A Semiotic and Usability Analysis of Diegetic UI: Metro—Last Light

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Abstract A Game's narrative is perhaps one of the key components of creating player immersion. As technology advances, game developers increase their toolset for creating increasingly complex game worlds. The UI has a crucial role, providing the player with feedback about the various attributes and mechanics within the game. Some games sought to integrate the traditionally intrusive UI within the game's narrative and art, by the means of Diegetic UI. The goal of this research paper is to understand how integrating the User Interface into the game's art and narrative—creating what is called a Diegetic Interface—can increase the feeling of immersion for the player. To identify the processes through which meaning is observed in Diegetic UI, we've relied on the Discoursive Semiotics proposed by A. J. Greimas and to assess if these Diegetic Representations affect Usability, we employed Game Usability Heuristics proposed by Desurvire and Wiberg. The methodology proved to yield interesting results regarding the relationships between UI and Narrative as well as the Usability impact derived from such implementation in the game Metro: Last Light.

Keywords UI · Immersion · Storytelling · Game design

1 Introduction

As games become increasingly complex and realistic due to technological advancements, the subject of immersion in games becomes central to understanding how to

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141

design games for Virtual Reality. However, VR games are not the sole candidate to benefit for research into Immersion [1].

One of the main goals for story-driven games is player immersion into the game's world. Conceptually, the player stops being an outside entity and assumes the role of a fictional character, with his own set of goals, beliefs and memories [2].

The game's User Interface, as the name suggests, bridges the information gap between the player and the game, providing information regarding various status of the gameplay. In truth, some games rely on the UI as much more than just its informative function, in city manager games for example the UI is the means through which the player selects the tool he wishes to use in order to complete the set goals. The use of Diegetic UI can be seen in some form in various games such as the often-quoted example of Dead Space and discussed by various authors such as Fagerholt and Lorentzon, Azevedo et al. and Salomoni et al. [3–5].

The goal of this paper is to understand how Diegetic Interfaces can potentially increase player immersion and to assess if such implementation can prove to be detrimental to Usability.

To approach this question, we will employ the methodology first proposed by Vitorino and Serrano [6], consisting of a combination of a Semiotic Analysis, based on the work of Greimas [7] and a Heuristic Evaluation based on the work of Desurvire and Wiberg [8]. This approach is qualitative in its nature, allowing us to understand how the interface is structured in order to create meaning, by becoming part of the discourse of a game's plot or universe.

The object of the analysis is the game Metro: Last Light, published by Quicksilver and released in May 17th, 2013.

2 Theoretical Framework

2.1 Heads-Up Display (HUD)

One of the main elements of GUIs found in videogames is called a Heads-Up Display (HUD), according to Fagerholt and Lorentzon: "A head-up display, or HUD, is any transparent display that presents data without requiring the user to look away from his or her usual viewpoint. The origin of the name stems from the user being able to view information with their head "up" and looking forward, instead of angled down looking at lower instruments" [3]. In games, the term HUD refers to the method by which information is visually conveyed to the player whilst a game is in progress. The HUD is frequently used to simultaneously display several pieces of information such as the main character's health, items, and indicators of game progression and goals.

We understand HUD in videogames as any overlaid frame which conveys information regarding the player's current status, such as health, ammo, map, compass and enemy's health. The elements positioning is static, although in some cases HUD

elements can be occluded when not in use and has the clear purpose of conveying information regarding the player's attributes.

The GUI is the larger system which consists of all on-screen elements, including Menus and other non-gameplay related elements that don't require the player's constant attention [3].

2.2 Diegesis and Videogames

The search for a definition of the term Diegesis apparently first arose with the postulates from Plato and Aristotle. Diegesis, from the Greek $\delta\iota\acute{\eta}\gamma\eta\sigma\iota\varsigma$, means 'to narrate, set out in detail, describe' [9]. Diegesis would be aligned with poetic imitation, known as *Mimesis*, that is, they were practically the same thing. To Plato, *Mimesis* and *Diegesis* were two distinct terms: Whereas *Diegesis* stands for the narration, *Mimesis* represents the Poetic Imitation. Aristotle however saw narrative as closer to Poetic Imitation in relationship to Plato's concept [4].

Azevedo et al. further adds that through the times, these concepts were revised by many authors, such as Lodge [10], who proposes that Plato's and Aristotle's definition is exceedingly limited to classify all the variations and nuances in fictional narrative. Furthermore, it's a common occurrence where narratives exhibit a thin line between *Diegesis* and *Mimesis*. As such, it's paramount that more diverse and complex forms of classifications are proposed [4].

In games, the study of *Diegesis* in the context the Heads-Up Display in First-Person Shooters was approached by Fagerholt and Lorentzon [3], where it was proposed that Diegesis in games refers to the world in which the game's story takes place, defining whether an elements is part of the game's world and if the characters that inhabit this world can perceive it.

2.3 Discoursive Semiotics

"Semiotics seeks to determine what the text says, how and why it says, through an analysis in different forms of expressions" [6]. Greimas' semiotic theory positions itself as the theory of the processes of signification, and not the science of the study of signs.

It focuses itself on the generative process behind the creating of meaning [11].

This discipline, which was heavily influenced by the works of Ferdinand de Saussure, developed into its own form of Semiotics, aimed specifically at Discourse Analysis alongside an original method proposed by Greimas. In addition to the methodological support, an extensive terminological vocabulary is also presented, which is described in the postulate *Semiotics and Language: An Analytical Dictionary* [12]. One of such terms is 'Text', and while it might seem unusual to refer to visual representations as such, our understanding is that: "The term text is often taken

as a synonym of discourse, (…) Both terms—text and discourse—can be employed interchangeably to designate the semantic axis of non-linguistic semiotics: a ritual or a ballet can be considered as either texts or discourses" [12].

The semiotic theory of Greimas is first characterized by the concept of a generative process of meaning, starting from the most simple and abstract to the most complex and concrete, and is composed of three levels, this is called the Plane of Content, where the main Discourse lies, and the Expression Plane, the externalization of the content. It is important to note that, analysing verbal and non-verbal text through Discursive Semiotics does not necessarily imply that it is necessary to observe each text in accordance to a previously constructed structure but rather, observe the possible articulations and constructions of meaning that, in the text, result in a determined structure [13].

The Plane of Content. On the Fundamental Level, we find the basic semantics that constitute the foundation of the text's construction. It is here we find the semantic categories that order the text's content in a general and abstract fashion. This level is based on difference and opposition, in order to establish this opposition however, it is necessary the existence of common traits [14].

Lara [15] provides us with the example semantic oppositions of /humanity/ versus /divinity/, which also yields the contraries /not humanity/ and /not divinity/ (which are also contrary in comparison to each other). Besides the oppositional relationships, there also exists complementary relationships, such as the case of /humanity/ and /not divinity/, as well as /divinity/ and /not humanity/.

On the narrative level, the abstract values from the Fundamental become inscribed into objects, with which the observer can relate by Conjunction or Disjunction. The texts in this level are structured by a Canonical Narrative Schema which comprises four phases, namely: Manipulation, Competence, Performance and Sanction. [13, 15].

Lastly, on the Discursive level, the Subjects and Objects become Actors in the Discourse and the narrative begins to display the Time and Space categories, in order to transform the text into a communicative situation. The values previously embedded in objects become widespread as Themes—abstract elements which explain and instil reality—as well as Figures—or concrete elements that built the world simulacra and cover adjacent themes [13, 16].

The Plane of Expression. As we delve further into the Semiotic Theory proposed by Greimas, we find heavy influences from Saussure and his conception of the Sign as a duality between Signifier and Signified. This dyadic—i.e. two sided—model was then revisited by Louis Hjelmslev, who renamed them into the two planes discussed in this section—the Signifier and Signified becomes the Plane of Expression and the Plane of Content respectively [17].

If, in a primary phase, the Semiotic Theory focuses its efforts in analysing the content of a text, then in a second phase that focus is transferred into the Plane of Expression, which if we refer to the Sausurrian model—i.e. the Signifier—constitutes the 'sound-image' component of a Sign. Hjelmslev however, understood that the Plane of Expression represents material culture and the physical materials of a medium—images, printed words, sounds or even physical performances[18].

Furthermore, Hjelmslev adds that: "There can be no content without an expression, or expressionless content; neither can there be an expression without a content, or content-less expression" [18].

Before analysing the visual text it's important to note that, the Semiotic Analysis of strictly visual representations doesn't privilege neither the Plane of Content or the Plane of Expression, as the Dimensions—Also referred to as Plastic Formants—can also hold complementary relationships with one or more units within the Plane of Content [19].

2.4 Heuristic Evaluation

Despite this paper's perspective of games as a medium through which storytelling can be achieved and, as Hassenzahl [20] puts it, a mediator for experiences, they are still, nevertheless, software. As such, they're still bound to the principles of Usability proposed by HCI studies. One of the methods proposed to analyse software in order to isolate Usability Issues is called Heuristic Evaluation. Perhaps the most known examples of this type of Evaluation is Nielsen's [21] Usability Heuristics, broad rules of thumb—for evaluating User Interfaces in a cheap and fast manner.

For the purposes of this paper and in aiding us in answering the research question, we will rely on the work of Desurvire and Wiberg [8] where they claim that traditional heuristic evaluation fails to consider important concepts in Game Design, such as Immersion, Challenges and Entertainment. Thus, a specific set of Heuristics for games is necessary, and they introduce the PLAY Heuristics as a possible solution.

2.5 Metro: Last Light

Metro: Last Light is second instalment in a series of games developed by 4A Games and published by Deep Silver, released May 17th, 2013. The game is based around the book series Metro 2033 by the Russian author, Dmitriy Glukhovskiy. The game is set in a post-apocalyptic Moscow, following a Nuclear War that made the surface uninhabitable and forced the survivors to live in the Moscow Metro. Upon reception, the game was lauded by critics for its atmosphere, world design, story and gameplay [22, 23].

The game is classified as a singleplayer first-person shooter, and features stealth gameplay elements, enabling the player to choose between direct combat or dispatching enemies quietly.

3 Method

3.1 Object

The game "Metro: Last Light" was chosen as the object of this research paper due to its implementation of Diegetic Interfaces as well as its focus on storytelling and gameplay.

For the purposes of this paper we've opted to play the game under Ranger Hardcore, which according to the text description aims to provide the most immersive experience of the game, removing all HUD elements. This choice was made in order to assess the impact of removing on-screen elements and if this way of playing the game has direct impact on Usability and Immersion. While a comparative analysis of playing the game with the HUD versus playing the game without the HUD was considered, we believe that by starting the game without the HUD it was possible to analyse the game under the perspective of someone who has never played the game.

3.2 Materials

To conduct the analysis, the Authors resorted to utilizing a combination of Semiotic Analysis and Heuristic Evaluation as proposed by Vitorino and Serrano [6], however instead of utilizing the heuristics proposed by the authors, the PLAY Heuristics [8] was utilized due to it being an updated version of the heuristics presented in the original paper by Vitorino and Serrano.

To classify the elements according to its design space, the following categories proposed by Fagerholt and Lorentzon [3] were utilized (Fig. 1).

Fig. 1 Types of interfaces distinguished by their presence in the narrative and 3D space [3]

Table 1 The dimensions of the plane of expression. Adapted from [6, 15, 19, 24]

Dimensions	Terms
Topological dimension Spatial properties	High versus low Centre versus extremity
Eidetic dimension Forms and shapes	Circular versus rectilinear Uniform versus multiform Expanded versus contracted Angular versus rounded
Photochromatic dimension Light and colour	Light versus dark Monochromatic versus polychromatic Chromatic versus achromatic Opacity versus transparency Warm colours versus cool colours

For the Semiotic Analysis of the Plane of Expression, the following Dimensions were employed, with no specific hierarchy in mind (Table 1).

To conduct the heuristic analysis of the interface, the PLAY Heuristics proposed by Desurvire and Wiberg [8] were used, specifically use the Category 3, which is concerned with Usability and Game Mechanics (Table 2).

3.3 Procedure

Determining the Interface Elements. Before analysing the individual elements of the interface, the elements were outlined and separated in accordance to their function. The interface in Metro—Last Light is very straightforward, from an early gameplay segment that features a prologue to the main story, we see two elements: *A Wristwatch* on the protagonist's left hand featuring a blue LED and a digital clock, *and a Gun.* Following this opening sequence, the player assumes control of the Protagonist, which proceeds to automatically take two items from his desk: *A Journal and a Lighter*. As previously stated, the difficulty level under which the game was analysed does not feature a HUD. Upon reaching the Armory, the player is presented with the *Gas Mask*.

Four distinct items were stablished, which play important roles in the game's mechanics and gameplay, namely:

- Watch;
- Gun;
- Gas Mask;
- Journal and Lighter.

There are other interface elements which are responsible for specific game mechanics, such as a Battery system which the player must use in order to recharge its flashlight, however this system is only used occasionally and thus, we've opted

Table 2 Category 3: usability and game mechanics of the PLAY heuristics [8]

A. Heuristic: documentation/tutorial

A1. Player does not need to read the manual or documentation to play; A2. Player does not need to access the tutorial in order to play

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B. Heuristic: status and score

B1. Game controls are consistent within the game and follow standard conventions
B2. Status score Indicators are seamless, obvious, available and do not interfere with gameplay
B3. Controls are intuitive and mapped in a natural way; they are customizable and default to industry standard settings
B4. Consistency shortens the learning curve by following the trends set by the gaming industry to meet users' expectations. If no industry standard exists, perform usability/playability research to ascertain the best mapping for the majority of intended players

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C. Heuristic: game provides feedback

C1. Game provides feedback and reacts in a consistent, immediate, challenging and exciting way to the players' actions
C2. Provide appropriate audio/visual/visceral feedback (music, sound effects, controller vibration)

D. Heuristic: terminology

D1. The game goals are clear. The game provides clear goals, presents overriding goals early as well as short term goals throughout gameplay
D2. The skills needed to attain goals are taught early enough to play or use later, or right before the new skill is needed
D3. The game gives rewards that immerse the player more deeply in the game by increasing their capabilities, capacity or, for example, expanding their ability to customize

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E. Heuristic: burden on player

E1. The game does not put an unnecessary burden on the player
E2. Player is given controls that are basic enough to learn quickly, yet expandable for advanced options for advanced players

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F. Heuristic: screen layout

F1. Screen layout is efficient, integrated, and visually pleasing;
F2. The player experiences the user interface as consistent (in controller, color, typographic, dialogue and user interface design)
F3. The players experience the user interface/HUD as a part of the game; F4. Art is recognizable to the player and speaks to its function

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G. Heuristic: navigation

G1. Navigation is consistent, logical and minimalist

H. Heuristic: error prevention

H1. Player error is avoided
H2. Player interruption is supported, so that players can easily turn the game on and off and be able to save the games in different states
H3. Upon turning on the game, the player has enough information to begin play
H4. Players should be given context sensitive help while playing so that they are not stuck and need to rely on a manual for help
H5. All levels of players are able to play and get involved quickly and easily with

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I. Heuristic: game story immersion

I.1 Game story encourages immersion (If game has story component)

not to analyse it and instead focus on the more prominent and common elements. Due to the page limit we will only showcase the analysis of the Watch element, but as the other elements were a part of the original research conducted under a master's degree thesis, we will take them into account during the conclusion.

The Watch is the one element which is consistently visible through the game with no changes in appearance, its purpose is to provide the player with two distinct status information: The current oxygen filter's duration and the protagonist's visibility to enemies, represented by a pair of the red glowing numbers on the watch and a blue led indicator, respectively.

Element Classification. The element assumes a Diegetic representation, the Watch is placed in the Protagonist's left wrist and is contextualized as part of the game's art and narrative.

Semiotic Analysis. On the Plane of Expression, the LED indicator manifests characteristics from the Photochromatic Dimension, by the oppositions /light/ versus /dark/ and /chromatic/ versus /achromatic/, they relate to the /visible/ versus /invisible/ oppositions on the Discoursive level, which lead to the /conflict/ versus /calm/ Fundamental terms, which can be found in the Plane of Content, establishing a semi-symbolic relationship. The clock's numbers also assume the /light/ versus /dark/ and /chromatic/ versus /achromatic/ in the Photochromatic Dimension of the Plane of Expression. As the numbers are displayed on what seems to be a Nixie Tube, we find the /analogue/ versus /digital/ and /decline/ versus /progress/ terms on the Discoursive level, leading us to the Fundamental opposition /culture/ versus /nature/.

The numbers on the watch continuously decline until the player replaces his oxygen filters, if he fails to do so, he will die. We find the /full/ versus /empty/ Discoursive Terms, leading us to the /life/ versus /death/ Fundamental opposition. While these oppositions are not represented on the current element's Plane of Expression, they appear on the Gas Mask element (Figs. 2, 3 and 4).

Heuristic Evaluation. The watch speaks to its function to the player, making it easy for a new player to understand the information being conveyed without having to read a manual or play a tutorial, as the game introduces the player to the watch's functionality through specific in-game sections. The watch beautifully performs as both an indicator of the player's visibility and the current air filter's duration, providing visual as well as auditory feedback—in the form of a beeping sound when the filter is running out—it does not lack any sort of feedback and thus, does not place a burden upon the player. The watch is placed on the lower centre portion of the screen, where the player can easily see looking by simply looking down during shooting portions. As a Diegetic element, it encourages the player to immerse itself into the game's narrative.

Overview. It's apparent that the watch is not hindered by the any lack of feedback from its function, its positioning in the lower-c entre of the screen attests to its importance in providing the player with crucial feedback regarding two game mechanics, Stealth and Oxygen. Not only does it provide feedback, it is also implemented into the game world in a realistic fashion, reinforcing the player's sense of immersion and conveying the Themes and Figures found in the game's discourse. In addition,

Fig. 2 While exploring the surface or in irradiated areas where the player must use a gas mask, the numbers on the watch represent the current oxygen filter's duration
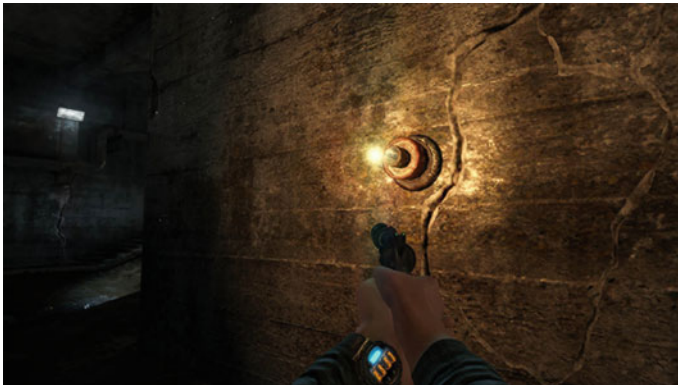
Fig. 3 While close to a light source, the lit LED indicates that the player is visible

we find that while specific Diegetic elements do not express their contents visually, the content can be expressed in other elements.

4   Results and Discussion

Through the information gathered by the Analysis of Watch element, previously established, we'll now present the results in a table in order to ease the visualization of the results, it consists of the Elements Classification, the Semiotic Analysis of

Fig. 4 In a dark area, the LED become unlit, indicating that the player is not visible to enemies

the Plane of Content and Plane of Expression as well as the Heuristics in which the elements fits, followed by an overview of the Results (Table 3).

It was possible to notice during the Analysis some of the common Themes of the Game and its use of visuals to convey its Discourse, Metro: Last Light is a game about a decaying society, where Humanity's last remnants struggle to survive the desolate world left by a Nuclear War. The sense of helplessness is reinforced to the player by the game's mechanics such as the Gas Mask mechanics, where the player must scavenge the ruins of Moscow in search of filters in order to survive and complete his Objectives. Overarching Themes such as the technological stagnation, the unrelenting and uninhabitable overworld as well as the constant threat of exposure to enemies are clearly reflected in the game's Diegetic Interface and in this sense, we could say that Metro: Last Light excels at its use of Diegesis to reinforce the Player's Immersion.

However, that is not to say that this implementation is without fault. During the Analysis it was possible to understand that, while traditional First-Person Shooters mechanics did not require any type of instruction to the player, such as movements,

Table 3 Results of the semiotic and usability analysis of metro: last light

Analysis results: watch	
Element classification	Diegetic
Plane of content	Discoursive Level visible versus invisible analogue versus digital decline versus progress full versus empty
	Fundamental Level life versus death culture versus nature conflict versus calm
Plane of expression	Photochromatic dimension light versus dark chromatic versus achromatic
Usability heuristics	A1, A2, B2, C2, E1, F1, F3, F4, H5, I1

aiming and shooting, the game's specific mechanics such as the Gas Mask and Journal and Compass.

The Gas Mask is perhaps the worst offender for Usability, although the mechanic itself is very easy to understand and gives the player feedback regarding various statuses, it suffers primarily due to it having 3 keys responsible for distinct functions—Replace Filter, Clean Mask and Remove Mask—and as the mechanics are not transversal to the First-Person Shooter genre, unlike the ones found in the Gun, remembering the mapping can prove to be challenging. The lack of an indication of how many filters there are available can also prove to be a potential hurdle to be overcome by casual players, however, this can also be an incentive for exploration and resource scavenging.

One of Metro: Last Light's strongest points is its constant use of feedback to indicate the player's current status, such as the use of Meta-Perception UI in the form of condensation in the mask, providing an indication that the player's Oxygen Filter is about to expire or the LED Display on the watch which signalizes if the player is visible to enemies. It's clear that although the game might suffer significantly on Usability while being player without the HUD, if the Player manages to memorize the key mappings this can prove to be an Immersive Story-Driven experience, where the player is put in the shoes of a survivor in the post-apocalyptic underground of Moscow's Metro system, with Gameplay Mechanics, UI and Visual Storytelling that reflect the care given to it.

The Semiotic Analysis proved useful in the textualization of the UI in order to identify the elements which constitute the game's Discourse, this is useful to analyse how well the narrative's Themes and Figures are represented Visually. By combining this with the Heuristic Evaluation it was possible to see that some while some aspects of the UI suffer in Usability from its Diegetic Approach, it's a trade-off which can prove to be beneficial in storytelling and world building in games, and in this sense potentially increase the Player's immersion through storytelling rather than gameplay.

This paper seeks to further the study of Diegesis in games and the relationship between Narrative and UI in in games and suggest that more research is conducted in the use of Discoursive Semiotics in analysing UI in games.

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