a foundation to expand into environmental narration.

One major environmental storytelling principle is to develop the environment so it plays to the expectations of players [4]. The more an environment fulfills the expectations of its players, the more immersed they are into that environment. If an environment appears, feels and sounds like a military base, then players can easily believe they are inside a military base. But the moment something contradicts and breaks their immersion, it can be difficult to re-establish the same level of immersion.

Letting the player discover where they are and how the environment is important to them is another important principle [4]. When using environmental storytelling, the player should be able to quickly know where they are and how they relate to the space. Once a level starts, the environment needs to communicate its overall theme and why the player is in this environment. Establishing this opening level context further pulls players into the environment and allows them the satisfaction of self-discovery.

The most popular and successful method of implementing environmental storytelling is through cause and effect, where a player analyzes clues in the environment to discover the cause that led to a particular effect [4]. With this technique developers can help players understand more about the environment and guide them to important narrative elements. This also allows players to feel satisfaction from discovering important information on their own.

Another principle of environmental storytelling is giving the player something familiar to keep them anchored in the environment [4]. If an environment, like an alien spaceship, is unknown or foreign to players then they can easily feel alienated from their surroundings. Having a reference in the environment, like a window that shows Earth, reminds players they are on an alien spaceship. This allows players to relate more to the environment, which immerses them further into the game.

Developers need to know when to use visual complexity in their environments to create unique and memorable spaces [4]. While creating an environment, visual complexity can draw a player's attention to a particular area and even create memorable moments in the game. However, this same visual complexity, if used wrong, can make an environment appear too busy or cluttered. If unimportant areas, like hallways or closets, have visual complexity, then they become monotonous and forgettable. Areas important in the environment should guide players with their visual complexity.

Environments can become more interesting to players by using contrasting elements to create variety and reduce repetition [4]. By using contrasting elements developers can emphasize and perpetuate particular emotions within the player. Having a player go from a quiet environment to a busy chaotic environment places emphasis on how busy the new environment is. This metaphoric form of asymmetry creates variety in the environment which reduces repetition. The environment can appear more realistic and more interesting with some well-placed variety.

A. Game Research

Even with the effectiveness of environmental storytelling, there are an overwhelming number of game narratives delivered mainly through texts and cinematic movies [3]. The reason given for this is that environmental storytelling alone is unable to communicate a narrative well enough. A common belief in the game industry is that at some point players need to have the story explicitly explained to them.

By incorporating a story into the environment developers can create a sense of mystery, further immerse players, relay important information and even give players the satisfaction of self-discovery. While most games already use environmental storytelling in some way, very few use it to deliver the main narrative. Currently the usage of environmental storytelling is to help reinforce a narrative primarily delivered through text, dialogue or cinematic movies [3]. Here are some examples of modern digital games that utilize environmental storytelling in their game worlds.

1) Dead Island

Dead Island [5] is a first-person horror game with fast paced action gameplay. The game takes place at a vacation island resort where players try to survive a zombie outbreak. In *Dead Island* environmental storytelling mostly informs players of the chaos and destruction caused by the zombie outbreak. Players find knocked over furniture or streaks of blood, but rarely is there a complex story behind these scenes.

Figure 1: *Dead Island* bloody pool scene

For example in one area, there is a pool where a man is kneeling beside and crying over a dead body with several other bodies floating around him. The pool is red with blood and the dead body he is crying over has a butterfly knife stuck in its head. It is easy to piece together a quick story just by analyzing the clues. The man is on his knees crying after killing a loved one with his butterfly knife, most likely after killing several other zombies. When the player runs up to the man he says that he had to kill his own brother. This is an example of environmental storytelling informing players of a simple side narrative.

Figure 2: *Dead Island* blood trails create foreshadowing

Also from *Dead Island* [5] players find a trail of blood going under a closed door and into a room. Therefore, players received a possible hint of danger lurking on the other side of the closed door. Without using text or a cinematic movie, players could prepare for a possible attack as they entered the room. If they continued to follow the blood trail into the bathroom a zombie attacked them. Environmental storytelling here acts as a warning for players walking into impending danger. But unlike the focus of this thesis, these examples do not tell the game's overall narrative. Even with these scenes removed, players can still discover *Dead Island's* main narrative.

2) Bioshock

Bioshock [6] is an open world first-person shooter game with a simplistic leveling up and skill system. Players navigate an underwater utopia city having fast-paced gun battles with its aggressive citizens. *Bioshock* is an example of conveying complex stories primarily through its environments. It unveiled the main story arc through character dialogue, text and expositions, but much of the underlining backstory comes from environmental clues. A good example of this is a backstory told within the Medical Pavilion level.

Figure 3: Area from the medical pavilion in *Bioshock*

Throughout the Medical Pavilion level, there are clues in the environment of the insane doctor J. S. Steinman's obsessive and destructive cosmetic work to achieve physical perfection. In the surgery foyer are posters of women's faces with blood and cut marks on them. In several hallways and rooms, there are dead women with surgical tools stuck in them or lying nearby. The name J. S. Steinman is near or on these grisly scenes usually written in blood. This helped players link J. S. Steinman to these murder scenes without using texts or a cinematic. Although players can find recordings depicting Dr. Steinman's extreme actions, they never explicitly explain any of the environmental clues found in the level. Even if the Medical Pavilion only tells a backstory in *Bioshock*, the complexity of the story makes its implementation into the environment difficult. This is an excellent example concerning this thesis because it has a complex narrative delivered mainly through the environment.

3) Dead Space 2

Horror-survival games also use many environmental storytelling elements in their levels [7]. *Dead Space 2* [8] is a third-person horror survival shooter game that puts players into the middle of a necromorph or 'alien zombie' outbreak. The game's progression is slow-paced, making normal-speed walking the default movement speed for players. Within *Dead Space 2* there are many examples of environmental storytelling, including ones that reiterate the game's overall main story.

Figure 4: A Unitology ritual scene in *Dead Space 2*

For example, as players progress through the Church of Unitology level in *Dead Space 2* they must go through the library. In this room the player discovers several dead bodies of Unitologists or members of the Unitology Church. Each body is on mats equally spaced apart with lit lanterns placed in strange configurations across the floor. This scene not only reveals a ritual sacrifice that took place, but it also reintroduces the game's overall theme and backstory. The whole necromorph outbreak initiates when Unitologists found an alien Marker that reanimates the dead. This scene helped restate the backstory of *Dead Space* [9] and *Dead Space 2* without using text or a cinematic movie. The importance of this design technique is it shows how to deliver a story without explicitly giving information. A player is able to stay immersed in the game world and create their own story about that world only using environmental clues.

4) L.A. Noire

The use of environmental storytelling by *L.A. Noire* [10] closely resembles the goals of this thesis. The game has a detective/investigation style of gameplay that encourages players to analyze clues in order to progress through the story. They may then use these environmental clues in future investigations, questioning of witnesses and interrogations.

Figure 5: Investigating clues in *L.A. Noire*

But even *L.A. Norie* does not fully utilize environmental storytelling as its main method of delivering its main story. While analyzing clues in *L.A. Noire*, the player's character reveals when something is of significance in the investigation. By using a voice over, that represents the character's internal dialogue, players know if a particular item is a clue. In addition, the game has a way of communicating that a clue is nearby or there are still clues left in the environment. One of these methods involves playing music as long as at least one clue is still undiscovered. Additionally, the controller vibrates in parallel with an audio 'chime' when the player comes close to a clue, which increases in intensity as they approach the potential clue. These gameplay features can easily cause a break in the player's immersion because they can ignore the environment until they hear a chime or feel a vibration in the controller. This reduces the effectiveness of environmental storytelling.

Figure 6: Recording an analyzed clue in *L.A. Noire*

These design techniques in *L.A. Noire* are outside of the player's world because they are not available in the real world to simulate intuition. In addition, if the game's design tells players what is important, how it relates to the crime or the cause of the evidence, then they are not uncovering the mystery themselves. The player is merely there to guide their character to clues and hear how characters solve the mystery for them.

The creation of the level artifact for this thesis examines how well players put together a level's narrative only with environmental clues. The less overt design techniques help deliver the level's narrative, the more effective the level artifact.

B. Investigation Research

Research on the differences between real life and "Hollywood" investigations provided a better understanding of crime scene investigations. This research helped provide clarity to real life investigation methods because so many people readily accept "Hollywood" investigations as fact. The research started with watching several episodes of *CSI: Las Vegas* [11] and documenting what occurred during their investigations. Comparisons of this information to web articles

documenting real CSI practices and procedures revealed many misconceptions [12].

Research discovered that each real crime scene is unique, and real-world CSI units altered their methods of investigation depending on the crime scene [13]. This means there is no "textbook" method investigators use for every crime scene as portrayed by Hollywood. A crime scene outside in a grassy field requires different investigation methods then one inside a hotel room. Even a crime scene in a hotel room may require different investigation methods than one in an apartment room.

There are five patterns used when investigating a real crime scene to thoroughly search for clues in the environment [13]. These patterns are paths investigators move along as they examine the area for evidence.

These paths move in either a:

- Inward spiral motion
- Outward spiral motion
- Grid-like motion
- Parallel motion
- Within zoned areas.

Investigators determine which path to use based on the crime scene in order to maximize the effectiveness of their search.

When an investigator documents evidence from a real crime scene, they do not interject their opinions on the evidence [13]. If an investigator saw a puddle of reddish brown liquid, they do not document it is a puddle of blood. Real investigators document the evidence as a reddish brown liquid puddle then later determine if it is blood through forensic analysis.

Research on mass murders helped in determining the path and actions of the killer in this level. A deranged individual, who believes they are a victim of an unjust act might justify killing others as a form of justice [14]. This manner of thinking can lead someone to commit mass murder and call it vigilante justice. A killer may not limit their vigilante justice only to those responsible for an unjust act, but sometimes they target society, the culture or the world. Strong fits of rage or deep despair may also motivate a person to commit mass murder.

III. Methodology

Development of the level artifact required creating a backstory, the killer's critical path, a pristine level and an evidence level. Details of required information were continuously refined to increase the level's effective use of Environmental Narration. Development involved conducting playtests with player sources, gathering feedback and iterating level details. These playtests helped to uncover what needed adjusting with each level's iteration.

A. Level Development

The first step in developing the level was creating a Level Design Document with explicit details on the level's creation. Writing a detailed backstory of the level defined the level's context during development.

Level backstory: A soldier named Tim Hopper regularly goes to the C.H. Baxter Laboratory for medical treatment and checkups. Only when he starts having weird muscle spasms and headaches does he suspect something is wrong. Tim discovers that the scientists at Baxter Lab have experimented on making him a genetically enhanced "super soldier." Realizing that he was deceived, he then plans a deadly revenge scheme to kill all of the Baxter Lab workers in a grisly fashion. When Tim threatens one of the scientists in his home, the scientist makes a deal with him. The scientist agrees to help Tim gain access to the Baxter Lab if he spares his life.

The next day, when the traitorous scientist comes to work, he prepares for Tim's arrival. Tim bypasses the guards at the front door by sneaking into the lab through a ventilation shaft in the executive copy room. Next, he disables the security camera watching over the whole executive office area. Then, he forces the lead scientist and director of Baxter Lab to leave their executive offices at gunpoint. Tim holds these two men most responsible for his condition and he brutally tortures and interrogates them. Once he discovers the truth, Tim destroys a super soldier display case and kills the executive group execution style. Subsequently, he heads to the main lab area where he finds the dead body of a fellow soldier and friend. At this point, he loses any semblance of control and begins a mass murder spree throughout the Baxter Lab building.

From the main lab area, Tim proceeds through the office area murdering anyone he finds with the exception of the traitor scientist. In the reception area, Tim kills two guards at the front door, he shoots the first guard unexpectedly from behind and kills him instantly, while the second guard is able to turn and open the door before Tim shoots him dead with two shots. From the receptionist's desk, Tim takes some flowers and returns to the main lab. He places the flowers on the fellow soldier's body to show his respects. At this point the traitor scientist pulls a handgun from his briefcase and tries to kill Tim, but he is able to detect his betrayal and kills the traitor scientist first.

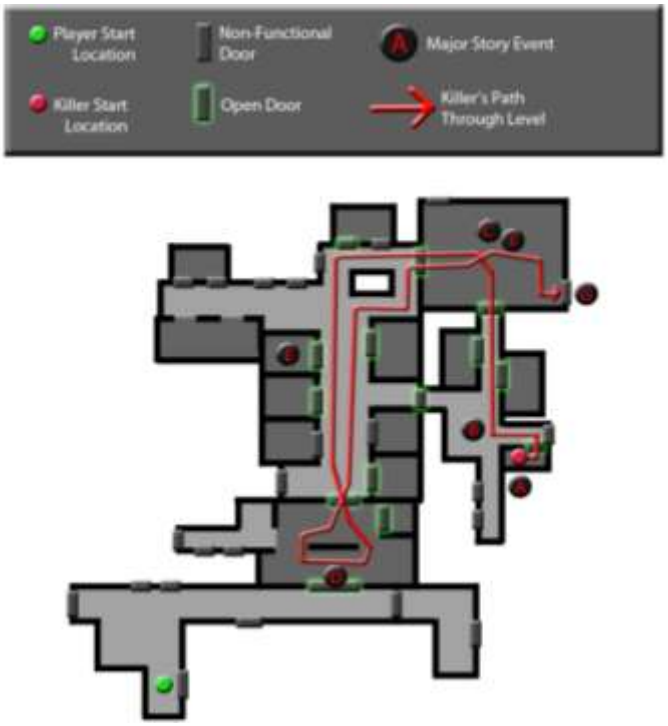

Figure 7: Killer's level path

Killer's Path:

A. Killer enters level through ventilation shaft in executive copy room
B. Killer interrogates, tortures and executes the director and lead scientist of Baxter Lab
C. Killer finds the body of fellow soldier and friend on operating table in main lab
D. Killer shoots and kills both entrance guards before killing the receptionist. Killer gathers flowers from the receptionist's desk
E. As killer heads back to main lab with flowers, traitor scientist gets his handgun out and prepares to betray the killer
F. Killer places flowers on the body of the fellow soldier and friend before shooting and killing the traitor scientist
G. Killer exits Baxter Lab through fire exit door

This backstory defined the environmental theme, arrangement of evidence and motives behind the murders. This determined the kinds of rooms, appearance of these rooms and the kinds of props that decorated the science lab and office areas.

B. Constructing the Crime Scene

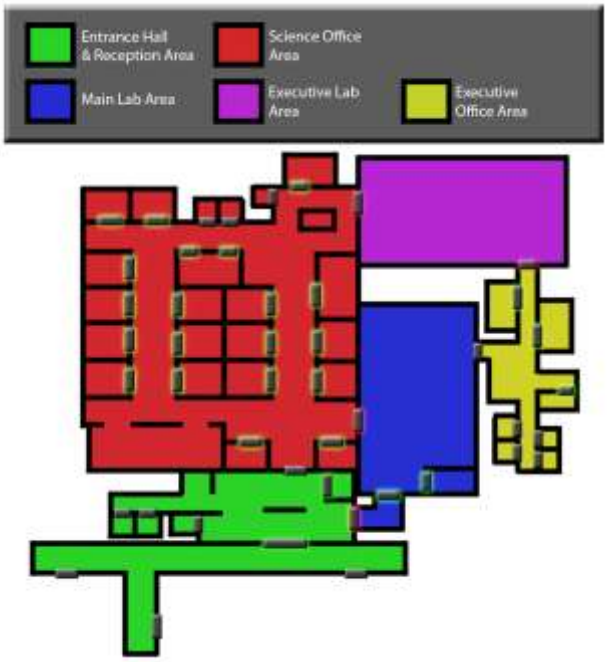

Figure 8: Early map of area breakdown of level

The creation of many maps analyzed the placement of evidence, the path of the killer, the chronology of the murders, level size and layout. The final map went through several iterations to create a logical environment with efficient level flow. When the level layout reached a semi-final state, development on a white box level started.

The white box explored the level's actual size, flow and layout in three-dimensional space. The most significant things learned from the white box were:

- Many of the rooms in the white box needed resizing to make the environment appear more believable. By placing reference objects in the rooms, their actual size became clearly apparent and adjustments were made accordingly
- The initial development of the level had many evidence items to create complexity in the level's narrative. But the number of items, such as too many dead bodies, became excessive and distracting. Having so many evidence items led to the killer's path becoming cluttered with evidence and difficult to follow
- The level flow and killer's path felt unnecessarily complicated and illogical. For example: the killer started in the middle of the office area, moved to the reception area and then went back to the executive lab area. This initial path increased complication without adding fun and immersion for the player.

Due to the issues revealed in the white box, the level went through a redesigning process. After redesigning the white box, the level decreased in size and number of evidence items. A new path started the killer in the executive office area and went through the main lab to the reception area. The tighter

level flow, more logical killer's path and reduction in evidence items made the environment more effective at revealing a complex narrative.

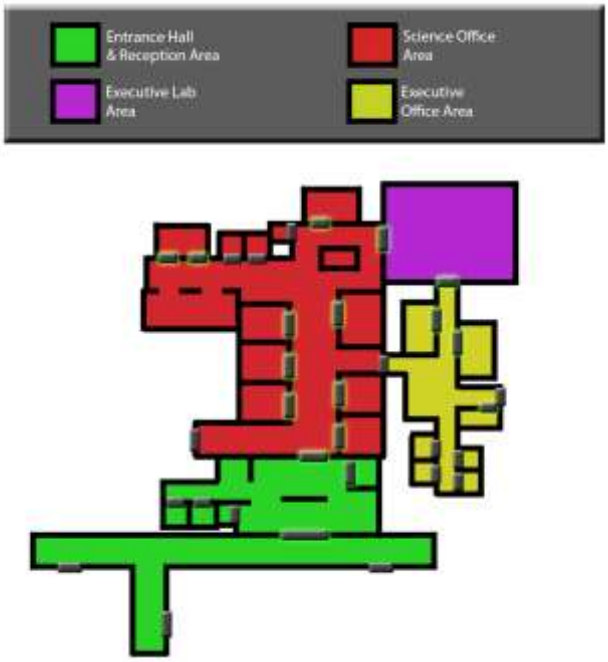

Figure 9: Final map of area breakdown of level

C. Building the Level

Inspired by the development process of the game *Dead Space* [13], development started with creating the level in an unaltered state before the murders happened. Creating an unaltered or "pristine" level involved making a layer called "Markers Pristine." This layer contained any objects altered in the environment during the murders but appeared as normal or unaltered before the murders occurred.

Pristine Level:

- Upright furniture
- Upright objects
- Solid glass planes
- Closed briefcase
- Undamaged security camera
- Vent cover on ventilation shaft

Another layer called "Markers Evidence" had duplicates of the same evidence objects as the "pristine" layer. This layer showed these items in their altered state after the murders occurred. The "evidence" layer also had other evidence on it not originally from the environment such as blood stains or dead bodies. Options for these layers allowed a developer to make objects visible or invisible in the level.

Evidence Level:

- Dead bodies
- Blood stains
- Blood drop trails
- Knocked over furniture
- Broken glass
- Knocked over objects
- Broken security camera
- Bullet holes
- Bullet casings
- Fallen papers
- Fallen vent cover
- Flowers
- Open briefcase with ammo clips

Figure 10: Executive copy room on pristine layer

As an example, the executive copy room appears normal and organized when the "pristine" layer is visible.

Figure 11: Executive copy room on evidence layer

Duplicates of the chair, laptop, vent cover, potted plant, papers, and the sticky board appear knocked over when the "evidence" layer is visible. Also, skid marks and dirt trails only appeared when the "evidence" layer was visible, because there are no duplicate copies on the "pristine" layer. The arrangement of these props resembles someone climbing into the room from the ventilation shaft. This scene's careful construction was not to show any signs of a struggle or vandalism. The skid marks on the wall gave indications of someone planting their feet as they crawled out of the ventilation shaft.

Having the ability to switch between an altered and unaltered state during development greatly assisted in developing environmental story elements. Viewing the level from an unaltered state created ideas for how to alter the environment after the killer passed through. The locations

where the chair, laptop and vent cover fell in the executive copy room came from using the “Pristine” level as reference for placing objects affected by the killer’s entry into plausible locations. As an example, the location of the laptop on the “pristine” level gave plausible ideas of where it could fall if accidentally knocked it over on the “evidence” level. Other factors like reason for object’s altered state and the amount of force used to alter it changed the objects position on the “evidence” level. Deliberate vandalism altered a fallen object’s position differently from accidentally bumping into the object. Also, the amount of force used to alter the object would change how far it fell or moved from its location on the “pristine” level.

If the level’s development involved placing evidence items and then creating a story, it most likely would not be as effective with environmental narration. This could have easily caused continuity errors in the story or in analyzing environmental clues.

Decorating this level for an investigative style of gameplay presented a challenge due to the expectation of players closely examining the environment. A decorative prop that was too flashy or attention grabbing earned the label “anomalous” because it could easily distract players. Anomalous also applied to an unrealistic number of props that overpopulate the environment. For example, unique objects and properties can help give an environment its unique identity. But if a unique object or property is too numerous in an environment then they become anomalous or unrealistic. Having too many of one unique object and property such as a bright pink tissue box, can easily draw a player’s attention.

The placement of props can also tell the wrong story elements to players. Placing certain props in certain ways can lead players to believe something about the narrative that is inaccurate or exaggerated. Having body bags placed on racks created the impression that the science lab was a cryogenics lab or a zombie attack had occurred.

Environmental narration heavily relies upon having a large variety of unique objects and properties. Having more of this variety allows for the placement of more unique objects and properties while reducing their anomalous effect numerically. All anomalous objects went through a filtering process to either completely remove them or reduce them in number.

Placing evidence items within the level was a crucial part of developing the environmental narration elements. The evidence items are the main objects that tell the level’s narrative, and if placed wrong they could easily lead players away from the narrative. Bullet and exit holes had to meticulously line up with gunshot victims and blood trail had to form recognizable paths.

D. First Set of Playtests

Three sets of playtests occurred at different times with eight different players. When the level reached its first major iteration, players examined its effectiveness through playtesting. For each playtest the player received information at the beginning of the test giving them context about the game level. To establish this context, the player saw a message telling them they were an investigator examining a crime scene. Since this level did not have an introduction sequences to get players familiar with the player’s character or their motives, this opening messages help set this context. The opening messages were purposefully vague and revealed nothing about the written narrative so that players could freely form their own stories.

Each playtest provided vital feedback as to how players interpreted the environmental clues. This feedback contributed to further develop the level and its environmental narration. The results gathered from the first set of playtests yielded various stories that diverged from the written narrative.

When players saw the text at the start of the level instructing them to “Investigate what happened in the environment,” they began to search everywhere for possible clues. The amount of searching went beyond the original expectations because all players went as far as reading text on props. By reading the text on posters, flags, televisions and newspapers the players formulated incorrect narratives. This behavior indicated the importance of not only specifically placing objects to advance the narrative, but also placing props with the intention of decorating the space. Seemingly innocuous props can take on unintended meaning when placed in an environment which the player’s task is to closely investigate or examine their surroundings. With a vague context of the level and no explicit information, any story the players came up with was plausible to them.

Each player commented on at least one object that appeared out of place or anomalous. Some of these comments were pointing out how an object visually clashed with the rest of the environment. As an example, one player mentioned that a particular door with scratches and dirt appeared as an exterior door inside an interior space. Primarily, the anomalous comments came from objects that either contradicted logic or told a different story entirely. As an example, one player saw bodies on the body racks in the main lab and assumed there was a zombie outbreak.

All of the players repeatedly jumped on top of counters and tables to get better views of objects. They also wanted to activate a zooming feature for a detailed look at the environment and assist in deciphering the level’s narrative.

Figure 12: A scene of scattered papers

Throughout the level, players either misunderstood or overlooked several important clues. This was due to them receiving ambiguous messages or just having difficulty seeing them. This gave clear feedback that the clues needed to both stand out and not have an ambiguous arrangement. Since players were going to form many of their own conclusions, the level did not need to add any additional confusion.

When a player saw an open file cabinet, scattered papers, or an open briefcase, they immediately assumed the killer searched for something important. Even if these scenes meant to show a struggle between two individuals, the prop's arrangements sent a different message.

Figure 13: Execution style murder scene in executive office

Each player had a hard time understanding the importance of the body on the operating table in the main lab. They also missed the lone flower placed on the body because of its difficulty to view in the environment.

Inside the executive office area players could not decipher the significance of two bodies arranged in an execution style. Only one player recognized that the arrangement of bodies appeared like an execution style killing.

E. Changes for First Iteration

After the first set of playtests, many changes occurred to improve the level's effectiveness.

- The beginning text changed from "Investigate what happened in the environment" to say "Investigate a possible break in." This new text message gave a better context of the level for players, and alleviated some of the wild stories in future playtests.

Figure 14: Body on operating table in main lab

- Another pass to replace and remove objects labeled as anomalous occurred. Adding and moving various important clues around in the environment made them easier to find.

Figure 15: Body on operating table with more flowers

- By placing more flowers around and on the operating table in the main lab they became easier to spot.

Figure 16: Dropped potted plant without blood stain

- The potted plant received a blood stain across it and a blood trail leading away from it. Players were supposed to reach the conclusion that the killer held and dropped this potted plant for an important reason.

Figure 17: Dropped potted plant with blood stains

- Placing blood droplet trails and adding a dead technician near the server room gave a better indication of the killer's path through the level.

Figure 18: Open briefcase on floor of office five

- Moving the briefcase from the floor to the desk of the fifth office gave the impression that the one who worked in this office owned the briefcase.

Figure 19: Open briefcase on desk of office five

- Neatly stacking the objects in the briefcase conveyed the message that the killer did not rummage through it. The open briefcase in the fifth office attempted to portray the traitorous scientist bringing a gun to work in order to betray the killer.
- A trail of blood droplets led from the operating table to the fire exit in the main lab showing the killer's escape path.
- Blood stains on the same fire exit reinforced the notion that the killer exited through this way.

Figure 20: Body bags on racks in the main lab

- Decorative props replaced the body racks and dead bodies in the main lab. This reduced the likelihood of players believing in a zombie outbreak or other incorrect interpretations such as cryogenic sleep.

Figure 21: Removal of body bag racks in main lab

F. Second Set of Playtests

During the second set of playtests the results were more favorable to the desired outcome. Players came closer to the narrative but still told inaccurate stories.

After seeing the text message "Investigate a possible break in" at the start of the level, each player examined the environment closely. This opening text message helped define the level context better than the previous message which stated "Investigate what happened in the environment." When a player read the opening message, they knew there was someone who entered the level forcibly. Because of this change to the opening message, players were able to narrow their stories down to more plausible explanations.

Once again the players tried to read the text found on any object. This showed how closely players examined their surroundings when required to investigate. Even the minute details on art assets have the potential of distracting or misleading players. Creating custom art assets that specifically help deliver the level's narrative is highly recommended.

Players again commented on a few anomalous objects in the environment. These comments gave feedback on the strange amount of a particular object. As an example, one player repeatedly noticed the number of chemical bottles placed throughout the level. This distracted from his investigation and led him to make incorrect conclusions about the narrative. Because of the large number of chemical bottles, he believed half of the people died from a chemical accident or biological attack.

One player believed that the two dead guards at the entrance were standing inside the reception area and fell through the glass windows when shot. He arrived at this conclusion because he only saw glass shards underneath the body and none on top. This scene earned the label "anomalous" because it told a different story from the level's narrative.

In the main lab, two players recognized the flowers on the operating table as the same flowers from the reception area, but none of the players knew the significance of the flowers or why they were on the operating table.

Figure 22: Execution style murder scene in executive office

A player recognized that the killings done in the executive office area were in an execution style. But none of them knew how the execution killings were important to the level's narrative. The new starting context had eliminated many wild stories but the conclusions of the players needed further narrowing down. The second set of playtests still had them misinterpreting or not knowing the importance of some evidence.

G. Changes to Second Iteration

The second set of players brought new changes to the level for creating better results in future playtests.

- The level's beginning text now read "Investigate a break in and murder scene at the Baxter Laboratory" and a second message followed it reading "This lab has received death threats in the past." These new messages narrowed the player's context down to a specific set of conclusions about the environment. The second message about 'receiving death threats' gave a clue to someone planning an attack on the Baxter Lab.
- Removing more anomalous objects from the environment helped reduce player distractions and misinterpretations about the level.

Figure 23: Dead guard with glass shards underneath him

- A glass shard decal placed on top of the dead guard indicated the location he was standing before his death. Now it appeared that the glass shattered behind the guard instead of him falling through it.

Figure 24: Dead guard with glass shards on top of body

- Adding a paper pad and pencil next to players in the third set of playtests provided a way to record evidence they found in the level. If they used these materials, then it reveals how much players wanted or needed a logbook system for their investigation.

H. Third Set of Playtest

The third set of playtests proved the most favorable, as players came very close to the overall narrative. The last player came closest to discovering the level's narrative as originally written.

Neither of the players used the provided pad and pencil next to them during their playtests. Players came up with many theories about the level's narrative, but then slowly eliminated narratives not supported by the evidence. One player changed his story several times from a disease outbreak to possible thievery and then kidnapping of a famous person. When he saw the operating table in the main lab he immediately changed his story to say someone attempted to rescue a victim of human experimentation.

The other player recognized that the killer possibly held and dropped the potted plant. When he saw the operating table in the main lab, he immediately made a connection between the flowers on the body and the flower pot in the reception area.

Figure 25: Knocked over display case in executive office

In the executive office area, both players saw the execution murder scene and recognized it as a possible interrogation or torture scene. A player even stated that for the killer to stop and kill these men in an execution style, he must have held them responsible for the human experimentation.

One player commented, "The flowers seem important somehow." He later said the flowers shows the killer had sympathy for the human experiment on the operating table, possibly because he was one himself or personally knew him. Then he asked what the texts at the beginning of the level said and when told he commented "Oh, well that changes everything," referencing the story he had created. Finally he stated the person on the operating table must have been a friend of the killer which explains the flowers on the body. After the final playtest the player stated that he believed the context messages were what finally led him to the level's narrative.

I. Changes to Third Iteration

Changes made to the level after the third set of playtests were relatively minor compared to earlier test results.

- Replaced the dark glass inside the main lab partitions with a clearer glass plane so that blood and bullet holes are easier to spot. The dark textures on the glass made the decals hard to see, making an important clue easy to miss.

Figure 26: Dark glass in main lab with blood stains

- Added blood drops from the body of the receptionist to the dropped potted plant in the reception area. This trail indicated where the killer went after murdering the receptionist.

J. Results

The level artifact "C. H. Baxter Laboratory" met the criteria for success in this thesis. Two out of the eight players who tested the level discovered the main highlights narrative. They recognized the arrangement of the two executive bodies as a torture/interrogation scene and knew the human experiment was a friend or family member of the killer. Players were even able to distinguish a scene where a violent struggle took place from a scene where objects were destroyed out of anger.

Over the course of the playtests the environmental narrative changed slightly due to player's feedback. If players had difficulty determining how an environmental clue made sense to the level's narrative, then that environmental clue was altered to make sense. As an example, one player mentioned that it made no sense for the killer to shoot one guard in front of the reception area and then hesitate before killing the other guard. Consequently the environmental narrative changed where the killer shot both guards in rapid succession. These slight alterations did not change the main highlights of the level's narrative but instead made it appear more sensible.

IV. Level Design Process Recommendations

Importance of Level Context: The level context is the context that the designer sets up as the initial elements that the player experiences at the beginning of the level. This context is usually setup through playing previous levels of a game. This thesis provided the context through a short message displayed as the level began.

During the first set of playtests, each player came up with wildly varying stories that greatly diverged from the level's written narrative. This was due to players having a broad message at the beginning of the level that gave them very little context about the events they were investigating.

Due to the broad introduction message, players created any story that seemed plausible from the evidence they found. The message did not set the proper context for players to recognize which stories were possible and which missed the mark. Expectations were for players to eliminate many of the incorrect stories after carefully applying logic to the evidence. This did not prevent players from creating stories about zombie outbreaks or alien creatures.

Figure 27: Source of the wild Cryogenics story

Interestingly enough, these incorrect stories came from players forming biases about the narrative by only finding evidence that confirmed what they believed. Each player came to conclusions about the story before finding all the evidence. When the players found evidence that confirmed their beliefs they accepted it, otherwise they ignored or overlooked it. One player read Cryogenics on a decorative poster and created a lengthy story about an alien creature waking up from a cryogenic sleep before slaughtering all the workers. He later stated he did not find any evidence of a cryogenics lab but still clung to his story even at the end of the playtest.

The first set of playtests led to changes in the opening message to provide more contexts for players. This helped the second set of players eliminate most of the more creative stories. For the third set of playtests the opening message gave even more detailed context about the level. With the context clearly defined, players from the third playtests came closest to the written narrative. The final player suggested displaying the opening message again as a reminder to players who might have forgotten what it said. Because he believed the opening message is what helped him finally discover the level's true narrative. The context players entered the level understanding became a critical part of utilizing environmental narration successfully.

Distraction of Anomalous Objects: Anomalous objects in this thesis are objects that appear out of place or unusual. When anomalous objects are in a game environment they easily distract players from the gameplay and disrupt their immersion. This is more prevalent when the player is required to investigate their surroundings closely, because any anomaly is easy to find in a thorough examination.

During development, it was found that telling such a complex story was unusually sensitive to unintended effects. Throughout all the playtests, anomalous objects were a recurring issue. Whether it was the excessive number of a certain object, or an object appearing out of place, anomalous objects easily distracted players from their investigation. Some objects in the environment sent the wrong message to players because of placement or orientation. The body racks in the main lab convinced some players that a zombie outbreak had occurred. Having too many chemical bottles caused one player to believe a biological attack had happened. There were examples where an anomalous object had the same level of influence as the level's opening context message. A good recommendation for using environmental narration is to remove all anomalous art assets in levels.

Independent Verification of Prop Placement: Playtesting is already an essential tool for balancing gameplay and discovering game glitches. But when developing for environmental narration, playtesting is essential for discovering how well the game delivers its narrative elements. Through playtesting, developers can better understand how players interpret their narrative elements within the game environment. Playtests allow players to provide "fresh" feedback on narration elements developed into the game's environment. Having a fresh perspective on a narrative's delivery is important for environmental narration.

Alternating Environments: A level's narrative can greatly benefit from first developing an unaltered environment without the story elements, then adding them in later. Having an unaltered version of a level allows developers to view the possible ways the environment can change. They can easily see where objects might move or fall in an unaltered environment. It was easier to place the fallen objects around the receptionist's desk after viewing it on the "pristine" layer. Seeing where the paper bin and potted plant sat on the "pristine" layer gave indications of where it would fall on the "evidence" layer. If developing a narrative in a chronological order, this development process becomes very helpful. Viewing an unaltered state of an environment assists in reducing continuity errors in a written narrative or while developing with environmental narration.

Figure 28: The tissue boxes is an anomaly in this scene

Unique Art Assets: While searching a level for evidence items, players examine the environment meticulously. During several playtests, players read text on any object in the environment. Several players inaccurately deduced the level's narrative as a result of text on an in-game art asset. Seeing how closely a player can examine the environment, it is a recommendation for art teams to create custom art assets that assist in delivering the game's narrative.

V. Recommendations for Future Research

After extensive research and testing on using environmental narration, there are recommendations for future research on environmental storytelling. Future research into these topics can make narratives more immersive and improve its delivery.

Figure 29: Sample of evidence logbook feature

Logbook Feature: Another recommendation is to add a logbook or record keeper for players to keep track of any evidence items discovered in investigative style games. Players must have the freedom to access this logbook feature at any moment to assist them in their investigation. To make this logbook feature more effective it needs customizable log entries. With a logbook the player can discover how certain evidence items relate to each other.

Evidence Board Feature: Allowing players to take custom screenshots, title the screenshots and draw virtual links between evidence items gives them the power to truly analyze a crime scene. This feature mostly resembles an evidence board that allows players to remember their progress through the investigation. Implementing these features allows players to create narratives more effectively.

Figure 30: Sample of evidence board

Zooming Feature: During each of the playtests, players repeatedly jumped on top of objects and crouched in order to get a better view of a particular item. Some of the players asked if there was a zooming feature for them to use. Implementing a zooming feature allows players to indiscriminately examine the environment more thoroughly. With players closely examining the environment, a zoom feature is an essential tool to investigative styles of gameplay.

Level End Point: One major issue during the artifact's development was ending the level. In the level's original design, playtests ended once a player discovered all of the major clues. But completing the level in this way seemed ineffective for the thesis's goal. Given that the level allowed players to freely explore the environment like an open world, it should not inform players when the investigation ended. Allowing a player to reexamine evidence in the environment meant that it would end at the player's discretion. For the playtests, players verbally stated when to end their play session.

A recommendation is to have a level endpoint that allows players to choose whether they stay in the environment to investigate, or proceed to their next destination. Another recommendation, if this were a full game, is to allow players to return to previous environments for further investigation. If a player found clues in other environments across the whole game world, clues from the opening level might reveal story elements in later levels.

VI. Conclusion

Using environmental narration allows the incorporation of complex narratives into level environments. Implementing storytelling into an environment allows for players to experience the story while staying immersed in the game world. The overall goal of this research and level artifact was to prove the effectiveness of environmental narration and find best practices for future game development.

The eight different playtests involving the level revealed many challenges and benefits of environmental narration. Challenges such as having anomalous objects, establishing the

level context, and verifying narrative elements can hinder the narrative's delivery. Environmental narration provided the benefits of immersing players deeper into the game world, giving players a sense of accomplishment as they discovered the narrative, and making the investigative gameplay appear more realistic.

Another major point was the importance of implementing context into a level's narrative. Giving players the proper introductory context proved essential when using environmental narration. Otherwise, players have the freedom to create inaccurate stories that seems plausible.

As a best practice, playtesting to discover flaws with the narrative's delivery is unavoidable if the developer wants to effectively use environmental narration. Conducting playtests utilizing individuals unfamiliar with the level is highly recommended. Such playtests give developers and designers a fresh perspective on how their narrative clues are interpreted.

In conclusion, environmental narration can be an effective method of delivering a complex narrative in games that have investigation style gameplay without encounters. Done poorly, it can become annoying, overwhelming or confusing to players. Done well it becomes a highly immersive storytelling experience that contributes to player satisfaction. This thesis revealed valuable information on environmental narration that can assist in developing narratives for future games and levels.

VII. References

References

[1] Mirasol, Michael. *Why Video Game Are Indeed Art* (2011, April 02) [Online] Available: http://www.rogerebert.com/far-flung-correspondents/why-video-games-are-indeed-art

[2] Hengeveld, Tim. *Let the world do the talking* (2010, January 07) [Online] Available: http://timhengeveld.com/files/Environmental_Storytelling_paper_TimH.pdf

[3] Fordevsbydevs. *The Four Types of Video Game Storytelling* (2013, August 11) [Online] Available: http://fordevsbydevs.wordpress.com/2013/08/11/the-four-types-of-video-game-storytelling/

[4] Carson, Don. *Environmental Storytelling: Creating Immersive 3D Worlds Using Lessons Learned from the Theme Park Industry*(2000, March 01) [Online] Available: http://www.gamasutra.com/view/feature/131594/environmental_storytelling_.php?page=1

[5] *Dead Island*, Techland, 2011

[6] *Bioshock*, 2K Games, 2007

[7] Jongeneel, Jethro. *Environmental Storytelling in a New and Unexplored World* (2013, August 14) [Online] Available: http://www.jethrojongeneel.com/sites/default/files/blogfiles/jongeneeljethro_es_in_a_new_and_unexplored_world_final.pdf

[8] *Dead Space 2*, Visceral Games, 2011

[9] *Dead Space*, EA Redwood Shores, 2008

[10] *L.A. Noir*, Rockstar Games, 2011

[11] *CSI: Crime Scene Investigation*, CBS, 2000

[12] College of Lake County Public Relations. *Real-life 'CSI' differs from the Hollywood version, professionals say* (2013, August 20) [Online] Available: http://www.chicagotribune.com/suburbs/grayslake-gurnee-round-lake/community/chi-ugc-article-real-life-csi-differs-from-the-hollywood-ve-2013-08-20-story.html

[13] Layton, Julia, and T. V. On (2006). *How Crime Scene Investigation Works* (2008, January) [Online] Available: http://www.acschools.org/cms/lib07/PA01916405/Centricity/Domain/362/How%20Crime%20Scene%20Investigation%20Works%20Article.pdf

[14] Ramsland, Katherine. *Mass Murder Motives* (2012, July 20) [Online] Available: http://www.psychologytoday.com/blog/shadow-boxing/201207/mass-murder-motives

VIII. Image References

Figure 1: "Dead Island: The Lighthouse", Meangentlemen.wordpress.com, http://meangentlemen.wordpress.com/2011/09/14/dead-island-the-lighthouse/

Figure 2: "Chapter 11 – The Crash – Dead Island Riptide Game Guide", Guides.GamePressure.com, http://guides.gamepressure.com/deadislandriptide/guide.asp?ID=19992

Figure 3: Multiplayer.it, http://multiplayer.it/soluzioni/la-soluzione-di-bioshock.html

Figure 4: "Talk: The Ubermorph", DeadSpace.wikia.com, http://deadspace.wikia.com/wiki/Talk:The_Ubermorph

Figure 5: "First In-Game L.A. Noire Screenshot Surface", PlaystationLifestyle.net, http://www.playstationlifestyle.net/2010/02/16/first-in-game-l-a-noire-screenshots-surface/

Figure 6: "Video Game Review - L.A. Noire", Dereklieu.wordpress.com, https://dereklieu.wordpress.com/2011/05/31/video-game-review-l-a-noire/

Figure 29: "Prop Preparation – Film Poster Photo shoot.", A2 Media, http://kimberleycarrollleytona2.blogspot.com/2014/01/prop-preparation-film-poster-photo-shoot.html

Figure 30: "Additional Evidence Sheet: Car, chunks of wall, etc.", KeddieColdCase.FreeForums.org, http://keddiecoldcase.freeforums.org/additioal-evidence-sheet-car-chunks-of-wall-etc-t29.html

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