Signposting, Mise-en-Scene, and Environmental Storytelling

Understanding signposting as part of the embedded narrative in environmental storytelling

Abstract

This paper studies the embedded narrative of three open world games, Tom Clancy's The Division, Fallout 4, and Deus Ex Mankind Divided, as part of the larger concept of environmental storytelling. The focus off this paper is to study signposting as part of the embedded narratives. In this paper signposting is understood as the visual clues that play a role in player navigation, orientation, and progression through the space and narrative of videogames. Video game spaces are considered a mise-en-scene where a developer builds a scene where all elements serve a purpose in conveying something to the player. Lighting as part of signposting plays a large role in this paper. The study of lighting as part of environmental storytelling combined with the focus on the functional purposes of signposting expands the academic debate on environmental storytelling. Two methodologies are used; the primary method is a textual analysis. This is preceded by data gathering using play as a method to identify relevant examples of signposting. Textual analysis relies on inductive reasoning to form general theories based on specific examples. This coincides with the goal of this paper, which is to study specific examples of signposting, then take a step back to induce general insights on how signposting plays a role in player navigation, narrative progression, and how they convey narrative information to the player. One of the generalized results of the textual analysis is a three part categorization consisting of directional, orientational, and contextual signposting. The context of appearance in the game world plays a large role in determining this. Signs are also semiotic in nature in many cases. Semiotic signposting can be indexical, building on existing relations, or symbolical, where they build new relations based on the history of the game world. The analysis also shows that signposting in open world games has three functions: playing a role in navigation, conveying embedded narrative information, and contributing to world-building. Additionally, it appears that signposting plays a very large role in fostering narrative progression, and less in telling an actual story. In this sense it often plays a supporting role for narratives in games.

Name: Bjorn Vredenberg
Student number: 3477096
Master New Media & Digital Culture
Supervisor: Teresa de la Hera
Second reader: Stefan Werning

TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION

In recent years open-world games have become increasingly popular. Many videogame franchises that previously were linear experiences have attempted to create an open-world experience. This development has occurred with the technical development of a new generation of consoles with more processing power that allow developers to create more expansive games without sacrificing graphical quality. Naturally the open worlds of these games give players more and new options to navigate through the games spaces, and as a consequence this provides the developer with more challenges as to how to guide the player effectively. In more traditional linear games the level design itself played a major role in guiding the player. As the player moves through the games space he also progresses through the narrative, slowly building a story over time. These changes in how games are played create a need for more research on open world games.

The focus of this paper is to study how graphical elements of video game spaces play a role in player navigation, telling a story, and narrative progression of a game. Specifically, I will look at the role environments in games play in the form of embedded narratives in environmental storytelling. Within this concept I will focus on how signposting functions in the context of the storytelling progress. Signposting refers to the signs in the form of lights, and objects such as traffic signs that assist the player in navigation through the game space. To study this I will take an approach that considers a game space to be filled with a mise-en-scene; signposting is a part of the mise-en-scene of a videogame.

The research questions are the following:

RQ: What is the role of signposting in the larger context of environmental storytelling in the open-world games Fallout 4, Deus Ex: Mankind Divided, and Tom Clancy's The Division?

SQ1: What types of signposting can be distinguished in the mise-en-scene of videogames?

SQ3: How do different forms of signposting relate to the narrative and narrative progression in open world games?

SQ3: What are the specific functions that the different types of signposting play in the process of (environmental) storytelling in open world games?

The eventual goal of this paper is to apply an inductive process to an analysis of three case studies on open-world games. By studying specific examples of signposting, analyse how they work, what narrative information they contain, and how they play a role in narrative progression I can use these detailed observations to form more generalized insights into the roles and functions signposting has in open world games. This should allow my insights to be useful to future research as well.

This topic falls in the larger academic debate on environmental storytelling and the use of spaces in videogames. The debate originated in the ludology vs narratology argument and has involved in a more focused discussion on the role of narratives in videogames and how spaces can play a role in this. Authors such as Jenkins, Nitsche and Fernanda-Vara play a role in this debate (Jenkins 2004) (Nitsche 2008) (Fernandez-Vara, Game Spaces Speak Volumes: Indexical Storytelling 2011). This thesis adds to this debate by focusing specifically on signposting on a more detailed scale when compared to many other papers. The debate also currently does not include discussions on the influence of various types of signs. This paper shows that lighting plays an important role as narrative and navigational tool and will provide an addition the current debate with this focus.

To study embedded narratives in environmental storytelling using inductive reasoning I will perform a textual analysis of examples of signposting encountered in the free-roam game space of several games to study the signs that play a role in narrative progression, and what effect they try to create in the context of that game. The textual analysis is preceded by a data-collection phase. Here I will use play as a method to encounter and gather examples of signposting that play a role in the narrative and narrative progression. This methodology is complementary the primary textual analysis.

In the rest of this first chapter I will determine the research questions and go more in depth about the background of the academic debate surrounding game spaces, environmental storytelling and its origins. In chapter two I will go into the concepts that are relevant for this paper, primarily the understanding of environmental storytelling as something that includes narrative information embedded in the game space, how signposting fits into environmental storytelling, and the importance of progression through a game space to build the narrative. Consequently I will discuss an understanding of how mise-en-scene is the set of concepts that fills a game space with observable objects. In chapter three I will discuss the methodology of a textual analysis and the use of play as a method to gather data. In chapter four, five, and six I will go into the results of the textual analysis and consecutively discuss the types of signposting, the relation of these types to the narrative, and the three main functions of signposting in environmental storytelling that were identified.

RELEVANCE

The contents and backgrounds of this paper can be placed in the wider discourse on spaces in games, how they are created, what they mean, and what they do. Additionally, this paper can also be placed in the discourse of storytelling in videogames. More specifically, this paper falls in the discourse on the use of spaces in storytelling that bridges and combines the two aforementioned areas of discussion. To get a better understanding of how this paper should be positioned within this discourse on spaces and storytelling, specifically the discourse on environmental storytelling and mise-en-scene in videogames it is important to understand the origins of environmental storytelling and how it was initially positioned in the academic debate. I will briefly describe the origins of the concept before going into the research on environmental storytelling and player navigation in recent years, and the contribution to this discourse that I plan to make.

Jenkins stated that the goal of his proposed idea of environmental storytelling was to provide a middle ground position between ludologists and narratologists (Jenkins 2004, 119). The former group was aiming at a formalist view of videogames that focused on the rules of a game and the formal systems that differentiate videogames from other genres such as theatre and literature (Aarseth 1997) (Juul 2001). The latter group attempted to put focus on games as stories rather than a system of rules and was based in more traditional understandings of narratives that originated in other fields such as literature and theatre (Ryan 2009) (Carlquist 2002) (Zimmerman 2004). Jenkins proposed a middle ground concept called environmental storytelling that incorporates recognition of both the formal elements of games and the importance of narrative elements in the creation of a meaningful experience.

Even though the concept as proposed by Jenkins has been picked up by academic community for further study and refinement there has not been a lot of research on environmental storytelling and player navigation from a media/humanist perspective. Researcher Bernadette Flynn wrote a paper based on Jenkins understanding of environmental storytelling named *Languages of Navigation within Computer Games* (Flynn 2003). In this article she goes into the ways that a player navigates game spaces via Chinese Garden metaphor (4). However, this article does this via a more philosophical approach that does not go into more detailed small scale examples of practical use. Instead she focuses on comments that apply to a game in general.

A paper by Clara Fernandez-Vara called *Games Spaces Speak Volumes: Indexical Storytelling* takes a similar approach and suggests a refinement of environmental storytelling from a semiotic perspective that she calls indexical storytelling (Fernandez-Vara 2011). This paper presents an interesting and useful insight to the elements of a game that both tell a player where to go, and play a part in telling a story. However, Fernandez's consideration of what she calls signage as a purely semiotic aspect of videogames puts strict limits on the usefulness of indexical storytelling. She also does not include a case study to support her suggested concept, and she does not dive very deeply into how signposting actually works in games from a practical viewpoint. This leaves room for a case study based research that does not limit signage to situations that require that a sign must have significant semiotic meaning.

A paper by researchers from the Aalborg University named *Project Aporia – An Exploration of Narrative Understanding of Environmental Storytelling in an Open World Scenario* takes an experimental approach to environmental storytelling (Bevensee,, et al. 2012). They used an experimental game devoid of classic forms of storytelling such as dialogue and focused on emergent environmental storytelling. However, they apply the concept on the level of an entire game while this research focuses on a small section of environmental storytelling related to signposting.

Another example of research on environmental storytelling is a recent master thesis from a student of the Concordia University in Montreal. He uses a presentation made by game developers the Game Developers Conference (GDC) as a primary source of information for his research on environmental storytelling in Bioshock Infinite. The use of literature outside of the academic field indicates there is not much discussion on this subject from an academic perspective (Tarnowetzki 2015). While by no means a peer-reviewed paper, it does give an indication to the lack of recent discourse on environmental storytelling on top of the limited amount of research discussed here.

All the research discussed in this section so far have in common that they focus on environmental storytelling in a more general sense. However, this paper distinguishes itself from these other papers by its strong focus on lighting as signposting. By focusing on lighting, and other elements of the mise-en-scene this paper is more focused then the papers discussed in the previous paragraphs. The focus on lighting from a more technical perspective also puts more emphasis on the practical application of signposting that goes beyond the academic discussions that most of the other research concern with. This will expand the current academic discourse on the use of spaces in storytelling with a more focused, deeper, point of view that emphasis lighting, and a generalized framework based on case studies that can be used to study how signposting and environmental storytelling in other open world games actually works and can be understood.

The related field of computer sciences sees an abundance of research into the field of navigation in games. This research is sometimes focused on the player but there is a lot of research into the navigation of AI in game spaces. Many of these papers focus on the algorithmic challenges associated with navigation and how to improve AI behaviour (Botea, et al. 2013) (Graham, McCabe and Sheridan 2003) (Bulitko, et al. 2011) (Cui and Shi 2011). Other papers focus on technical challenges related with world-building in videogames (Fitzmaurice, et al. 2008). One of these, a paper named *High Quality Navigation in Computer Games* has some conceptual similarities with this paper but it takes a different approach (Nieuwenhuisen, Kamphuis and Overmars 2007). Instead of studying signposting it focuses on some of the technical challenges related with effective movement through a game space in relation to world building. Although this research originates in a different field with its own academic debate, taking a media studies approach to player navigation could help in understanding player navigation from a computer sciences standpoint as well.

CHAPTER 2: BACKGROUND: ENVIRONMENTAL STORYTELLING, SIGNPOSTING, MISE-EN-SCENE & LIGHTING

In the next sections I will discuss the theoretical backgrounds of the concepts used in this paper. The focus is on environmental storytelling and specifically, the signposting aspect of it. First I will suggest a broad definition of signposting and what elements of a game world I do and do not consider part of this concept. Next I will introduce the concept of embedded environmental storytelling as suggested by Jenkins, how this concept was iterated on by other researchers, how signposting in videogames relates to environmental storytelling, and the importance of progression in a narrative experience. Part of this concept is the notion that the meanings and interpretations that result from this form of storytelling depend on both the game design decisions by the developer and the actions of the player that together result in a unique experience.

Following that I will discuss how the concept of mise-en-scene can be applied on videogames and how I will use that as a framework for the analysis of game spaces. In this sense mise-en-scene is the concept that allows me to study a game space as a collection of separate but related entities, signposting being one of them, that come together to form a unique narrative experience that is more than the sum of its parts.

Next I will discuss a definition of semiotics and state why they are important for understanding the narrative meanings and contents of environmental storytelling. To wrap up chapter two I will introduce the proceduralist viewpoint I will be employing during the analysis. This viewpoint is related to a developer-focused view on game spaces in which all elements of a game are designed with a function in mind. The final section will introduce definitions of various forms of lighting that can be used in videogames. This section is less focused on academic understandings of lighting and more on technical aspects of how they are used in videogames.

SIGNPOSTING

Signposting is a term that is commonly used in the context of real world signs such as traffic signs. It is also a term that is used in literature studies or studies on academic writing to denote a point of importance in a language or text (van Lier 2004) (Coffin, et al. 2003). In a general sense; signposting refers to points of transitions or points in a space, narrative, or world that tell people 'where to go from there'. For the specific use of this concept in videogames I define signposting in the following way:

> *Signposting refers to all the artefacts in a game that are based on visual aesthetics that fill a game space with content with the purpose of supporting player navigation, orientation, and progression through the space and narrative.*

This definition limits signposting to the visual elements of a game that play a role in navigation. Signposting is broadly defined here and not specific to environmental storytelling. The emphasis is on the small micro scale objects that fill a game space, and not on the macro based level design that sculpts the space itself. The grey area between this two where signposting functions to direct the player to a transitional point, called a liminal point by Flynn, is included because these areas can lie between doors or loading screens that are often signalled (Flynn 2003, 4). Liminal points are moments where a space opens up from what is often a narrow corridor into a wide open area or landmark that impresses the player.

The definition includes signs that are part of the spaces pre-generated by a developer, but it can also include signs that originate from player interactions with the game space. Fernandez-Vara makes a useful distinction between these two. She refers to signposting as

signage but does not further define it (Fernandez-Vara 2011). However, she makes distinction between two types of stories in games; history of the game world (7), and history of the player (10). She refers to signs in the first category as *signage*, and the signs in the second as *traces* left by a player. The definition of signposting proposes here includes both. However, for this paper the focus is on the signposting in relation to the history of the world, in other words; the emphasis is on the pre-generated content that exists prior to player's interaction with the game. Exactly how signposting can fit within the purview of environmental storytelling will be discussed after I define that concept in the next section.

ENVIRONMENTAL STORYTELLING, EMBEDDED NARRATIVES, AND SPACES

The key concept in this paper is environmental storytelling; this concept is discussed by Henry Jenkins in his article *Game Design as a Narrative Architecture* (Jenkins 2004). Using theme park rides as an initial example he explains environmental storytelling in the context of digital videogames as part of a larger ecology of other media that use environmental storytelling to tell a narrative. He defines it as something that "creates the preconditions for an immersive narrative experience" (123) and as a tool that supports narrative development of stories in videogames. He suggest four ways in which environmental storytelling can take place: Evocative spaces that invoke pre-existing narrative associations, enacting stories that provide a 'staging ground' for narrative events, embedded narratives where narrative information is embedded within the mise-en-scene of a space, or an environment that provides resources for emergent narratives created by players. In this paper the embedded narrative is the most relevant because it concerns with information placed in the game space by the developers, but the meaning is negotiated by the player via the act of play. This idea of the embedded narrative is also explained by Salen and Zimmerman in their book *Rules of Play*. They define it as "pre-generated narrative content that exists prior to a player's interaction with the game" (Salen and Zimmerman 2004, 7). The definitions lead to the conclusion that we can consider a game space an encoded body of information awaiting discovery by the player.

Jenkins recognizes the importance of spaces in a game when it comes to environmental storytelling and he suggests that "Game designers don't simply tell stories; they design worlds and sculpt space" (Jenkins 2004, 121). Environmental storytelling is the mechanic that allows embedded narrative information to be conveyed to the player via game spaces and spatial stories. Nitsche goes into how this is done in his book *Video Game Spaces* (Nitsche 2008). He states that "game spaces evoke narratives because the player is making sense of them in order to engage with them, through a comprehension of signs and interaction with them, the player generates new meaning" (3). Here he essentially states players can progress a narrative by discovering it in the game space and giving meaning to the discovered information.

However, environmental storytelling has a significant limitation; it almost never tells 'the whole story'. As the term and this discussion suggests, the focus is on how spaces play a role in the generation of a narrative experience for the player. But this emphasis on spaces and spatial stories proves that environmental storytelling is only part of the wider process of storytelling in games. Classic forms of storytelling such as written text and dialogue between characters fall outside the realm of environmental storytelling. In reality almost all videogames make use of these classic forms, and very few, if any games make exclusive use of environmental storytelling as primary way to tell a story and some the games that do are created in an experimental setting (Bevensee,, et al. 2012). Therefore it should be noted that a game space can only ever tell a small part of a narrative, but almost never a complete story.

ENVIRONMENTAL STORYTELLING AND SIGNPOSTING

The key to understanding the role and importance of signposting in the process of environmental storytelling is the realisation that it is as much the journey as it is the destination; a narrative, a story in a game the result of a gradual collection of narrative information that comes together to form a narrative. A player does not boot up the game, presses Play and have the entire narrative presented to him in an instant. Storytelling is a process where the player slowly learns more about the game and story he is playing as he plays it. Jenkins states that "narrative comprehension is an active process by which viewers assemble and make hypotheses about likely narrative developments on the basis of information drawn from textual cues and clues" (Jenkins 2004, 126). In the context of a videogame this means that in order to reach the end of a story the player has to play through the spaces created in a game. This means that there is a sense of progression to the narrative. However, the developer does not have full control over how the player navigates through a space. There is room for error and Jenkins realised that players might navigate a space differently, missing embedded narrative information. On this subject he states that:

> *Within an open-ended and exploratory narrative structure like a game, essential narrative information must be presented redundantly across a range of spaces and artifacts, because one cannot assume the player will necessarily locate or recognize the significance of any given element. Game designers have developed a variety of kludges that allow them to prompt prayers or steer them towards narratively salient spaces* (Jenkins 2004, 126).

These "kludges" refer to the signposting that is studied here. This statement also tells us why signposting is important in environmental storytelling in general, and the discovery of embedded narrative information in specific: without it the player might not discover the information at all. Therefore, signposting is a tool that is used to navigate spaces, but these signs can also contain embedded narrative information making them a part of the storytelling process. However, it should be noted that not all signposting is automatically environmental storytelling, nor do all signs contain embedded narrative information. Fernandez-Vara also goes into the significance of signposting. She focuses on semiotics as a way of understanding environmental storytelling. Her approach called indexical storytelling limits itself to semiotic signs only, specifically indexes that she calls indices (Fernandez-Vara 2011, 5). Unfortunately, this assumption excludes signs that are not semiotic in nature. However, the insights she provides suggest that semiotics play a crucial role in signposting and the ways they contain embedded narrative information. I will discuss a brief background on semiotics in the next section.

SEMIOTICS

Salen and Zimmerman discuss a basic understanding of semiotics in their book *Game Design Fundamentals* that entails how semiotic signs denote something that "represents something other than itself" (Salen and Zimmerman 2004, Chapter 4 pg.6). They explain semiotic signs as "something that stands for something, to somebody, in some respect or capacity". Fernandez-Vara cites Charles Peirce and his philosophy of language. According to Peirce there are three types of signs as cited by Fernandez-Vara (Fernandez-Vara 2011, 5):
- Icons: signs that convey ideas by imitating them.
- Indices/indexes: The idea is physically connected with a sign. Peirce provides a signpost as example. Another example would be smoke; smoke is often associated with fire. The cultural context of smoke shapes the interpretation of the sign as a possible indicator of fire.

- Symbols/general signs: Signs that are associated with meaning through usage. The relationship of the sign and its associated meaning is arbitrary and not based on a causal connection as is the case with indexes (smoke indicates fire) (Peirce 1998).

For this study indexes are the most relevant as these signs have the strongest connection with signposting. However the analysis will also show that symbolic relationships exist, or can be created in videogame spaces. This further shows that indexical storytelling does not cover all the possible options.

SIGNPOSTING FROM A PROCEDURALISTIC VIEWPOINT

Proceduralism is a philosophy on games that explains digital games as having a 'procedural nature' where the meaning and possible interpretations of a game are formalized in the rule based game system (Sicart 2011). Because a lot of the power in shaping the embedded narrative lies with the developer, I will use a proceduralist viewpoint during the analysis of the mise-en-scene in order to gain insights in how the developer might have intended something to function and what information he embedded in the mise-en-scene. Ian Bogost defines procedural rhetoric as "the art of persuasion through rule-based representations and interactions, rather than the spoken word, writing, images, or moving pictures" (Ferrari 2010, 5). He suggests procedural rhetoric as the essential meaning making function of video games (6). The possible meanings and interpretations of videogames are formalized in the computer based rules and mechanics that govern the game. In regards to game space Ferarri suggests that the formal "rules of game space" encompass the "structuring of play through geographic architecture and mise-en-scene" (12). We could then say that the mise-en-scene that affords environmental storytelling is something that is formalised in the game system as an embedded narrative, controlled by the designer, waiting on the player to decode the pre-encoded message in the ways that the developer envisioned for them. This rhymes with the embedded narrative as explained by Jenkins in the context of a detective game. He states that:

> [O]ne can imagine the game designer as developing two kinds of narratives; one relatively unstructured and controlled by the player as they explore the game space and unlock its secrets. The other pre-structured but embedded within the mise-en-scene awaiting discovery (Jenkins 2004, 162).

The issue with this approach is that it places the agency regarding possible interpretations with the designer, and not with the player. However, for the purpose of this research the viewpoint that the developer has a large influence on the development and possible meanings of the narrative information is sufficient and goes well with the textual analysis.

MISE-EN-SCENE IN VIDEOGAMES

Mise-en-scene in videogames can be seen as the digital artefacts that fill, and help shape, the game space. In the context of this paper, mise-en-scene is the framework that affords study of the game space as a set of artefacts that play a designed role in the storytelling process. Jenkins uses this concept as a way to describe how narrative information can embedded in a game space to play a role in environmental storytelling (Jenkins 2004, 126). The original concept as it was used in cinema and theatre is discussed by Bordwell and Thompson in their book *Film Art: an Introduction* (Bordwell and Thompson 2010). The term originates in theatrical plays and was adopted by film scholars. They used it to "signify the director's control over what appears in the film frame". Mise-en-scene has different aspects that create a larger whole: the setting, lightning, costume, and the behaviour of the figures/characters (118). By controlling this, the director 'stages' the event for the camera.

Applying this to videogames we see clear parallels, with the camera being replaced by the player and the director by the designer. Essentially, a mise-en-scene in the traditional sense in theatre and movies is built in a 3D space with a single fixed camera position; the viewer or audience, let us call this 2.5D. A videogame takes place in a virtual 3D space, but the camera position is not fixed and the player can make use of the full 3D space by rotating the camera and moving around the game space. To illustrate; if an audience would do this in a theatre you would see them walking up the stage and realising the nicely looking house is made of cardboard without an actual inside. This player agency results in other demands on the construction of the mise-en-scene. In the context of lightning and props this means that game developers can not solely trust on traditional lightning techniques developed for theatre and TV such as frontal, side, back and under lighting to shape the 3D game space (132). In order to do this successfully the developer has to take into account that the player will move around their metaphorical stage to see what is behind that wall on their left. The simple 'frame' that is normally presented to viewers is no longer sufficient when applied to videogames. Instead the 'frame' is replaced by a 'space'.

The setting (including the objects, textures, etcetera), lighting, costumes (the looks of the player or NPC's) and their behaviours can all contain narrative information that is embedded in the game space, waiting for the player to discover and interpret it. The aesthetics of a game play a key role in establishing this mise-en-scene that is in turn created in the virtual game space. A key difference is the presence of off-screen space. This is discussed by Mike Jones who argues on important of sound in the mise-en-scene and the off-screen properties that exist outside of the cinematic 'frame' (Jones 2005). The traditional 'frame' is replaced by the 'space' that signals a change in the role of the spectator, who is now a player with an active role in interpreting the mise-en-scene of the game space. (5).

This creates a new relation between developer-player when compared to the traditional director-spectator situation. In the traditional situation the full control over what the spectator would see rested with the director. Ivan Girina calls this scripted staging, the embedded narrative is controlled by the designer, but has to be experienced and interpreted by the player (Girina 2013, 49). This change in control creates a distinct difference between mise-en-scene in cinema and videogames, even though both rely on similar ways of creating the (virtual) 'frame'. The presence of players who can play a game in a different ways leaves room for situations where the player does not encounter, or does not give meaning to the embedded narrative information. However, ultimately it is the developer that gives the players the tools and the information they use to create their experience. Therefore play still takes place within the 'box' created by the developers.

To summarize, mise-en-scene is a concept that is useful for the study of games as a framework to study how a game space takes shape. However, not all the properties of a traditional mise-en-scene might be applicable due to change from a 2.5D to a fully 3D space with variable camera positions and the presence of off-screen space that can change a space even when the player is not present. This removes control from the 'director' and gives more agency to the player when it comes to comprehension of, and meanings given to the artefacts in a mise-en-scene.

LIGHTING AS PART OF THE MISE-EN-SCENE

In this section I will provide a background of different types of lighting that are relevant to this research. It is common knowledge that the human eyes are sensitive to light and movement. Game developers make use of this by employing lighting to draw the attention of the player. The same process happens in the previously discussed original application of mise-en-scene, such as cinema and theatre, where the director can decide to light various parts of the stage. However, the mise-en-scene in theatre/cinema and videogames are created and function in different ways. Lighting techniques in cinema are used with a fixed camera position in mind. Bordwell and Thompson identify different types of lighting use: frontal, side, back, under, and top lighting that put emphasis on different parts of the mise-en-scene, and create different shadow effects (Bordwell and Thompson 2010, 132). This understanding of lighting is still useful, but less relevant in the mise-en-scene of a game space due to the 3D environment.

This section further discusses various forms of lightning that are recognized and discussed by game developers, and is therefore less academic in nature. It will serve as a reference point for the latter analysis and allows the proper qualification of the various examples. The section is based upon journalistic instead of academic articles.

Two important forms of lightning that can be identified are global illumination and volumetric lightning. Global illumination is also referred to as 'indirect lightning' because of its uses; the algorithms calculate how light bounces from and to surfaces in the game space and how these surfaces receive and transmit light, resulting in a natural lightning experience in a room, open space, or the entire level based upon the light source (Freeman 2015). This works very easy in theory, but requires a decent amount of processing power to achieve. A second important form is Volumetric Lighting; this is often referred to as dynamic lightning (Ohannessian 2015). These are algorithms and forms of light sources that interact with the environment and do not necessarily have a fixed position but are often moving light sources that cause changing light patterns and shadows based on the camera/player location. Not all the forms of lightning fall into these categories, for example: a flickering light on a wall with a fixed falloff range(only illuminates everything in radius X), it is not 'global' because it does not bounce and reflect of a lot of surfaces, but neither is it completely volumetric because of its fixed position.

LIGHTING TYPES

Light sources themselves can be of several different types, and with different properties. Here I identify two main properties that are used during the analysis; contrast and colour, and five types that are common and distinguishable; directional, spot, point, area, and volume.[1]

Properties:

- **Contrast:** Lighting sources itself do not create contrast, but the interplay between dark, non-lit areas, and areas illuminated by a light source create the contrast that the human eye is sensitive too (Nerurkar 2009). In the context of games contrast can be used to set a mood in a scene, or as a tool to draw the players eye to a specific area of the mise-en-scene such as a doorway that is the only lit object in an otherwise unlit environment.
- **Colour:** Decals, objects and lights can have different colours that play upon different associations people have with lights. For example, red or orange lights can draw attention to explosive barrels or create a sense of alertness in players because red and

---

[1] Not all of these types will be relevant in the analysis, but naming all of them does create a clear picture of the various possible forms of lighting.

orange lights are often associated with danger or alarms. Green lights can indicate a passageway, playing upon the relation with exit signs and traffic lights. (Walton 2014)

Types of lightning:

- **Directional:** A directional light mimics the form of lightning that would originate from the sun. These light sources emit parallel light rays in a single direction, but without falloff of the illumination strength so they reach out into infinity. This form of lightning is often used to illuminate a large area or entire level, often mimicking the sun (Prall 2012)**.**
- **Spot:** A spotlight is a commonly used directional light source that radiates in a specific direction, often in the form of a cone. A comparable example would be functionality of a flashlight. These forms of lighting are often used to illuminate objects in the game world from specific angles to create specific effects. Masters suggests a form called three-point-lighting where three spot lights are used to create unique effects with illumination and shadows (Masters 2013).
- **Point:** A point light is a light source that emits omnidirectional light beams. Masters explains this as a sphere that is filled with light rays and that gets dimmer the further they move away from the source (Masters 2013). As a result objects further away will be less brightly lit then objects close to the light source. An example could be an orb that sends out laser beams in each direction. As the lasers hit walls further away, the distance between each dot will be larger. This represents how the lighting intensity "drops off".
- **Area:** An area light can most easily be described as a collection of point lights collected in a horizontal or vertical surface such as a fluorescent ceiling light. These types of lights are used to create an effect where an object or surface is having a large luminescent area that would be unrealistically lit by a single point light. For example; fluorescent ceiling lights create a different effect when compared to normal light bulbs (Masters 2013).
- **Volume:** A volume light is similar to a point light in the sense that it creates omni-directional rays originating in a single point. However, a volume light has a specific shape and size that affect the falloff of the light rays. Essentially the light rays don't travel outside their defined 'box', thus only objects within that defined area are illuminated (Masters 2013).

CHAPTER 3: METHODOLOGY

The primary methodology used for analysis in this paper is a textual analysis of examples of signposting and environmental storytelling. I make a distinction between the methodology used for data gathering and the methodology used for analysis of the examples. Gathering of the examples is done using play as a method. This method is discussed by Aarseth in his article *Playing Research: Methodological Approaches to Game Analysis* (Aarseth 2003). He states that to understand games it is necessary we play and experience them as well as just looking at them and studying them from a 'distance'. Games are about the experience as much as about the formal systems, because of the varied nature of videogames, their different genres and the different possible experiences that result from play. Aarseth suggests a number of different strategies in game analysis via play. These options range from what he calls 'superficial play' to 'total completion', and 'repeated play' (6). These methods are not exhaustive and not without overlap, but each focus creates different insights. Since I am looking for distinct situations that use signposting to convey part of the narrative, I will focus on a partial completion approach. A critical outlook is required for this and a distinction has to be made between a focus on rules and interaction, thematic analysis and a focus on representation aspect (Mayra 2008, 165). Here I will focus on the representational aspects of the mediated game space, specifically the semiotic signs and the context of their use in providing the player with narrative information or progressing the narrative via navigation.

As mentioned, analysis of these examples is done using a textual analysis. Alan Mckee gives a definition of textual analysis. He states that "when we perform textual analysis on a text, we make an educated guess at some of the most likely interpretations that might be made of that text" (McKee 2003, 1). This means that from images or text researches try to create an understanding about what the meaning and implication of that text is. In her book *Introduction to Game Analysis* Ferández-Vara supports this understanding of textual analysis. She describes the practice of textual analysis as:

> [U]sing inductive reasoning and analysing specific texts, we can develop general theories that can be applied to other works. The strategies of textual analysis go beyond interpreting the piece or event itself: part of it is trying to make sense of the text, while it may also address the varied ways in which different people can interpret it" (Fernandez-Vara 2015, 9).

In the context of this research performing a textual analysis means critically studying the embedded narrative and signposting in the mise-en-scene of several examples identified during the 'play phase'. Salen and Zimmerman stated that "Play is free movement within a more rigid structure" (Salen and Zimmerman 2004, Hfst 22 p.2). In this part of the research the goal is to use play to discover signposting embedded in the more rigid structure of a game space and study their function, forms, and embedded narrative. The discovered examples are analysed via textual analysis with a procedural perspective to interpret the narrative information and signposting with the meanings that might been intended by the developer.

A weakness of the textual analysis could be that it is less valuable when it is used from the perspective of a player. Each player of a game creates his own experiences and has his own playstyle. This would make it difficult to create a generalized set of insights. However, taking the proceduralist viewpoint makes the analysis less dependent on player experience and it is a more top-down point of view that conveys a range pre-determined set of meanings to the player. These pre-determined meanings cover the varied interpretations players can make of a text and it gives insights in the structures that exist behind the individual occurrences of signposting.

The goal of this paper aligns well with this methodology since it studies a specific section of the mise-en-scene, then takes a step back to provide general theories and insights

and that can be applied for other research on the subject of player navigation. The process of inductive reasoning that accompanies a textual analysis and that leads to these generalized insights can be seen throughout the analysis sections of this paper. The categories and identified functions of signposting will have generalized descriptions and discussions that can be applied to the study of other open world games. But these descriptions of the categories, functions, and relations of these categories to the larger narrative are based on the examples from the case studies. For the data collection I will focus on the four named components of the mise-en-scene that fall within the definition of signposting I proposed earlier:

- **Lighting**: The various forms of light sources in game worlds as discussed in the previous sections. For a repeat of these types I recommend to read the relevant section.
- **Signs:** Signs in the sense of actual "traffic signs", not semiotic signs. These are elements comparable to actual signposting such as exit signs, arrows and other signs that represent directions in our cultural context.
- **Decals:** Decals could be described as "mini textures" they are decorations on objects, walls, the grounds, etcetera. Examples are smudges of paint, bloodstains, mud on the ground. Where actual textures in a game world are repeating occurrences, decals are "single" textures that do not repeat themselves directly.
- **Objects:** In the context of this research the objects considered are the 3D objects placed in the mise-en-scene that play a role in progression, signposting, and environmental storytelling. Examples are light posts, boxes, sheets of fabric, furniture and other modelled objects that are more than textures placed on a wall.

An important part of the results is a three-part categorization of functions of signposting. Therefore whenever I analyse an example in detail I will describe the category of navigational artefacts they fall in, in relation to their placement in the game space from. Additionally I will describe the nature of the object itself (is it a light, what type of light, perhaps a sign pointing a certain way). The rest of the discussion on each example is depending on the point being made with that example. Each example will be discussed in the following format when relevant:
- **Type:** What type/category it falls in
- **Nature:** What is it?(light, what kind of light, sign, object)
- **Context:** Context of appearance of the sign in the game space.
- **Embedded narrative:** What narrative information does the sign convey to the player.
- **Place of sign:** The place of sign in the larger narrative(part of the main story, explorable area unrelated to the main plot)
- **Consequence of sign removal:** Related to the functions of signposting. What would be the result if the sign was removed.

CORPUS

The corpus for this research is composed of several recent games that feature open worlds, specifically: Fallout 4, Tom Clancy's The Division, Deus Ex Mankind Divided. These three games are all open-world experiences, but they vary slightly in the ways that these spaces are shaped. These variations complement each other in the functional aspects of signposting as the different shapes of the spaces present the player with different navigational challenges. Using three cases will also create better insights in how signposting in each game is related to the narrative of that game.

Tom Clancy's: The Division is a seamless open world that does not require loading screens when the player wants to enter a new area, or a more scripted mission area. The world is based on New York and gives the player a lot of space to explore the game space.

Fallout 4 is a post-apocalyptic game that features an open world that can be explored by the player. Because most of the environment is destroyed the world is less densely packed than that of The Division, giving the player more free movement. A difference with The Division is that new areas, indoor areas, or mission areas usually require the player to encounter a loading screen. The result is that the signposting is often more focused on these liminal transitional points between areas.

Deus Ex: Mankind Divided is, again, slightly different than the previous two games. This game consists of large city-hubs that can be freely navigated and explored by the player combined with more cordoned of areas that are associated with main missions that progress the game. These city-hubs are densely packed and contain a lot of detail; the gameplay puts a large emphasis on finding alternative routes and hidden information. Signposting in this game is less focused on indicating new or explorable areas and more on information and items in direct proximity of the player. Together these three games will provide a representable cross-section of open world games that provide the best opportunities for generalization of results; fully open worlds, open worlds with closed of areas, and games that vary "hub" areas with linear gameplay.

CHAPTER 4: TYPES OF SIGNPOSTING AS NAVIGATIONAL TOOL

In this chapter and the next I will discuss the results of the textual analysis with play as a method from a procedural viewpoint. The goal is to create insights in exactly what the role is of signposting in the process on environmental storytelling. Specifically what types of signposting can be distinguished in the mise-en-scene, the relations of these types of signposting to the narrative, and the various functions of signposting in the context of environmental storytelling.

In this chapter I will discuss what types of signposting there are, the differences between them, and what factors contribute in determining the category a sign falls in. This is done by looking at the functional purposes of a sign in the game space in regards to its navigational purpose. In chapter six I will discuss how the various types of signposting relate to the narrative in a game. This discussion will go into how much embedded narrative information a sign can contain, how various types of signs relate to the narrative differently, and how the types of signs and their narrative content can fit in the broader narrative of a game. In chapter seven I will discuss the three functions that signposting performs in environmental storytelling. Because chapter five and six are closely related with the functions performed I will briefly name the them below

1. Signposting supports and affords the navigation of the player through the game space. This is closely related with the three types of signposting that will be discussed.
2. Signposts themselves can contain embedded narrative information. I will show that the use of indexical and symbolic semiotics play an important function in conveying narrative information via signposting.
3. As a consequence of the first two functions, signposting plays a small but important function in the creation of an immersive narrative and spatial experience in open world games. To explain this I will take an approach where I will illustrate the consequences of what can happens when signposting is removed from the mise-en-scene in every example where this is relevant.

In the rest of this chapter I will discuss a categorization that is made up of three types of signposting. This three-part categorization can be used to understand the effects and intends, created by various forms of signposting. The three types of signs are: directional, orientational, and contextual signposting. Before the proposed categorization I will discuss the important insight that in many cases the decision to assign an example of a sign to a particular category is determined by the larger context of the placement of that sign in the mise-en-scene and narrative, instead of just the nature of the sign itself.

The examples used in this chapter have a minimum amount of embedded narrative information. However, I will mention the place of each example in the broader narrative and storytelling process. Examples that do have a significant amount of embedded narrative information are discussed in the next chapter. This is to keep the discussion focused on the functional purpose of signposts now and on the relation of signs to the narrative in the next chapter.

CONTEXT OF APPEARANCE IN THE GAME SPACE

Most examples of signposting are not unique to a certain category; instead the category, and thereby their functionality, is determined by the context of their placement in the mise-en-scene of the game space. I have determined three primary factors that influence the category a sign falls into and consequently; its function in the development of the narrative:

1) The current objective in the game, this can be an emergent objective created by the players desire to explore, or developer generated objective included in the formal

systems of the game that leads to direct progression in the narrative such as a story mission.

2) The location of a sign in the game space. It is important to consider the placement of a sign in the larger context of a game because the context influences how a sign should be interpreted.

3) The unique identity and setting of each game. Not all signs are the same. Different games use different kinds of signposting depending on the nature and backstory of their game. For example: Fallout 4 is a post-apocalyptic RPG that takes place in a ruined world. As a result electricity is not widely available and lighting is used sparsely.

An example of the first two points could be a piece of fabric in the game space. This sign might point to a wall that the player can climb over. The determination on which category to place this example in would then be influenced by the game world around the sign. Can the player climb up that wall and explore a new area? In that case the emergent objective set by the players desire to explore influences the function of the sign in that particular context. Or is the wall in question the only way to exit a certain area and progress with the game? Another option is that it is signalled by a quest marker in the context of a story mission and is climbing over the wall the only way to start this mission and thereby progress. This shows that the act of play has a significant influence on the functions of signposting.

DIRECTIONAL SIGNPOSTING

Directional signposting refers to the direct progression in the game space and narrative via signs and semiotic clues embedded in the mise-en-scene by a developer. Clues of this form either direct the player to the most direct, or only, path from location A to location B in a section of the game space, or they direct the player to a new section of the game space outside the direct proximity of the player.

A ——————➤ B

Figure 1 Schematic representation of a directional sign: From A to B

Directional clues of this form are often repeated throughout a game in the same or very similar form, signalling where players need to go to progress, or pointing to transitional points in the game space such as doors that lead to loading screens or doors that only open after a certain action has been completed. The repeated use of these signs thereby crafts a sense of recognition with the player. Other clues are not necessarily repeated in the same form but are repeated conceptually.[2]

Directional signs often use either literal signs such as arrows or traffic signs or lighting to signal direction. White point or spot lights are regularly used in open world games to indicate direction or points of transitions between areas to the player. These white lights do not hold significant embedded narrative information. However, the use of white light creates the strongest possible contrast between light and dark areas and this has the function of attracting the attention of the player. Colour is also linked to directional signposting. The use of coloured lights generally coincides with an event in the game space that progresses the narrative. This is shown in the third example. Examples start on the next page.

---

[2] For example, contrast between light and dark areas can be used to draw the attention of the player, the locations in the game space change, but conceptually they stay the same.

Figure 2 Fallout 4: The Castle

Type: Directional

Nature: Light source: point light, contrast

Context: This light is placed in the basement of the Castle, a location in Fallout 4. In order to progress with the narrative this location has to be cleared of enemies. This door is the only way out of the basement.

Place of sign: The Castle is part of the main quest line, therefore this sign signals a prerequisite point of transition to progress the narrative.

Consequence of sign removal: The exit would appear less obvious to players and as a consequence they might spent more time searching for the exit, potentially getting lost.
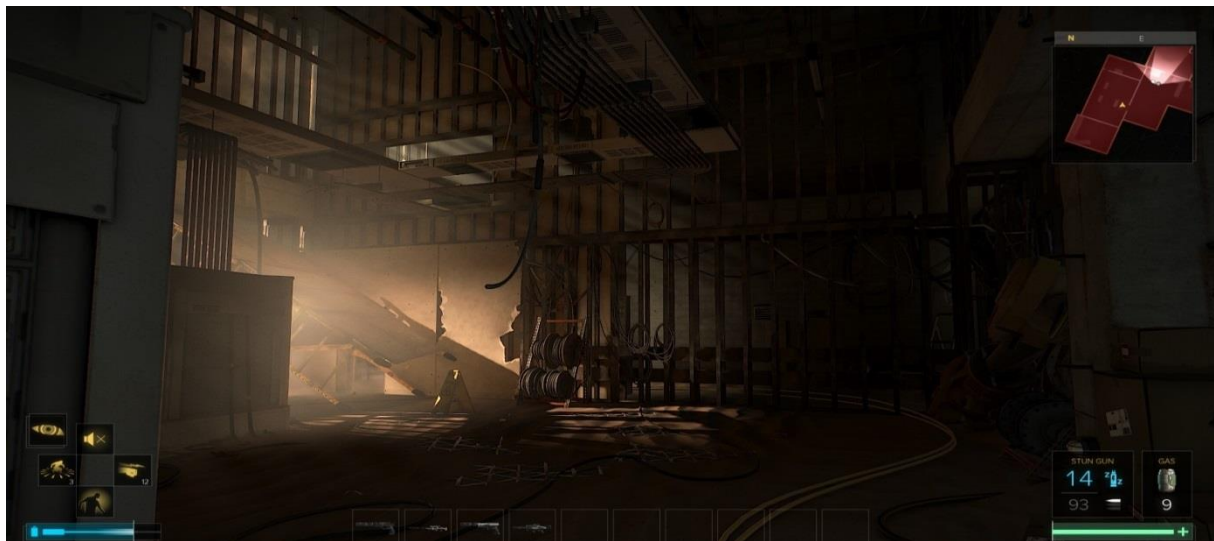

Figure 3 Deus Ex Mankind Divided: Dubai mission

Type: Directional

Nature: Light source: spot light, contrast

Context: A spotlight placed in the area of the first story mission which takes place in an under-construction building. Climbing up the lit area that represents a building site is the only way of progression. This sign does not give the player new narrative information, but instead allows the player to progress through the space more easily.

Place of sign: This sign is placed in the first inside area of the first story mission in Dubai. The protagonist has to navigate through the construction site in order to reach the objective and progress the narrative.

Consequence of sign removal: Without this light source, it will be less clear for the player where he has to go. This might lead to a frustration of getting lost.
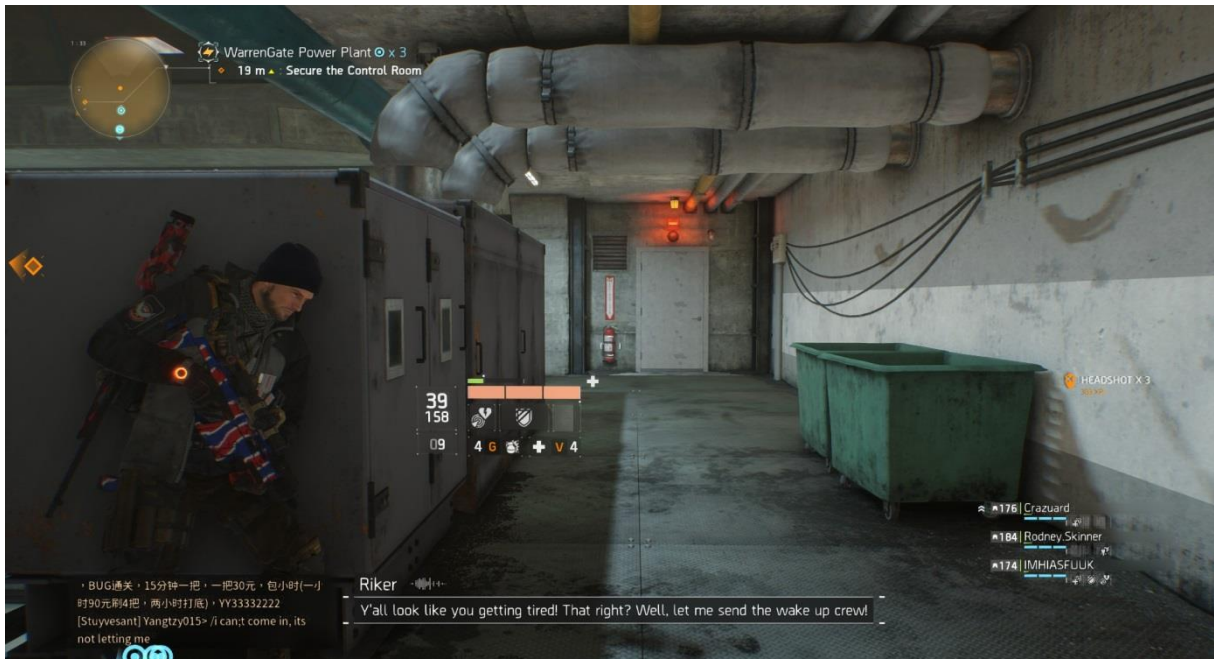
Figure 4 The Division: Warrengate Power Plant - Final room

Type: Directional

Nature: Light source, rotating point light, colour, indexical sign: red-danger

Context: These red or orange alarm lights are used repeatedly throughout The Division in various main mission areas to designate spawn points for enemy waves. Clearing these waves is required for progression therefore the signs are directional. The colour red/dark orange teaches the player that enemies will spawn in these locations. This makes it easier for the player to fight them, and it also reinforces the indexical relation between red colours and danger.

Place of sign: This sign is placed in the final boss room of the Warrengate mission. Completing this mission is required to unlock the next set of missions and thus to advance the plot. This sign is focused on the narrative progression of the player throughout this mission and the game as a whole.

Consequence of sign removal: Little to no consequence for the narrative, the enemies will spawn either way. However, not knowing the enemy spawn locations might result in the player getting swarmed and thus in a worse gameplay experience.

ORIENTATIONAL SIGNPOSTING

Orientational signposting refers to signs in the game world that point players towards the presence of alternate routes and spaces throughout the game such as shortcuts and hidden areas. These can be areas that give more information on the narrative of the game, or other areas that do not lead to direct progression concurrent with the current objective in the game. Generally these signs stimulate and support the exploration of the (open) game world by the player thereby contributing to storytelling and the spatial stories. The distinct difference with directional signposting is that following orientational signs is not a requisite for narrative progression, but can lead to progression in the narrative in a more circuitous way by exploration or alternate routes. A similarity with directional signposting is that orientational signposting can also be repeated in the same form. However, whether the sign is directional or orientational depends on the context of appearance in the game space. Orientational signposting can contain embedded narrative information that can be discovered by the player. However, this is not a pre-requisite for a sign to be considered as orientational. As a simplified example of orientational signposting: the player can navigate through the game spaces in different ways. He can go to A to B via C, or he can interpret C as a 'distraction' on the way from A to B as depicted below.
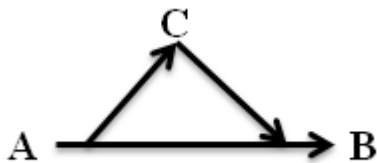
Figure 2 Schematic of a game space with an alternate route indicated with orientational signposting
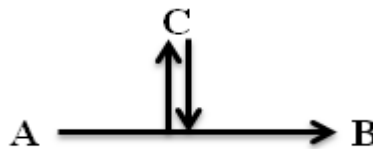
Figure 3 Schematic of a game space with an extra explorable area indicated with orientational signposting

Signposts in orientational setting often make use of lighting, colour, and contrast to help the player navigate through the game space. White point and spot lights are used in a similar manner as with directional signposting. However, in the case of directional signposting these lights generally point towards a door or point of transition creating contrast with the rest of the game space. The use of contrast is important in orientational signposting and when a sign is used in this manner there is often an embedded narrative embedded in the sign as well. When the sign is orientational the light usually illuminates a larger area. These distinctions are not exclusive; the exact function of a sign depends on its purpose in the game world in relation to the narrative and current objective of the game. Signs that use colour very prevalent in orientational signposting, coloured signs usually have an associated embedded narrative element to them that assists in the world-building aspect of signposting. Coloured signs also point towards an area of interest rather than a specific door or point of transition.

Figure 5 Deus Ex Mankind Divided: Dvali Territory

Type: Orientational

Nature: Light source, spotlight, contrast

Context: This sign is placed in a back alley near the theatre in the Prague city hub and points the player towards an alternate route of approaching an area that can be explored.

Place of sign: In the narrative of Mankind Divided this shortcut allows the player to directly access the building from which the players needs to extract an NPC.

Consequence of sign removal: Without this sign it will be less obvious where the player can go. This can lead to fewer players discovering this alternate route.

Figure 6 The Division: Dark Zone 2 Infected Zone

Type: Orientational

Nature: Decal, colour, symbolic sign: yellow-sickness

Context: Part of the The Division is the Dark Zone. In this game there are 'contaminated areas' that contain loot but are dangerous to the player. All these areas are signalled by yellow decals at the entrance of each zone. These areas can be explored for loot, but the player will die if he stays there too long.

Place of sign: In the narrative of The Division, specifically the History of the Game World, the colour yellow is used extensively to tell the player that he is entering an infected area, or to keep reminding the player that he is playing in a post-apocalyptic world.

Consequence of sign removal: If this type of signage was removed the player could have more problems discovering these loot-rich areas. This will reduce the rate at which the player can progress through the game space.

Figure 7 Fallout 4: Central Boston - outside area

Type: Primarily orientational, secondary directional

Nature: Light source, point light, contrast

Context: This form of contrast based lighting is encountered repeatedly in the open world of Fallout 4. Generally the light sources represent fires that create contrast and stand out in otherwise dark areas. Depending on the objective they can serve a directional purpose but normally they point to areas with enemies or access to indoor areas.

Place of sign: This specific sign has no function in the main narrative other than signalling another place to explore by the player. This type of signage is used in other places in the game that do have a link to the narrative.

Consequence of sign removal: Without this light the player might not notice there is an area of interest, the player then has to search in every proverbial corner to find these areas if they are not signalled.

CONTEXTUAL SIGNPOSTING

Contextual signposting is a different type of signposting when compared to directional and orientational signposting. The latter two are more focused on driving and continuing the narrative progression by assisting in player navigation and exploration of a game space. Contextual signposting puts more emphasis on conveying narrative information that is often related to the plot, and less on widening the narrative with background information. Contextual signposting can work in two ways:

- They point to embedded narrative information in the vicinity of the player in the game space.
- The sign itself contains embedded narrative information.

In this manner it contributes to the process of environmental storytelling by pointing the player to this information. A prerequisite for signposting to be considered as contextual is that it the embedded narrative is placed in the direct proximity of the player and that the signs are directly visible to the player from his current location.[3] These forms of signposting can be more subtle when compared to the other two categories in their appearance, but the signs and lighting used are not unique to this category, again the context of their appearance in the game world is what determines the category. Many cases of contextual signposting use spotlights or rely on decals to convey narrative information. Below is a simplified schematic of contextual signposting in conjunction with directional and orientational signposting.
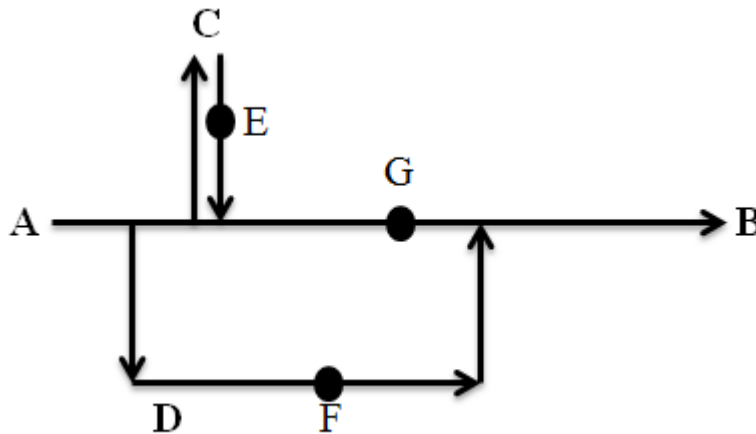

Figure 4 Schematic of a game space with directional routes (A, B) and alternate routes and explorable areas (C, D) with locations of embedded narrative information signalled by contextual signposting (E, F, and G)

---

[3] Example: a corpse with a light shining on it will be considered as contextual, but for the sign to have effect the player has to be in direct proximity for the light to be visible. A light shining on a doorway with a corps in it will still be considered contextual. But if the player enters a hallway that diffuses from the main path, then only the sign pointing to the room with the corpse at the end will be considered contextual, the sign pointing to that hallway is one that stimulates exploration and is therefore orientational.

Figure 8 Deus Ex Mankind Divided: Southern subway area

Type: Contextual

Nature: Light source, spot light

Context: Spotlights are used in Deus Ex: Mankind Divided to draw the attention of the player towards the presence of narrative information that propels the plot. This example is located in the Prague city hub sewers and directs the player to embedded narrative information in the direct vicinity of the player.

Place of sign: In the context of the narrative in Deux Ex: Mankind Divided this sign points to the death of an NPC that is related to a sidequest. The tablet found near this body gives the player a keycode to open an area.

Consequence of sign removal: Finding this is not mandatory for progression in the narrative, but instead a reward for the player exploring the world.

Figure 9 Fallout 4: Commonwealth - Gunners Plaza

Type: Contextual

Nature: Decal

Context: These decals symbolize a faction in Fallout 4 called the Gunners and these signs are placed at their headquarters. This sign points towards their headquarters as a location occupied by their faction.

Place of sign: In the world of Fallout 4 the Gunners are considered "ruthless mercenaries". This use of a 'skull' tries to convey that message to the player.

Consequence of sign removal: This contextual sign tells something about the background of a faction in the game; it deepens the narrative but is not required for progression or the wider plot. There is also no chance of the player missing the fact that this is a Gunner hideout because this location spawns enemies.

CHAPTER 5: SIGNPOSTING AS EMBEDDED NARRATIVE

In this chapter I will discuss how signposting in general and different types of signposting relate to the narrative and narrative progression in open world games. For this I have analysed how narrative information is embedded in signposting and how much information is actually made available for the player to discover. Before I go into these examples I will go back to the previously mentioned importance of semiotics in signposting. The textual analysis shows that both indexes and symbols play an important role in conveying narrative information in signposts to the player. This goes beyond what Fernandez-Vara discussed in her work on indexical storytelling (Fernandez-Vara 2011). Below is a brief repetition of that various symbolic signs and a description of the relations between sign and signified object.

- Icons: signs that convey ideas by imitating them.
- Indices/indexes: The idea is physically connected with a sign.
- Symbols/general signs: Signs which are associated with meaning through usage.

Additionally I will show the importance of signposting for the creation of a narrative and spatial experience throughout open world games by illustrating what the consequences could be if the signs are not present. This relates to the third function that will be discussed in chapter 6.

After the examples I will discuss how the various types of signposting relate to the narrative, what place they have in the broader narrative and how it plays into progression of the narrative. Because I am interested in how this is done in open world games in a more general fashion I will focus on more generalized conclusions based on the examples and the categories rather than making statements about each of the three cases.

INDEXES AND REINFORCING THEM

First, indexes in signposting can be used to reinforce existing relations players have with the sign. Indexes signs are used as directional, orientational, and contextual clues to create a recognizable context in the design of a game by using existing associations the player has with specific colours, sensitivity to lighting or obvious signs such as exit signs and arrows. These relations are then reinforced by the repetition of signposting throughout a game space. This engrains the importance of these signs and its place in the narrative and the mise-en-scene in the player as he travels through the various game spaces in open world games. By increasing the awareness and making it more easily recognizable the semiotic "power" of a sign is increased, making it a more effective storytelling tool. The result of this reinforcement is that navigation is made easier because the player can more easily assign meaning to a certain sign since he has encountered it repeatedly in his experience. Consequently, signs that are indexes fulfil all three of the functions mentioned earlier.

NEW SYMBOLS

Second, developers sometimes try to create new symbolic associations that are ingrained on the player via playful interaction and repeated occurrences of these signs. This creates new symbolic relationships that are only relevant for the game that they occur in. These signs have the same function in environmental storytelling, and they are embedded in the game space and the mise-en-scene in the same ways and they drive narrative progression in the same manner as indexical signs. The difference is that these new symbols attempt to create new associations using repeated occurrences of these signs. The player has no pre-existing knowledge of what these signs mean when they start playing the game as is the case with indexes. Repetition throughout the game finally results in the player associating these signs with their in-game meanings that already existed as part of the history of the game world that Fernandez-Vara discussed (Fernandez-Vara 2011).
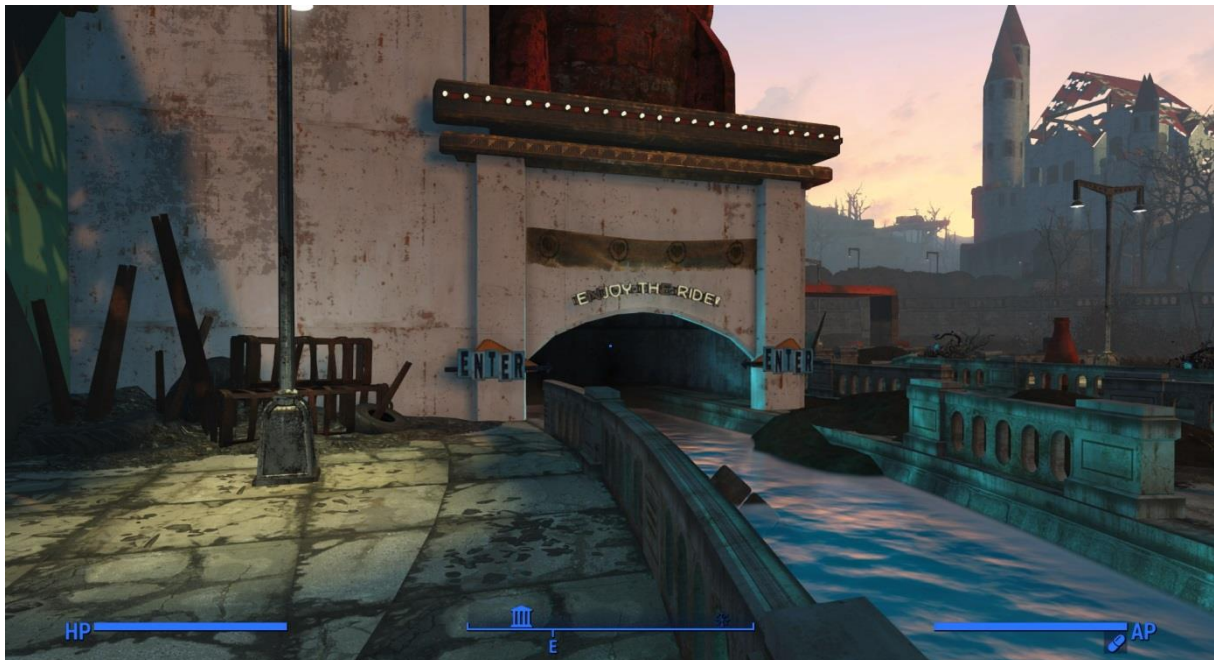
Figure 10 Fallout 4: Nuka World - Bottling Plant

Type: Directional

Nature: An object in the form of an arrow/enter sign

Context: Appears at the Nuka World factory in Fallout 4. The entrance signalled here is the only entrance to this factory. Since this would also be the entrance for the tour boats that drove her in the past this sign is well placed in the lore of Fallout 4.

Embedded narrative: This sign has obvious navigational purposes. However it also gives the player information about what exactly this building is. It is an indexical sign that refers to the start of attractions we can see in theme parks. This is most visible in the "enjoy the ride" phrase.

Place of sign: The player is already aware that this part of the game takes place in a theme park and has to explore this building as a part of the main plotline. Aside from referring to the main questline that requires the player to clear the park of threats, this sign contributes to world-building and it is one of the details in the mise-en-scene that make the game as a whole more immersive.

Consequence of sign removal: The consequences for this sign not being here are minimal. In regards to the navigational function of this sign; this is the only way into the building. The sign also does not give large amount of narrative information. As a result absence would not influence the immersive experience of the game in a significant way.

Figure 11 Fallout 4: Nuka World

Type: Primarily orientational, secondary directional
Nature: Light source, point light, contrast
Context: This form of contrast based lighting is encountered repeatedly in the open world of Fallout 4. Generally the light sources represent fires that stand out in otherwise dark areas. Depending on the objective they can serve a directional purpose but normally they point to areas with enemies or access to indoor areas.
Embedded narrative: The narrative embedded within this symbolic sign is closely related with its navigational purpose. It uses contrast in the mise-en-scene to attract the attention of the player, but in the History of the World in Fallout 4 the presence of light means that there is probably someone living there. This specific sign points towards a building that is inhabited by Raiders. This form of signposting is used regularly throughout the game and thereby reinforces the associations the player can develop in regards to the link between lights and inhabited areas. The repeated use of these forms of point lights and contrasts contributes to the world-building aspect of signposting
Place of sign: In the narrative of Fallout 4 this particular area has no specific role. But this sign affords story progression and storytelling by making the world easier to navigate and giving the player areas to explore.
Consequence of sign removal: If this sign was not present it would not be clear to the player that there is an object of interest here. As a result, the player would learn less about the people living in the Wasteland and the world would feel emptier. There is no direct consequence for the main storyline, but if these signs would never be used in this way throughout the game, the world would feel emptier and probably more boring.

Type: Orientational, secondary contextual

Nature: Objects

Context: This indexical sign uses text and lighting to point the player to a settlement called Goodneighbour. It uses lighting similar to advertising signs someone could encounter in shops.

Embedded narrative: Goodneighbour is settlement run by NPC's that exists as part of the history of the game in Fallout 4. It is a hub for quests and shops and a safe haven for the player. This specific sign tells that player that there is a settlement behind that wall. In the context of Fallout 4, the narrative embedded in this sign tells that player that there is a measure of civilization and safety here that stands in contrast with the lawless nature of the Wasteland.

This indexical sign also functions as a liminal point because interacting with the door nearby for the first time transports the player inside this landmark, offering an open view of the settlement to the player.

Place of sign: In the context of the wider narrative in Fallout 4 Goodneighbour is a small city hub that servers as a collection point of shops and questgivers. This settlement is also run by intelligent "Ghouls"[4] that play an important part in the game. The area indicated by this sign thus provides the player with another outlook on an enemy faction and plays a role in some moral decisions the player has to make.

Consequence of sign removal: A consequence of this sign not being present might result in the player never finding this settlement as it is located in an otherwise ruined and destroyed city. The presence of the sign almost ensures that players will find it eventually. This removes the need for the player to spend a lot of time searching for it, improving the spatial experience and preventing the player from getting lost.

---

[4] Ghouls are a main enemy in Fallout 4, essentially they are humans whose brains have decayed due to radiation, leaving them in a feral zombie-like state. However, some Ghouls have managed to maintain their memories and humanity.

Figure 13 Fallout 4: Diamond City - Entrance

Type: Orientational

Nature: Object

Context: This sign that points towards the Mayor's office is located in Diamond City in Fallout 4. After entering the city the player is spawned in a location from which this sign is visible.

Embedded narrative: Similar to the previous example that showed Goodneighbour, this indexical sign works on the expectation people have with a Mayor. The fact that Diamond City has a mayor can be perceived by the player as proof that this city is safe, civilized and important in the world of Fallout 4. This sign also points the player towards the shortest route to the Mayor's office.

Place of sign: In the larger context of the narrative in Fallout 4 this becomes important later in the game when the player is tasked with a quest that involves finding and talking to the mayor. The presence of the sign makes it easier to find him and this improves the spatial experience of the player.

Consequence of sign removal: If the sign would not be present it would be easy to get lost in the many narrow corridors of this city hub. This could force the player to look behind every proverbial door to find the Mayor and it would slow down the narrative progression of the game.

Figure 14 The Division: Clear Sky Incursion - first area

Type: Primarily orientational, secondary directional

Nature: Object/Decal

Context: These sheets are used extensively in The Division as a means to point players towards objects they can climb on to find alternate routes and new areas. They are primarily used in the open world, but also in story missions.

Embedded narrative: These yellow sheets of fabric that are placed over objects convey to the player that someone in the history of the game world placed them there to help the player reach new areas. This is a symbolic sign that the player becomes acquainted to throughout the game and at some point can be considered an indexical sign when the player concludes these sheets serve a navigational function. This specific sign is placed in a Raid style mission and has an additional sign, the crosshairs, next to it. These crosshairs tell the player that this path leads to a vantage point.

Place of sign: The possible story and role in the narrative behind this is that someone attempted to attack this area before the player and left markers to support their attack. At a later stage in the history of the game world the player can make use of these signs to plan his own attack on the checkpoint at the end of the road.

Consequence of sign removal: Removal of all these sheet based signs would result in a less immersive experience for the player because it reduces the amount of detail, making the game space blander. It would also make it less clear for the player how he has to navigate the game space.

Figure 15 The Division: Survival mode - Safehouse

Type: Orientational

Nature: Light source, spotlight, contrast

Context: These orange lights are placed in the game world of The Division: Survival to signal safe houses where players can hide from the cold. Every safe house is signalled with these orange lights.

Embedded narrative: This light is a symbolic sign that teaches the player that safe houses are signalled in this manner as the player plays this game mode. The use of an orange light in a blizzard creates a stark contrast with the white atmosphere. After a short period this sign can be considered as indexical because the player will recognize these lights from a distance and recognize their function. This improves the spatial experience of the game and makes navigation easier. By this system of repetition these signs are given a place in the narrative of the game by telling the player that there is a safe room located near tis light.

Place of sign: In the narrative of this Survival mode this is one of the safe houses that the player can use to hide from the cold and gather loot. These safe houses are run by military personnel who are aligned with the player. In these safe houses the player can craft items he needs to enter the Dark Zone and to survive the cold longer.

Consequence of sign removal: Absence of this sign would, compared with the low visibility inside the game space, result in a situation where many players would be unable to find safe houses. Given that the player has to visit these safe houses regularly in order to proceed successfully through the game space, the immersive experience will be ruined quickly.

Figure 16 The Division: Dark Zone 3 - Infected area

Type: Orientational

Nature: Decal, colour

Context: One of the contaminated areas in The Division. All these areas are signalled by yellow decals at the entrance of each zone. These areas can be explored for loot, but the player will die if he stays there too long.

Embedded narrative: These signs are strongly symbolic and have an association between the colour yellow and biohazard dangerous. The game builds upon this association by teaching the players that yellow colours stand for dangerous virus infected areas. During the course of the game this sign might be considered indexical when the player becomes aware of this association. This particular sign also alerts the player that enemies are present in this contaminated zone by the use of a yellow skull.

Place of sign: In the context of the larger narrative in the game this sign tells something about the history of the game world. These areas are dangerous but people might have died here that left valuable loot behind for the player. However, the skull indicates that it is also an stronghold of enemies.

Consequence of sign removal: If these yellow signs would be removed the game space would have less impact on a positive spatial experience, and navigating the game world would be harder as the player will have a harder time finding these loot-rich areas.
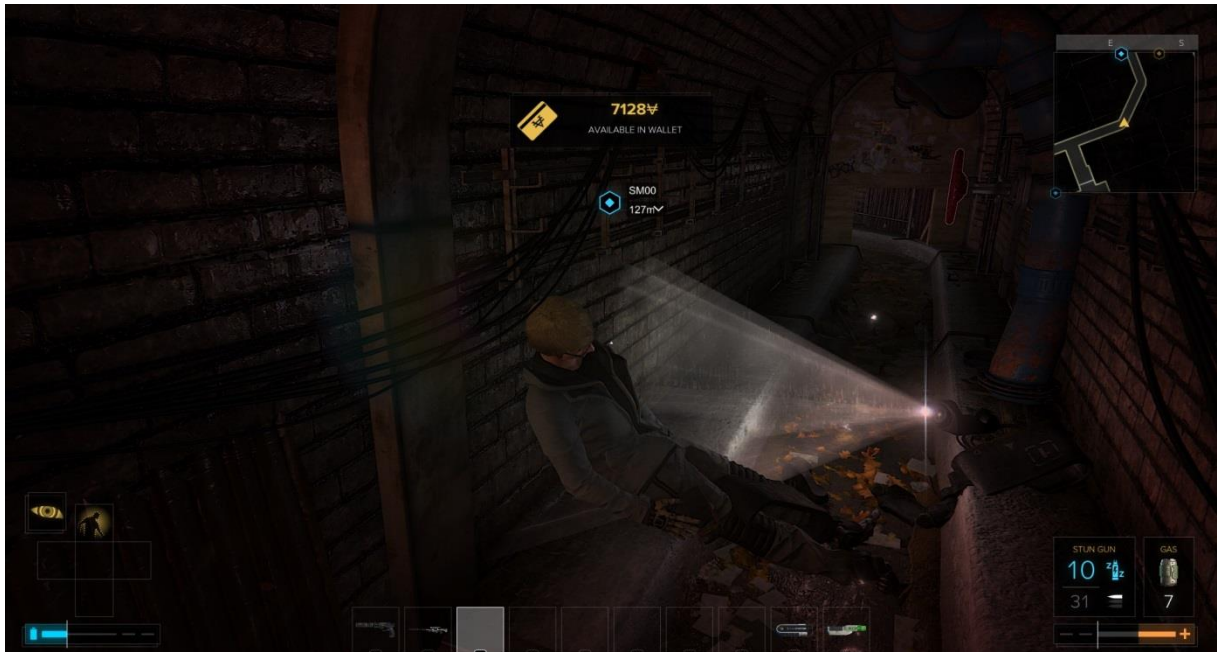
Figure 17 Deus Ex Mankind Divided: Southern Prague - sewer area

Type: Contextual

Nature: Light source, spot light

Context: This spotlight is located in the Prague City Hub Sewer and it points the attention of the player towards this body and a datapad that tells something about how he died.

Embedded narrative: In the context of that backstory this person fled down into the sewers and died in this corridor from toxic gas. The gas is cleared in this screenshot. This sign is not symbolic or indexical but does point towards this body and the information that can be deduced from it. A datapad with his story is next to the body.

Place of sign: In the world of Deus Ex Mankind Divided there is a class war going on between augmented and non-augmented people. On the streets of Prague police officers are rounding up people and sending them to a gulag. As a result many people have fled or sought refuge in the sewers.

Consequence of sign removal: If this sign was not present it would be less obvious to the player that he can learn something about the history of the game world here. Given that the body is in a narrow corridor many players would still find it but the percentage of players that do is higher now that the sign is included in the mise-en-scene.

In this section I will discuss the relations of the different identified forms of signposting with the narrative, starting with some general remarks on the relation between signposting and narratives. Earlier in this paper I discussed environmental storytelling and the importance of progression in a narrative experience. Jenkins stated that "narrative comprehension is an active process by which viewers assemble and make hypotheses about likely narrative developments on the basis of information drawn from textual cues and clues" (126). Essentially we can see "storytelling" as a combination of the words "story" and "telling".

I want to pose the relation between signposting and the narrative in the following way:

It is not so much about the destination as it is about the journey.

The narrative in a game is not just there (at least not from the perspective of the player), it is discovered and experienced by a player as he plays the game. Signposting as embedded narrative information plays a role in the narrative, but also in how the narrative is told; it plays an important role in the journey through a game. In the analysis I identified three types of signposting, directional, orientational, and contextual. These are functional categories that determine the function of a sign in the "telling" aspect of storytelling. This "telling" function is very important as is linked with gameplay and how a player navigates spaces. Without it a narrative would stagnate. Imagine a book where you can't turn a page, or a book where you can only read the pages with page numbers, but some pages don't have any, or they are mixed up. Signposts are the proverbial page numbers and the mechanics that allow you to turn the page.

Additionally, in many cases signposting also contains embedded narrative information. The analysis of the examples shows that in cases this embedded information is part of the narrative of the game; it is part of the "story" part of storytelling. However, in many cases it is not associated with the main plotline of a game. World-building, the telling of the history of the game world before the plot of the game are the primary ways in which signposting conveys narrative information. There are examples of signs, such as the example on the previous page, and the Fallout 4 example regarding Goodneighbour that do present information related to the main plot. But these are a minority. This can also be seen in the screenshots in the attachments. The main focus of signposting in relation to the narrative, barren aforementioned examples, appears to be the facilitation of the "telling" part of storytelling, it is related to the journey of a player and the narrative progression. However, different types of signposting also have a different relation to the narrative of games regarding the embedded narrative content, and in the sense on how the information is shaped and presented to the player.

Another observation is that the forms of signposting, what types of light are used etcetera have a strong correlation with the history of the game world. In Fallout 4 we see a heavy use of contrast, explicit signs, and fires, corresponding with the narrative that it is a post-apocalyptic world. In The Division we see a heavy use of colour and decals, something that fits well with the infection theme and the mise-en-scene of a ravaged city. Deus Ex: Mankind Divided has a focus on the use of lighting and contrast. It takes place in a modern world, but has a strict colour based art direction. As a result there is less use of colours that would stand out in signposting. Many of the games scenes are also situated at night time or underground, making contrast even more relevant for signposting.

Directional signposting is primarily related to the "telling" part of environmental storytelling. These signs are often as explicit as possible, but in a way that makes them fall in the narrative scope of the game in question. This can be seen in Fallout 4 where directional signs can be point lights that heavily build upon creating contrast, something that works well in a world with little to no electricity. In Deus Ex: Mankind Divided many directional signs come in the form of spot lights that illuminate the area the player needs for progression. These signs rely heavily on contrast, hold little relevant narrative information, but they are created to blend in well with the rest of the mise-en-scene in the game space. In that sense they give a minimum amount of narrative information, but rarely anything that refers to the main plot.

Directional signposting relies heavily on the use of semiotics that players are familiar with, namely indexical signs. In practice this means that many directional signs have existing connotations: the use of contrast, arrows, exit signs, red lights to indicate danger. This can be explained from a logical perspective: to guide the player through a game space, effectively, from the start of the game, the player has to recognize the elements that try to achieve this. As a result many directional signs have existing indexical relations. By repetition these relations are enforced. In relation to the narrative the result is that these signs generally don't tell much about the narrative of the game. The signs are part of the history of the game world, but they generally don't tell anything about the plot.

Orientational signs have a stronger relationship with the narrative of a game then directional signs. Both still have the functional purpose of guiding player navigation through the game space, but the signs that I consider orientational contain more embedded narrative information. In many cases the information that these signs convey also has a stronger presence in the history of the game world, giving these signs more narrative meaning both in and outside the main plotline. This can be seen in the Division examples on the Dark Zone, the colour yellow has a semiotic link to sickness and infection that is ingrained on the player over time. This sign assists the player with navigation of explorable areas. But it also tells the player that he is in an area with high infection rates.

Other examples also made extensive used of semiotics to convey narrative information. But orientational signposts also make use of symbolic signs. These are the semiotic signs that only get assigned meaning through repetition and *play* of the game. The meanings assigned to these signs often originate in the history of the game world. A similar dual purpose can be seen in the examples that discussed the use of fire as a lighting source in the open world of Fallout 4. The sign uses contrast to attract player attention and assists in navigation, and it also tells the player that in the history of the game world, people are most likely living there. In some cases these areas are related to the main plot as well. Thus, compared to directional signposting; orientational signs are more organically placed in the narrative. They tell "story" but they still play a part in "telling" as well by supporting exploration.

Essentially, embedded narrative information in orientational signs widens the narrative the player experiences by presenting more information that originates in the history of the world. Going back to the book metaphor I used earlier. Directional signposting can be compared with the page numbers of a book, but these numbers are written in a font that relates to the topic of the book. Orientational signposting could be explained as post-its sticking out of a book, giving the reader more information about a passage. For example, the passage could describe the character in the book entering a library. The post-it could widen the narrative by explaining what the library looks like.

Between the three types of signposting, contextual signposting has the strongest relation with the narrative. The examples show that in many cases the embedded narrative

information that can be learned from these items is not related to the main plotline. Instead it gives additional information on side-quests and important actors, such as factions, in the narrative of the game. In other cases it refers to information that learns the player something about the larger history of the game world. Many of these signs are of symbolic nature drawing attention to an object or decal. In some cases, as can be seen in the sewer screenshot of Deus Ex: Mankind Divided, the sign is support by a spotlight. These lights are used in all three case games to draw attention to objects in the player's vicinity.

The difference with orientational signposting is there is more "story" and less "telling" in these signs. As mentioned in the previous chapter. Contextual signposting relates to objects or information in the direct environment of the player while orientational signposting usually also refers to an explorable area.

This leads to the conclusion that the narrative information embedded in contextual signposting usually deepens the narrative experience of the player by giving more information on quests or important parts of the history of the game that the player is already familiar with in some way. If this is placed in the book metaphor I used earlier this can be described as post-its attached to the pages that describe the thoughts of characters other than the main character.

To summarize, what these results indicate is that, exceptions notwithstanding, the more embedded narrative information a sign contains it is less likely to have a significant navigational function as well. Directional signs have the weakest relation with the narrative, but are vital in guiding player progression. Contextual signs don't play an important role in player navigation through a game space, but they are the most likely to contain narrative information that is related to the plot.

CHAPTER 6: THREE FUNCTIONS OF SIGNPOSTING

To conclude the analysis I want to briefly discuss the three functions that signposting performs in the context of environmental storytelling. These three functions originate as a consequence of signposts performing both navigational tasks and storytelling tasks. The third function is a consequence of this two and is related to the goal of a game to create an immersive experience. The three functions have been mentioned in chapter five and are: navigational functions, storytelling functions, and contributing to an immersive narrative experience. I will discuss each function briefly.

1. Signposting supports and affords the navigation of the player through the game space. Consequently it supports in the progression of the narrative, and the discovery of more narrative information. It can direct the player to embedded narrative information, or to other more classic forms of storytelling such as cut scenes. This is closely related with the three types of signposting that were discussed. Directional signposting supports navigation in the most direct way. These signs are often located at transitional or liminal points in a game space. They are often indexical and created in an explicit way. Lighting is used extensively, in many cases point, or spot lights that illuminate a small part of the game space in order to put focus on the required path of progression. Orientational signs can often be seen in more open areas and they generally support the exploration of the game worlds but drawing attention to areas that are of interest to the player, often because of the associated "history of the world" for that area. Contextual signs have less navigational functions, but they do draw attention to objects of interest in the vicinity of the player.

2. Signposts themselves can contain embedded narrative information. Not all signs contain an embedded narrative as it depends on the nature of the sign. Analysis shows that directional signposts perform this function the least, while contextual signposting has the strongest link to the narrative. All forms of signposting make heavy use of semiotics, both symbolic and indexical signs. The contributions made to the narrative are small and generally contribute to widening of the narrative experience in the form of world-building, but they do not progress the main plotline. On top of that contextual signposting can also further deepen and explore the narrative by providing more information on important actors in the story.

3. The third function appears small, but is quite significant. Signposting contributes to an immersive narrative and spatial experience for the player. This is a result of the first two functions. Essentially signposting makes sure that the player gets where he needs to be and learns about the story what he needs to learn. Studying to what extend signposting matters for an immersive experience was not part of this study. But it contributes to this to some extent. This is best illustrated by the examples in which I discussed the results of the signposting being removed. In most cases this would lead to a higher chance of players getting lost and the amount of narrative information the player could discover would be reduced. Getting lost can lead to frustration in gameplay, and that breaks immersion. By adding signposting as details to the mise-en-scene this situation can be prevented.

CHAPTER 7: CONCLUSION

In this paper I have attempted to shed more light on the importance of environmental storytelling in videogames, and specifically the role that signposting plays in the process. With the popularity of open world games, games that are less limited by their level design, more information is being embedded in the environment of a game space. With this paper I have provided a more in depth study of the role of signposting in video games when compared to previous research on this subject. The conclusion is that signposting fulfils three main roles in the process of environmental storytelling: it assists the player in navigation through the game space, it contains embedded narrative information, and as a consequence of these first two it also contributes to a convincing immersive narrative experience. The actual amount of narrative information conveyed by signposting is limited. It mainly conveys information that either assists in more effective navigation, information that points to more parts of the story in the vicinity of the player, or it helps making the game space more alive by adding details to the mise-en-scene.

However, this paper also has several limitations. For starters, textual analysis as a method is focused on making interpretations that can be generalized. In this case I have attempted to use a viewpoint akin to a developer of a game in order to deduce likely functions and meanings. This inductive approached worked well for this paper and it allowed me to suggest the categorization. However, a textual analysis does not account for the act of play very well. As a result of this act players might interpret information differently or miss signs all together. This leaves room for research that puts more emphasis on the experience of different players and how they interpret different signs. A good approach for this would be to conduct an experiment with an experimental level that minimizes other factors. This experiment could focus on how different players experience signposting differently and if they prioritize signs in a way that would correlate with the types and functions that are discussed in this paper. Another limitation in this paper is that it can only reasonably be generalized to include open world games. I cannot say anything about the applicability of these categories of signposting and the other different roles in anything other than an open world game. It is conceivable that the results are applicable to other first or third person games as well. However this still leaves a large portion of games excluded, think of sidescrollers, top down games, strategy games etcetera. A possible venue for future research could be to perform a textual analysis on other types of games to study the importance of signposting in those. This could add upon this research by extending the types and functions of signposting to other, perhaps more linear experiences. One of the three functions I discussed, the influence of signposting on the immersive experience, did not fall within the scope on this paper. The discussion on immersion in videogames is a discourse on its own. However signposting does appear to have a role in this rather complex concept. An avenue for future research could be to study how signposting plays into the immersive feeling of a videogame. This would also link signposting, and thereby environmental storytelling and the discourse on narratives and spaces directly to the discourse on immersion, this could lead to new insights that benefit both discourses.

This research was highly focused on signposting as component of the embedded narrative that is part of the broader concept of environmental storytelling, and that concept is only concerned with one form of storytelling. In this context the focussed nature is a limitation in itself. Jenkins identified at least three other types of narratives related to environmental storytelling. A suggestion for further research is to study exactly how signposting fits into these other types of stories and if the types suggested here are applicable in these other forms of storytelling. Another venue is to expand the definition of signposting and include audio in the study of signposting. A research goal here could be to study to what extend audio can contain embedded narrative information. This could focus on either background audio or audio that is part of the storytelling process.

BIBLIOGRAPHY

Aarseth, E J. "Introduction: Ergodic Literature." In *Cybertext: Perspectives on Ergodic Literature*, 15. Baltimore: John Hopkins University Press, 1997.

—. "Playing Research: Methodological Approaches to Game Analysis." *Digital Arts and Culture (DAC).* Melbourne, 2003. 9.

Bevensee,, S.H, K.A Dahlsgaard Boisen, M.P Olsen, H Schoenau-Fog, and L.E Bruni. "Project Aporia – An Exploration of Narrative Understanding of Environmental Storytelling in an Open World Scenario." Edited by D Oyarzun, F Peinado, R.M Young, A Elizalde and G Mendez. *International Conference on Interactive Digital Storytelling.* Heidelberg: Springer Berlin, 2012. 96-101.

Bordwell, D, and K Thompson. *Film Art: An Introduction.* 9. New York: The McGraw-Hill Companies, 2010.

Botea, A, B Bouzy, M Buro, C Bauckhage, and D Nau. "Pathfinding in Games." In *Artificial and Computational Intelligence in Games*, 21-31. Dagstuhl: Schloss Dagstuhl-Leibniz-Zentrum fuer Informatik, 2013.

Bulitko, V, Y Bjornsson, N.R Sturtevant, and R Lawrence. "Real-Time Heuristic Search for Pathfinding in Video Games." In *Artificial Intelligence for Computer Games*, edited by P.A Gonzalez-Calero and M.A Gomez-Martin, 1-30. New York: Springer, 2011.

Carlquist, J. "Playing the Story: Computer Games as Narrative Genre." *Human IT: Journal for Information Technology Studies as a Human Science* 3, no. 6 (2002): 7-53.

Coffin, C, M J Curry, S Goodman, A Hewings, T M Lillis, and J Swann. *Teaching Academic Writing: A Toolkit for Higher Education.* London: Routledge, 2003.

Cui, X, and H Shi. "Direction Oriented Pathfinding in Video games." *International Journal of Artificial Intelligence and Applications* 2, no. 4 (2011).

Fernandez-Vara, C. "Game Spaces Speak Volumes: Indexical Storytelling." *2011 DiGRA International Conference: Think Design Play.* Digital Games Research Association, 2011. 13.

—. *Introduction to Game Analysis.* New York: Routledge, 2015.

Ferrari, S. *The Judgment of Procedural Rhetoric.* Dissertation, Atlanta: Georgia Institute of Technology, 2010, 129.

Fitzmaurice, G, J Matejka, I Mordatch, A Khan, and G Kurtenbach. "Safe 3D Navigation." *Symposium on Interactive 3D graphics and games.* Redwood City: ACM, 2008. 7-15.

Flynn, B. "Languages Of Navigation within Computer Games." *Proceedings of MelbourneDAC, the 5th International Digital Arts and Culture Conference.* Melbourne: DIGRA, 2003. 5.

Freeman, W. "Eight expert game lighting tips." *Develop Online.* 11 December 2015. http://www.develop-online.net/tutorials/eight-expert-game-lighting-tips/0214711 (accessed December 15, 2016).

Girina, I. "Video Game Mise-En-Scene Remediation of Cinematic Codes in Video Games." *International Conference on Interactive Digital Storytelling.* Cham: Springer, 2013. 45-54.

Graham, R, H McCabe, and S Sheridan. "Pathfinding in Computer Games." *The ITB Journal* 4, no. 2 (2003).

Jenkins, H. "Game Design as Narrative Architecture." *Computer* 44, no. 3 (2004): 118-130.

Jones, M. "Composing Space: Cinema and Computer Gaming-The Macro- Mise En Scene and Spatial Composition." *Imaginary Worlds Symposium.* 2005. 20.

Juul, J. "Games Telling Stories? A Brief Note on Games and Narratives." *Game Studies: The International Journal of Computer Game Research* 1, no. 1 (2001): 1-12.

Masters, M. "Understanding Different Light Types." *Digital Tutors Blog.* 2013. http://blog.digitaltutors.com/understanding-different-light-types/ (accessed December 15, 2016).

Mayra, F. *An Introduction to Game Studies: Games and Culture.* London: Sage, 2008.

McKee, A. "What is textual analysis?" In *Textual Analysis: A Beginner's Guide*, by A McKee, 1-33. London: SAGE Publications, 2003.

Nerurkar, M. "No More Wrong Turns." *Gamasutra.* 25 August 2009. http://www.gamasutra.com/view/feature/132504/no_more_wrong_turns.php?page=1 (accessed December 15, 2016).

Nieuwenhuisen, D, A Kamphuis, and M.H Overmars. "High Quality Navigation in Computer Games." *Science of Computer Programming* 67, no. 1 (2007): 91-104.

Nitsche, M. "Introduction." In *Video Game Spaces*, by M Nitsche, 1-21. Cambridge: MIT PRess, 2008.

Ohannessian, K. "Video Game Lighting Effects Bring Games to Life." *IQ.* 15 January 2015. https://iq.intel.com/bringing-games-life-with-light/ (accessed December 15, 2016).

Peirce, C. *Selected Philosophical Writings Volume 2.* Bloomington: Indiana University Press, 1998.

Prall, C. "Introduction to Lighting in Games." *Build New Games.* 4 December 2012. http://buildnewgames.com/lighting/ (accessed December 15, 2016).

Ryan, M-L. "From Narrative Games to Playable Stories: Toward a Poetics of Interactive Narrative." *StoryWorlds: a Journal of Narrative Studies* 1 (2009): 43-58.

Salen, K, and E Zimmerman. *Rules of Play: Game Design Fundamentals.* London: MIT Press Cambridge, 2004.

Sicart, Miguel. "Against procedurality." *Game Studies* 11, no. 3 (December 2011).

Tarnowetzki, L. "Environmental Storytelling and BioShock Infinite: Moving from Game Design to Game Studies." Dissertation, Concordia, 2015, 139.

van Lier, L. *The Ecology and Semiotics of Language Learning: A Sociocultural Perspective.* Boston: Springer, 2004.

Walton, Q. "Signposting tips and tricks." *Game Dev Focus.* 12 December 2014. http://gamedevfocus.blogspot.nl/2014/12/signposting-tips-and-tricks.html (accessed December 15, 2016).

Zimmerman, E. "Narrative, Interactivity, Play, and Games: Four Naughty Concepts in need of Discipline." *First Person: New media as story*, 2004: 154-164.

LUDOLOGY

Bethesda Game Studios (2015) Fallout 4

Massive Entertainment (2016) Tom Clancy's The Division

Square Enix (2016) Deux Ex: Mankind Divided

ATTACHMENTS

The attachments are presented in order of the chapter they appeared in. The extra images that serve as proof for the examples are located in Addendum 1.1 to 1.12.

Contents of the addendums:
- 1.1: Fallout 4 directional signposts and exit signs
- 1.2: Deus Ex Mankind Divided orientational signs
- 1.3 The Division directional exit signs
- 1.4 The Division directional light based signs
- 1.5 Fallout 4 orientational signs
- 1.6 Fallout 4 orientational signs
- 1.7 Fallout 4 directional/orientational signs
- 1.8 Deus Ex Mankind Divided orientational signs
- 1.9 The Division Survival orientational lights
- 1.10 The Division orientational sheets/fabrics
- 1.11 The Division orientational Dark Zone decals
- 1.12 The Division orientational decals

Due to file size issues, attachments 1.1 to 1.12 can be found in an online folder. It is accessible via this link:

https://www.dropbox.com/s/qmvdeiyou3btckr/Master%20Thesis%20Attachments.rar?dl=0