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Implicit Wayshowing in Open World Games

Bachelor's thesis

Game Design

Game Design and Culture of Arts

2025

South-Eastern Finland
University of Applied Sciences

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Degree title	Bachelor of Culture and Arts
Author(s)	Vesna Grau
Thesis title	Implicit Wayfinding in Open World Games
Year	2025
Pages	102 pages
Supervisor(s)	Suvi Pylvänen

ABSTRACT

The objective of this research was to investigate how players naturally navigate large, complex open-world environments and to identify which design principles support this navigation implicitly, without relying on explicit instructions that break immersion. To achieve this, the study first analyzed academic literature on wayfinding, cognitive mapping, and wayshowing to establish a theoretical foundation. These insights were then operationalized into an analysis framework used to examine two award-winning games (Elden Ring and A Short Hike) focusing on their cognitive mapping elements, gameplay site placement, and navigation aids.

The results revealed consistent themes across both games, despite their differences in scale, mechanics, and visual style. Both titles primarily rely on terrain cues, global landmarks, and the strategic positioning of gameplay sites to guide players naturally through their worlds. While the findings are strong and repeatedly observed, reliability is constrained by the limited number of case studies and the interpretive nature of qualitative spatial analysis.

The study concludes that implicit wayfinding emerges when cognitive mapping principles, terrain design, and gameplay site distribution work together to create clear spatial logic without overt instructions. Instead of explicit markers, players rely on environmental structure, goal salience, and steady activity density to maintain orientation and engagement. These findings demonstrate that implicit wayshowing is not accidental but a systematic design approach.

Keywords: open-world games, wayfinding, wayshowing, implicit guidance

CONTENTS

GLOSSARY

Spatial environment – the physical surroundings and built environment of a particular location, influencing the experiences and behaviors of individuals within that space (Wisdomlib 2025).

Open-world games – video games in which the player is not forced to achieve goals at specific times and has a large degree of freedom to explore, interact with the game space, or modify it (MerriamWebster n.d.). The environment of an open-world game is considered to be a spatial environment (Chapter 2.2).

Navigation – the science of managing a vessel by determining its position, course, and the distance it traveled. Navigation is connected to finding the way to the desired destination while avoiding obstacles, conserving fuel, and meeting schedules (Encyclopaedia Britannica 2025).

Wayfinding – the process of determining the path to the goal from the current position and following it within the game world (ZHdK 2025).

Implicit wayfinding – the cognitive and sensory processes that allow people to navigate an environment without consciously seeking or interpreting explicit signs, maps, or instructions (Dalton, Hölscher & Montello 2019). This contrasts with explicit wayfinding, which relies on direct, conscious perception of information like signage or verbal directions (Schwarz & Hamburger 2023).

Wayshowing – all activities and implements that make a location navigable: identifiable, understandable, memorable, and accessible (Mollerup 2005). Alotaishan (2017) sees wayshowing as design solutions that help users (wayfinders) to get from their current location to their destination.

Implicit wayshowing – design solutions that help users find their way (Alotaishan 2017) without being aware of the guidance (Cambridge University Press, n.d.)

Spatial cognition – a broad term that refers to the entire set of cognitive processes engaged in acquiring, organizing, and using knowledge about spatial environments. The variety of its tasks includes mental rotation, spatial navigation, and spatial working memory (Behrmann & Shomstein 2009).

Spatial ability – a specific skill required to orient and perceive one's body in space, as well as to detect and understand relationships between objects in a spatial environment. It is a component within spatial cognition, focusing on measurable cognitive tasks, such as reading maps or assembling jigsaw puzzles (APA Dictionary of Psychology n.d.).

Spatial orientation – the ability to understand how one's location in space relates to other objects and the ability to adjust it when needed (APA Dictionary of Psychology n.d.). While spatial orientation is sometimes used interchangeably with spatial ability, the two concepts differ in scope and emphasis. Spatial ability is a broader concept describing the cognitive skills required to reason about spatial relationships, while spatial orientation involves movement and the acquisition of knowledge about the environment (Chamizo & Rodrigo 2019).

Path integration – a fundamental process within spatial orientation which refers to the updating of one's position and orientation during self-motion without reliance on external landmarks (Loomis et al. 1993; Mittelstaedt & Mittelstaedt 1980).

Spatial-knowledge acquisition – an important aspect of spatial cognition which refers to the ability to gather and organize information about spatial environments, such as understanding how paths connect and where items are in the environment (Golledge 1999).

Cognitive mapping – the outcome of the spatial-knowledge acquisition. The ‘cognitive map’ hypothesis proposes that the brain builds a unified representation of the spatial environment to support memory and guide future action (Epstein et al. 2017).

Egocentric frame of reference - location and orientation are determined with respect to the organism, and include eye, head, and body coordinates (Ruggiero et al., 2009).

Allocentric frame of reference – location and orientation are specified with respect to elements and features of the environment independently of the viewer’s position (Ruggiero et al., 2009).

Weenie – a nickname inherited from the Disney Imagineering team used to refer to tall visual landmarks that are centralized attractions, like EPCOT or the Disney Park’s Magic Castle (Francis, 2021).

1 INTRODUCTION

Open-world games have become one of the most ambitious and popular forms of digital play, offering players vast environments to explore and interact with (Chapter 2.1). However, these games are frequently criticized for the immersion-breaking ways they support player wayfinding. Many rely heavily on explicit navigational aids to guide players through the world. While these systems ensure clarity and accessibility, they often diminish the sense of discovery and spatial awareness that make open-world experiences compelling. As a result, navigation can start to feel mechanical, pulling players out of the game world rather than inviting them to engage with it (Chapter 2.2).

This thesis explores how insights from real-world wayfinding can inform more immersive navigation design in open-world games. By examining how people naturally orient themselves, recognize landmarks, and make spatial decisions in physical environments (Chapter 4), the research seeks to identify design principles that encourage intuitive navigation without relying on immersion-breaking elements. However, this thesis also gives the benefit of the doubt to Navigation aids and assumes that there is a way to incorporate them in immersive ways.

To build this understanding, the thesis first compiles a comprehensive overview of existing design strategies (Chapter 5.1) and navigation aids (Chapter 5.2) currently used in games. It then analyses how certain already implicit titles employ guidance to direct movement subtly (Chapter 6). From this analysis, the thesis identifies which principles support immersion and player autonomy, and which approaches risk undermining those goals (Chapter 6.3). By drawing from both real-world wayfinding behaviours and existing examples of successful implicit guidance, it proposes that game worlds themselves can become the primary navigational tool – guiding players not through markers or maps, but through thoughtful, meaningful design.

2 CONTEXTUAL STUDY

This chapter provides context for the open-world research that is conducted in later chapters. It explores the concepts of real-life wayfinding and explains how those concepts are relevant to open-world games. It also provides an insight into why the research on open-world games is important.

To illustrate how concepts mentioned in the Glossary chapter relate to each other, a visual map was created (Figure 1). They are visually split into three sections. Orange represents all cognitive processes involved in navigation. Pink states which part of navigation is wayfinding and classifies it. Blue provides a look into how designers employ wayshowing to support wayfinding.

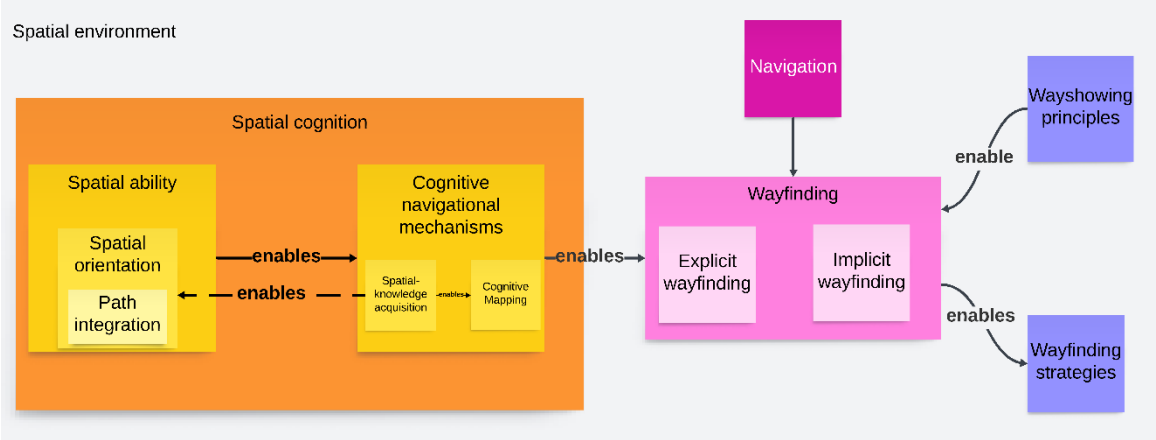

Figure 1. The relation of the key concepts to each other

Figure 1, presented above, provides a general overview of the concepts discussed in this paper. It includes both the topics explored in the theoretical framework and related subjects. This study focuses specifically on three main areas: Cognitive mapping (light yellow), Wayfinding (pink), and Wayshowing (blue).

2.1 Industry relevance

To show the significance of open-world video games within the gaming industry, statistical data has been gathered about the share of open-world games in the

overall market and how their popularity is trending. The data shows that five out of twenty of the best-selling games of this century are open-world games, making them 25% of all game genres (Statista 2025a). These best-selling open-world games are:

- Minecraft (2011),
- Grand Theft Auto V (2013),
- Red Dead Redemption 2 (2018),
- The Witcher 3: Wild Hunt (2015),
- The Legend of Zelda: Breath of the Wild (2017).

Not only the revenue but also the quality of open-world games make them important for the gaming industry. Five out of twenty of the highest-rated games of this century are open-world games, making them 25% of all game genres on the market (Statista 2025b). The highest rated open-world games are:

- Grand Theft Auto IV (2008),
- The Legend of Zelda: Breath of the Wild (2017),
- Red Dead Redemption 2 (2018),
- Grand Theft Auto V (2014),
- Grand Theft Auto III (2001).

Neither trends outlined above seem to decline over time. Three out of ten (or 30%) of the top-rated games of 2025 are open-world games (Statista 2025c). These games are:

- Kingdom Come: Deliverance II (Feb 2025),
- Monster Hunter Wilds (Feb 2025),
- Xenoblade Chronicles X: Definitive Edition (Mar 2025).

It is fair to conclude that open-world games occupy a significant niche within critically acclaimed titles. In fact, they consistently represent over 30% of top-rated and best-selling games, a trend that has remained steady in recent years. This sustained prominence shows that open-world design is not only popular but influential, making research into how these games function is highly valuable for the industry.

2.2 Open-world games' navigational challenges

Among all game genres, open-world games reflect real-life wayfinding and decision-making the most. This can be concluded by comparing real-life and

open-world game navigation. Debus (2021) created a step-by-step classification of navigational acts in games (Figure 2).

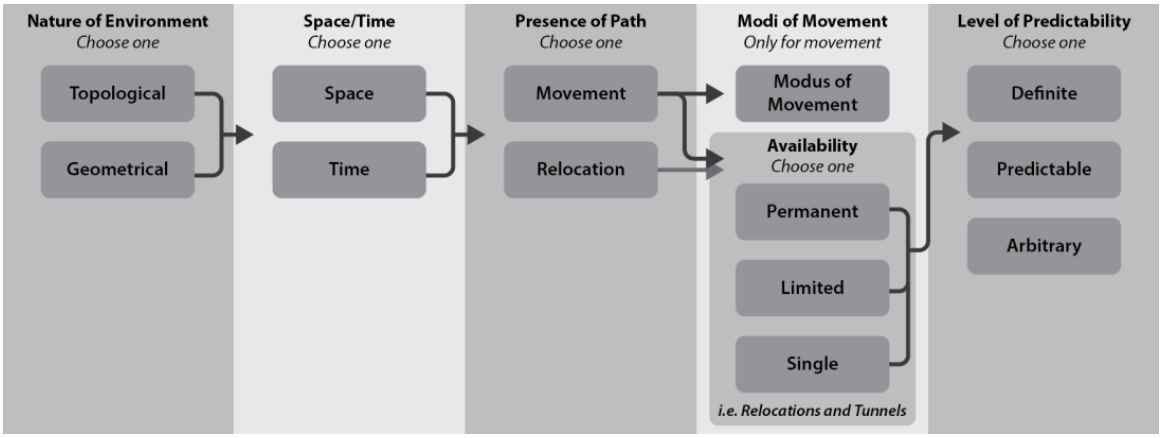

Figure 2. Classification of navigational acts (Debus 2021)

Nature of Environment describes the structure of the world, determining which movement options are available: continuous (geometrical) or discrete (typological). Space/Time refers to whether the player moves within the spatial (space) or temporal (time) dimensions. The Presence of Path explores whether the player moves continuously (movement) or can teleport (relocation). The existence of Modus of Movement means that the player can execute movement actions (such as walking, running, or jumping). Availability encompasses how many times a player can revisit the same area. Finally, the Level of Predictability addresses the degree of certainty a player has regarding where they would end up after they perform a certain action (Debus 2021). Applying this classification to both open-world and real-life contexts (Table 1), it can be concluded that those two domains share a lot of similarities.

Table 1. Key features of cognitive maps

Context	**Nature of Environment**	**Space/Time**	**Presence of Path**	**Modi of Movement**	**Level of Predictability**
Open-world games	Geometrical	• Space • Time (only puzzles & narrative purposes)	• Movement • Relocation (instant travel)	• Modus of Movement • Any availability (context-based)	Any (context-based)
Real life	Geometrical	Space	Movement	• Modus of Movement • Any availability (context-based)	Any (context-based)

This breakdown also provides an insight into the player's adventure, not being entirely determined by a narrative arc or gameplay mechanics in open-world settings. Rather, its essence is in letting the player decide where to go, why, and when. This freedom, however, comes with the challenge of ensuring that the player does not get lost exploring enormous maps and finds quests relevant to moving the progression further. Since it is impossible to guarantee the direction of the player's gaze, Rogers (2014, 219) suggests that scripted events are difficult to execute in open-world games.

Most open-world games rely heavily on navigation aids to combat this challenge. For example, non-diegetic Heads Up Display, later referred to as "HUD" (mini-map, compass, quest marker, etc.) or intrusive art elements that do not fit into the game world (yellow paint, specific "interactive" textures, etc.) are frequently seen in open-world games. While the design of the HUD itself does not affect player immersion (Khazanehdarloo & Mohamed 2023), Bergman and Hermansson (2023) suggest that non-diegetic UI (explained in Chapter 5.3) is perceived as less immersive. Additionally, Khan and Rahman (2017) prove that mini-maps impair the development of spatial knowledge in computer games. Research finds that mini-maps with the arrow cue make players rely almost exclusively on the 2D map and spend very little time looking at the 3D maze (Vembar et al. 2004).

It can be concluded that extensive use of navigation aids, while useful, may interrupt intended experience and cause players to overlook big parts of the game world. This paper aims to find out what navigation aids open-world games that are known for their intuitive guidance utilize. It also researches how these games assist players with wayfinding outside navigation aids.

3 RESEARCH DESIGN

This thesis explores wayfinding in open-world games within the context of how people execute wayfinding and navigation in real life. The question this research

answers is *“What cognitive mapping principles, wayshowing strategies, and navigation aids do successfully implicit open-world games rely on to help players navigate?”*

Two methods were used to conduct this research. To analyze academic sources on human wayfinding and wayshowing in level design, a thematic literature review was conducted. This method is defined as a review that organizes literature around key themes or topics (Grant & Booth 2009). In this thesis, the themes are formulated as questions of what makes an environment navigable, how people navigate spaces, and how designers aid users in finding their way.

The games for Case studies are selected using the Purposive sampling method (Scribbr n.d.), because the study specifically aims to examine titles that are successful in their use of implicit guidance to uncover how they became such. The inclusion criterion requires the games to win or be nominated for a significant Game Design award in the past fifteen years. The list of open-world games that qualify is presented in Table 2.

Table 2. Open-world winners and nominees of Game Design awards

Game	**Award**	**Category**	**Year**	**Result**
The Legend of Zelda: Breath of the Wild	D.I.C.E. (AIAS) / GDCA	Outstanding Achievement in Game Design / Best Design	2018 / 2018	Winner / Winner
Elden Ring	GDCA / BAFTA	Best Design / Game Design	2023 / 2022	Winner / Nominee
Outer Wilds	IGF / BAFTA	Excellence in Design; Seumas McNally Grand Prize / Game Design	2015 / 2019	Winner / Nominee
Ghost of Tsushima	D.I.C.E. / NAVGTR / BAFTA	Outstanding Achievement in Game Design / Game Design / Game Design	2021	Nominee / Winner / Nominee

A Short Hike	IGF	Excellence in Design / Seumas McNally Grand Prize	2020	Finalist / Winner
The Witcher 3: Wild Hunt	D.I.C.E. (AIAS)	Outstanding Achievement in Game Design	2016	Winner
Baldur's Gate 3	GDCA	Best Design	2024	Winner
Grand Theft Auto III	GDCA	Best Design	2002	Winner
Red Dead Redemption	GDCA	Best Design	2011	Winner
Subnautica	D.I.C.E. (AIAS)	Outstanding Achievement in Game Design	2019	Nominee
Horizon Zero Dawn	GDCA / BAFTA	Best Design / Game Design	2018 / 2018	Finalist / Nominee
Far Cry 4	D.I.C.E. (AIAS)	Outstanding Achievement in Game Design	2015	Nominee
Fallout 4	D.I.C.E. (AIAS)	Outstanding Achievement in Game 2024Design	2016	Nominee
The Legend of Zelda: Tears of the Kingdom	D.I.C.E. (AIAS)	Outstanding Achievement in Game Design	2024	Nominee
Super Mario Odyssey	BAFTA	Game Design	2018	Nominee

To choose games most suitable for researching implicit wayfinding, the exclusion criteria are established. Thus, the chosen games should qualify for the "implicitness requirements." Firstly, the games must not have a mini-map or a

quest compass serving the same purpose. According to Dahmani et al. (2020) and Zagata, Dey & Sanorita (2025), mini-maps impair the spatial skills of the player. Secondly, the games must have little to no HUD signs, mini-maps, or instructions (according to the definition of implicit wayfinding established in the Glossary). The use of global maps is permitted, as excluding them would create criteria so restrictive that almost no suitable titles would remain.

The eight games that seem to qualify for the first criterion are Outer Wilds, A Short Hike, Subnautica, Ghost of Tsushima, Elden Ring, Super Mario Odyssey, and both Legend of Zelda titles when played in the Pro HUD mode. However, Outer Wilds includes a movement tracker that becomes active once the player lands on a planet. Although it is not a mini-map or a quest compass, it visually represents the player's movement, which makes it difficult to determine how effectively players develop their spatial knowledge. Similarly, Ghost of Tsushima, while lacking a traditional non-diegetic quest compass, features a diegetic alternative in the form of wind, birds, and foxes that guide the player toward objectives. Subnautica also has the "radio pings" that act as direct, quest-compass-like markers.

The second criterion eliminates both Zelda titles in the Pro HUD mode and Super Mario Odyssey. Although these games do not rely on mini-maps or quest compasses, their global maps show the positions of quest objectives. While it is hard to say whether players use global maps for navigation, the availability of the feature gives them this option.

The remaining two games, A Short Hike and Elden Ring, appear to be the only examples that fully satisfy all criteria established above. For this reason, they are selected for detailed exploratory analysis (Scribbr n.d.) in Chapter 6. Each game is first examined individually to establish how it accommodates Gameplay sites, Cognitive map elements, and Navigation aids.

To find similarities within how the selected open-world video games approach implicit wayshowing, this paper uses Braun and Clarke's (2019) six-phase thematic analysis framework, which includes (1) familiarization with data, (2) generating initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, and (6) writing the report (Ahmed et al. 2025). Familiarization with the data is addressed in Chapter 6, while the generation of initial codes is covered in the Wayshowing chapter. Therefore, only steps 3, 4, and 5 are part of the Comparative analysis chapter. Step 6 is covered in Chapter 7.

4 THEMATIC LITERATURE REVIEW: WAYFINDING

To determine how games that succeeded in accommodating implicit wayfinding did it, it is crucial to understand what makes an environment navigable, how people navigate spaces, and how designers aid users in finding their way. This section explores these themes in depth, creating a foundation for Chapter 6.

4.1 Cognitive mapping principles

Wayfinding is informed by the principles of cognitive mapping, where people construct mental representations of the world through their experiences. The term was first suggested by Tolman (1948), who, through experimenting on rats, found that these animals were able to build mental images of the environment through acquiring large numbers of cues.

Twelve years later, Lynch (1960) published a study in which he explored how humans construct sharp mental maps of urban environments. He was the first to suggest that cognitive mapping relies on people's ability to understand and remember the relationships between five key environmental elements: paths, landmarks, districts, edges, and nodes. When these components are integrated coherently, they allow people to mentally navigate cities without getting lost.

Below is a detailed breakdown of five key environmental elements that inform the creation of clear cognitive maps and their functions. Their definitions and key

features are gathered from Lynch's (1960) *The Image of the City* and Oueijan's (2021) GDC talk *Stop getting lost: make cognitive maps, not levels* and are presented in Table 3.

Table 3. Key features of cognitive maps

Feature	**Definition**	**Function**
Paths	Linear spaces that direct movement and travel, otherwise defined as "Linear References".	Paths guide players efficiently to destinations, reorient "lost" players, establish player flow throughout levels, and link expansive areas.
Landmarks	Single, localized, and memorable features that can be recognized visually, narratively, or experientially. They are also defined as "Point-References".	Landmarks provide orientation from a distance and situate the elements of the map among themselves. They are most useful when they can be used for orientation multiple times.
Edges	Linear non-paths that indicate, separate, or control continuity. Edges are considered "Linear References".	Edges manifest as linear non-paths that demarcate or control continuity. Examples include walls, cliffs, and boundary lines. Their bold design fosters clarity within levels, frequently employing verticality.
Districts	Regions identifiable by characteristics or qualities, which are easily recalled when composed of similar entities. Districts can be visual, semantic, or mechanical, and are also	Districts enhance intra-group contrast and establish the unique identity of a space.

	understood as “Zonal References”.	
Nodes	Convergences of paths, or “Point-References” defined by paths.	Nodes serve as reference points within levels, typically located within or between districts. They facilitate branching milestones for player navigation, designed for repeated visitation.

Various scholars suggest that game players construct mental maps to orient themselves in game spaces the same way they do in real-life environments (McLaren-Gradinaru et al. 2023; Sánchez et al. 2014; Butler et al. 2021; Sim 2008; O’Garra et al. 2021). Oueijan (2021) suggests that the cognitive mapping theory, applied to designing game spaces, can prevent players from getting lost. He defines “getting lost” as the misalignment of a player’s cognitive map with their surroundings. Oueijan (2021) defines the cause as changes in the environment (or a player’s place in it) or insufficiently broad or clear cognitive maps that prevent players from responding to the environmental changes in an adequate way.

4.2 Wayfinding strategies

As established in Table 1, open-world video games closely reflect real-life wayfinding. Following this statement, this paper delved into Wayfinding strategies, the strategies players (and people in general) use to help orient themselves and navigate without hints within the game world (Oniscu 2020). Various academic publications on the topics of level design, urban design, cognitive science, and human-computer interaction define different strategies people use to find their way in environments. The most influential ones are presented below.

Mollerup (2005) defines nine Wayfinding strategies: track following, route following, educated seeking, inference, screening, aiming, map reading, compassing, and social navigation. However, he does not state what data the breakdown was informed by. Nevertheless, his work is “heavily influential in the field of wayfinding design” (Wattne & Volden 2023), specifically in the built environment sector. For example, The Level Design Book (2025) builds its wayfinding article on his breakdown.

Barker (2019) presents a broader twelve-category classification of wayfinding behaviours. He proposes that the same principles apply across all contexts: from traversing environmental and digital spaces to seeking a book in a library.

Rinne, Memmert, and Bock (2022) break down the *cognitive* Wayfinding strategies into five categories: three egocentric strategies (sequential, associative cue, and beacon) and two allocentric strategies (relative location and the cognitive map). Their research covers both built and natural environments, as well as giving insight into digital space navigation. The context of their study is deliberate wayfinding in unfamiliar places using exclusively allocentric and egocentric orientation. However, focusing on cognitive wayfinding only, this research overlooks the aspects of social, systematic, and experience-based wayfinding that both Mollerup (2005) and Barker (2019) mention in their studies.

Wattne & Volden (2023) recognize the extensive amount of data on the topic, describing and comparing dominating opinions on the categorization of these strategies. Their own typology on ways to recover when temporarily lost in the outdoors draws inspiration from Mollerup’s (2005) Wayfinding strategies. However, Wattne & Volden (2023) state that their findings are “of a spur-of-the-moment, spontaneous – and hence possibly not strictly speaking strategic – nature”, compared to Mollerup’s (2005) strictly rational definition of Wayfinding strategies. Nevertheless, they report a lot of similarities between strategic wayfinding in built environments and spontaneous wayfinding in natural environments.

4.3 Original Wayfinding strategies breakdown

This paper's breakdown of Wayfinding strategies is based on all sources listed above. It employs Barker's (2019) generalized navigational breakdown, combining it with Mollerup's (2005) specific sectioning and Wattne & Volden's (2023) overview of Wayfinding tactics.

This decision is informed by the significant disadvantages each individual study has. Mollerup (2005) does not provide any sources as to how the data informing his breakdown was gathered, making it less reliable. Barker (2019), while backing up his typology with quantitative data, touches upon the topic too broadly to confidently apply it for such a niche (in a grand scheme of all possible wayfinding contexts) medium as games. Rinne et al.'s (2022) research only highlights the cognitive aspect of wayfinding, while Wattne & Volden's (2023) focus specifically on reorienting when lost.

Moreover, this thesis follows the definition of Wayfinding strategies strictly and does not list any tactics people may use to execute those strategies. Additionally, it differentiates Wayfinding strategies from Route planning, which ScienceDirect Topics (n.d.) defines as "the process of selecting a minimum cost path from a starting position to a destination." Table 4 visually represents how Route planning involves navigational problems different from Wayfinding. The arrows represent how an objective shifts once a problem is solved.

Table 4. Problems that Wayfinding strategies and Route planning tactics combat

		Does the navigator know their own location?	
Does the navigator know where their destination is located?		No	Yes
	No	Wayfinding (Lost) →	Wayfinding (Searching for destination) ↓
	Yes	Wayfinding (Determining own location) ↓	Route planning (from current location to destination)

It is worth mentioning that Rinne et al.'s (2022) research calls Cognitive Mapping a cognitive Wayfinding strategy. However, this paper follows Epstein et al.'s (2017) definition, viewing it as a memory-supporting brain function that can enhance wayfinding rather than a deliberately utilized strategy or tactic. This decision is informed by the research on Wayfinding strategies in the previous chapter.

4.3.1 Social

Dalton, Hölscher, and Montello (2019) argue that wayfinding can be understood as a social activity. In this thesis, “social activity” includes terms such as “intra-personal.” They recognize four types of social navigation that are formed as a combination of the following: strong (direct input from people), weak (indirect people’s input), synchronous (with people physically present), and asynchronous (without people’s presence). They use a diagram to describe them (Figure 3).

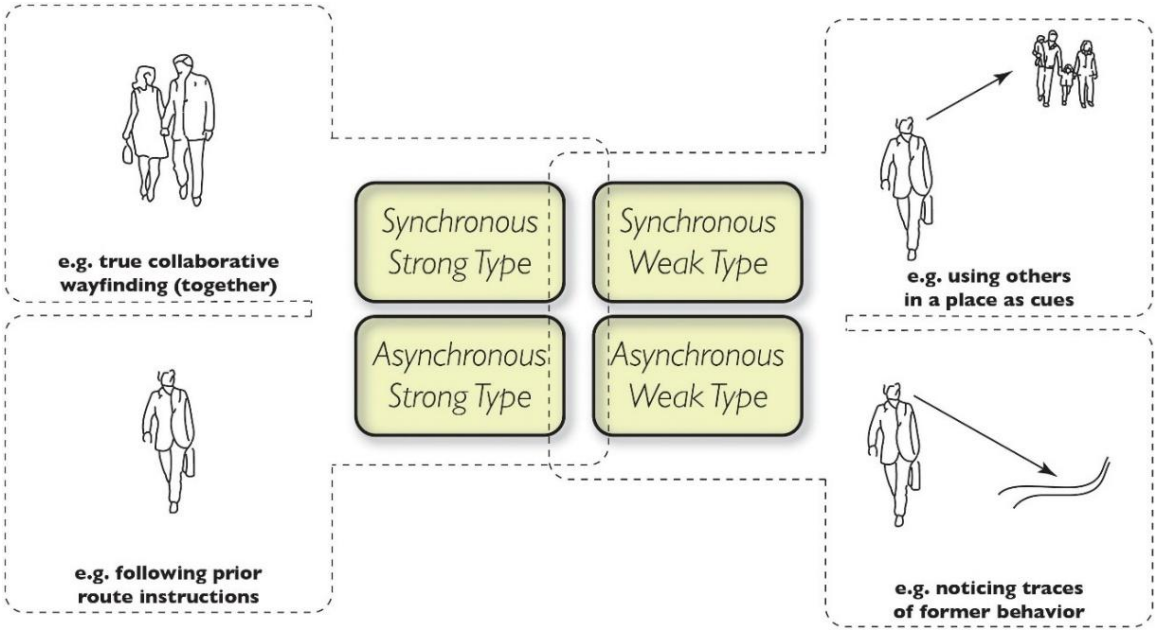

Figure 3. Four types of social wayfinding (Dalton, Hölscher & Montello 2019)

Strong Synchronous:

The navigational decisions are made with intentional input from others. This strategy includes a list of tactics, like following a navigator (usually an acquaintance) or following immediate gestural/spoken directional instructions (usually from a stranger). The group of people providing guidance is small.

Strong Asynchronous:

People make their wayfinding decisions prior to travel based on the intentional input from others. This strategy includes the same tactic of directional instructions as the Synchronous type. The key difference is that the execution of the instructions does not take place with the other person present.

Weak Synchronous:

The wayfinding decision-making is influenced by others in indirect and unintentional ways. Some of the prominent tactics include following the crowd, joining the crowd that surrounds something (e.g., a street artist), and traveling to popular destinations. Dalton, Hölscher & Montello (2019) explain that the individuals involved in both sending and receiving navigational cues are usually

unaware of the exchange and do not consider themselves to be engaged in social interaction.

Weak Asynchronous:

This strategy is about interpreting the telltale physical traces left by other people, without them being physically present in the space. The most popular tactic is following social trails (otherwise called desire lines) or visible paths created by repeated footfall. Following trails created by animals, however, is an example of Educated seeking since it requires knowledge of zoology. Wattne & Volden (2023) mention trail following in their paper and presume that “people might not have a certain sense of location or direction even while being on a trail, but by following a trail, [they] re-establish that sense.”

4.3.2 Semantic

Barker (2019) includes behaviors that require the use of information that is external to the individuals themselves and fixed (in place or time). Wattne & Volden (2023) define a similar category of “Recovery by the use of materials, tools, and technology” in their research.

Navigational map reading:

Ottosson (1987) defines map-reading as “all cognitive activity involved in ‘choosing’ a route and in keeping track of position … when one intends to reach a specific location”. He concludes that people have three reasons to consult a map:

1. To acquire thematized factual knowledge (for example, how to proceed from A to B, or what is the exact position of oneself on the map)
2. To find a feature they see in the physical terrain
3. To restore the feeling of harmony, when they cannot match the visible terrain with what they expected to see

It is worth mentioning that in his study, Ottosson (1987) identifies wayfinding tactics used in reading specifically physical allocentric maps, which represent object-to-object relationships, independent of the observer’s position. Thus, it is hard to translate his findings to digital or egocentric map-reading.

Various scholars present evidence that egocentric map-reading in general (and GPS usage in particular) allows people to better recall immediate routes but have poorer knowledge of overall spatial layout. Ben-Elia et al. (2021) state that egocentric map users show inferior results in building a spatial sense of direction, landmark, and route recognition. Topete et al. (2024) add that egocentric maps (GPS in particular) contribute to worse distance estimation and higher spatial anxiety. Kozhevnikov et al. (2023) state that only egocentric mappers are vulnerable to disorientation.

Smith and Jones (2018) present evidence that subjects of allocentric map-reading rely on the use of environmental cues to reach the destination, while those using the egocentric strategy reproduce the sequence of left-right body turns. The reason for such distinction is subjects' reliance on a combination of body signals communicating information as they move through an environment, rather than relying on external visual cues.

In addition, substantial research from the literature on how texts are comprehended demonstrates that individuals learn better when they generate their own visual representations (Fiorella & Zhang 2018; Hellenbrand et al. 2019; Schmeck et al. 2014). However, Jaeger et al. (2023) found that this principle does not work when applied to wayfinding. According to their research, the process of self-mapping (generating one's own map instead of relying on a previously created medium) does not improve spatial knowledge acquisition or significantly aid wayfinding.

Compass use:

Kozhevnikov et al. (2023) suggest that compass use can be both egocentric and allocentric, depending on the task context. Wattne & Volden (2023) provide evidence that around 3% of people use compasses for wayfinding. However, 47% of those who used the compass did it in combination with a map. Using the evidence above, it can be concluded that humans refer to a compass for

wayfinding in specific, rare cases, when an environment lacks landmarks or other navigational cues.

4.3.3 Spatial

Barker (2019) includes behaviors that rely on interpreting and acting upon environmental cues. He emphasizes the process of recognition and the use of physical features of space. This also includes acquiring knowledge of the spatial relations between objects within that environment.

Beaconing (visual and auditory landmark-based navigation):
Liu et al. (2022) state that the beacon-based strategy involves navigating directly toward a nearby visible goal using an egocentric spatial framework. They present evidence that animals, just like humans, use sensory cues from a distant object (the "beacon") to navigate directly toward it or to a goal in its direction. Carpman & Grant (2002) describe a navigational strategy of “seeing the destination and moving steadily towards it,” but do not give it a name. Mollerup (2005) calls the same strategy “aiming”.

Various studies show that beacons can be not only visual but also auditory (Tran et al. 2000; Walker & Lindsay 2006; Clemenson et al. 2021). Moreover, Clemenson et al. (2021) show that “using auditory beacons to navigate can lead to greater explorative behavior and the formation of more accurate mental maps of the surrounding environment when compared to turn-by-turn navigation.”

Celestial orientation (constructing a mental compass):
Kevin Lynch (1960) suggests that not only static but also mobile landmarks whose motion is slow and regular, like the sun, can serve for navigation. However, Jang (2019) admits that there is no evidence for sun compass use throughout the day in humans.

Some of the common examples of this strategy use include celestial navigation in maritime environments (Pinčetić, Lušić & Krančević 2024), rainforests (Jang 2019), polar and remote regions (Weems 1952), and aviation (Smithsonian National Air and Space Museum n.d.). It can be concluded that the use of the environmental orientation strategy requires a space lacking in landmarks and other navigational cues. The usage of this strategy implies that a person has prior knowledge of which cardinal direction is useful for their navigation.

Environmental orientation (Screening / Environmental scanning):
Mollerup (2005) defines screening as a systematic search of an area for a helpful clue, even when there may not be any. He likely employed the concept of "environmental scanning" from the business context, defined as a "systematic process of gathering external information."

Wattne & Volden (2023), however, provide a proven insight into how this strategy (referred to as "recovery by reading the terrain") enables wayfinding. They state that people recognize landscapes, distinct types of vegetation, see and follow a stream, and read the angle of terrain incline or waves to establish the direction of their further movement. This strategy employs multiple processes, including stopping to reorient, screening the environment, and following a determined direction (Beaconing or trail following of Weak Asynchronous Social strategy).

Path integration (Dead reckoning):
Tversky (2003) defines dead reckoning, otherwise known as path integration, as the process of updating a person's own position in space by referencing their movement progress compared to the starting point. This process is based on egocentric and environmental cues. The experiments Tversky et al. conducted in 70s and 90s involved virtual environments, like those that players interact with in video games. They determined that the accuracy levels of the dead reckoning orientation strategy were very high. Müller and Wehner (1988) present evidence that animals show impressive levels of accuracy in constructing cognitive maps using only the path integration strategy.

4.3.4 Experiential

Wattne & Volden (2023) present the “recovery by using existing knowledge and memory” category as a part of their taxonomy. They highlight the internal cognition process required for this form of wayfinding, where individuals actively use their own prior knowledge (and memories) to navigate. Unlike Semantic, Spatial, or Social wayfinding, which rely on interpreting existing cues, this approach is characterized by the use of internal resources rather than external information.

Educated seeking (Leveraging Past Experience):
Unlike Celestial or Environmental orientation, which partially rely on previously acquired knowledge (e.g., knowing what cardinal direction brings a person to their destination or knowing what vegetation type corresponds with one’s current location), Educated seeking includes actionable tactics informed by past experiences. Wattne & Volden (2023) list “recovery by ascending to higher ground for view enhancement” and “navigation by letting the dog lead the way” as part of a “recovery by using existing knowledge and memory” general strategy. In both tactics, people based their decisions on their knowledge of general norms rather than on environmental objects in front of them. This differentiates Educated seeking from Spatial or Semantic strategies.

Trial and error:
Wattne & Volden (2023) describe a tactic of “recovery by general movement” that is a good example of a Trial-and-error Wayfinding strategy. They state that this strategy was the third most popular one, and describe it as people moving without an intention, aim, or direction in a general manner until they recognize a location. They also mention that two people moved in circles and one person used the “recovery by accident” tactic, which all fall under “Trial-and-error” as well. This corresponds with Merriam-Webster's (n.d.) definition of trial and error as “the trying of one thing or another until something succeeds.”

Backtracking:

Wattne & Volden (2023) define backtracking as an act of retracing one's previous movements to return to the last location a person can recognize. They claim that it can take the form of following a trail backwards or getting back to a landmark to establish their location. Based on the nature of their research (how lost individuals recovered), it is fair to assume that they refer to "forced" backtracking, an action informed by a change of external circumstances (getting lost) rather than an internal decision. Wattne & Volden (2023) also state that since backtracking is informed by both movement and the use of existing knowledge, this strategy can fall into both Spatial and Experiential categories.

Javadi et al. (2019) add that backtracking is a part of explorative behavior in the context of lost individuals. They claim that "spontaneous" backtracking (not informed by external changes or instructions) is common, accurate, anxiety-lowering, and helpful. In fact, 68% of backtracking events happening during their experiment resulted in a shorter path to the goal.

They present evidence that a 'looking back' action supports the formation of cognitive allocentric maps and aids navigation by allowing the one who navigates to see the space from different perspectives. Unlike with forced backtracking, in most of the spontaneous backtracking events, people realized that they were heading the wrong way and decided to turn around, highlighting it as an exploratory rather than simply reorienting mechanism (Javadi et al. 2019).

4.4 Application cases of Wayfinding strategies

The use of Wayfinding strategies may be limited to specific cases depending on context. For example, the Trial-and-error approach cannot be used unless the navigator is lost. Alternatively, Beaconing cannot be employed unless the destination (beacon) is not only known but also visible. This research illustrates

the use cases of every Wayfinding strategy (Table 5) but acknowledges that the categorization may be inaccurate due to its purely assumptive nature.

Table 5. Application cases of Wayfinding strategies

		Does the navigator know their own location?	
Does the navigator know where their destination is located?		No	Yes
	No	Weak Synchronous Weak Asynchronous Environmental orientation Backtracking Trial and error	Strong Synchronous Weak Synchronous Environmental orientation Navigational map reading Educated seeking Trial and error
	Yes	Strong Synchronous Strong Asynchronous Beaconing Celestial orientation Environmental orientation Navigational map reading Compass use Educated seeking	

It is fair to conclude that Path integration does not appear to be useful in any of the cases where a search for an unknown location is expected (Table 5). However, there is no doubt that Path integration is a crucial component of wayfinding; its application case is just extremely specific and limited to returning to a known location in an environment scarce for landmarks.

5 THEMATIC LITERATURE REVIEW: WAYSHOWING

Unlike Cognitive mapping principles or Wayfinding strategies, which focus on how people navigate environments, wayshowing explores navigation from a designer's perspective. According to Mollerup (2005) and Alotaishan (2017), wayshowing is a set of design solutions that make a location navigable and help

users (wayfinders) to get from their current place to their destination. Cambridge University Press (n.d.) defines “navigable” as easy to move around in to find a desired path.

According to the definitions, the focus of a wayshowing designer is on planning the placement of elements that help people orient and navigate. In Chapter 6, this research analyzes *how* these elements are situated in successfully implicit games. However, to make this analysis possible, further chapters first present the list of *what* elements designers can manipulate apart from the cognitive mapping objects mentioned before (Table 3; Oueijan 2021).

5.1 Gameplay sites

Various scholars view level design as the combination of making both gameplay beats and level geometry (Morrison 2021; Gilbert 2022). A level designer creates gameplay with the help of environmental elements, not the other way around (Hullett 2010; VG Entertainment 2024). The games are played not because of their well-constructed environments but because of their gameplay – it motivates players to traverse and explore, which, according to Montello (2005), fulfils one of the two requirements of navigation: locomotion and wayfinding.

In open-world games in particular, players are presented with a series of contextually situated experiences. They “purposefully engage with in-game content but remain flexible to what the experience affords*”* (Hughes 2023). Hughes (2023) states that players pursue one of the nine goals when engaging with open-world gameplay sites (Table 6).

Table 6. Open-world player goals (Hughes 2023)

Player behavior	**Player goal**
Questing	“Completing story missions or side quests that the game provides.”

Exploration	“Travelling around and interacting with the world, often with no set aim except to see new sights or places.”
Combat	“Fighting enemies, either in main quest, side quest, or chance encounters.”
Resource Gathering	“Finding and collecting items, materials, resources, or loot within the game world.”
Customization	“Changing the character’s appearance, ability loadout, or the base/home.”
Socializing	“Talking to non-player characters, joining group activities, or engaging with multiplayer content.”
Building/Creation	“Construction of objects, settlements, or modifications of the environment.”
Minigames and Diversions	“Participating in races, games of chance, or other mechanics distinct from the main game.”
Traversal and Movement	“Travelling, either rapidly (‘fast travel’) or slow-paced journeys, including travel for the sake of seeing the world or relaxing.”

Hughes (2023) identifies four types of gameplay sites based on what player goals occur repeatedly in them. These categories are presented in Table 7. Hughes’s (2023) robust sampling makes this framework applicable to most open-world games.

Table 7. Four main types of open-world gameplay sites (Hughes 2023)

Name	**Function**
Narrative hubs	Locations that progress the story or enable dialogue, usually called quest or side quest sites.
Combat arenas	Clusters of enemies that call for a fight, either in a main quest, side quests, or chance encounters.
Exploratory landscapes	Discovery spaces that also enable sightseeing, usually not related to the main quest.

Travel zones	Negative space between the other activity points that connects them together.

This paper adopts Hughes's (2023) breakdown of gameplay site types as a guiding framework. The classification is used to analyze how different areas in games are built around supporting recurring player goals. It serves as a basis for comparison across the Case studies.

5.2 Navigation aids

Oueijan (2021) suggests a "squint test" to assess the coherence of a game map and its potential to form clear cognitive maps in players' minds. However, it is impossible to predict with utmost certainty how players see the world from every single viewpoint (Rogers 2014). To mitigate the uncertainty, designers can use Navigation aids. NAVAIDs or ATON are devices, systems, or services external to a person that are designed to enhance safe and efficient navigation (IALA n.d.). Even though the term originates in marine navigation and applies to vessels, it is also used in the context of level design.

This chapter examines navigation aids through the lens of the principal wayfinding problems outlined in Tables 4 and 5. It generates high-level taxonomy, addressing the following user needs: establishing the user's ("where am I?") and destination's ("where is my goal?") location (Table 8). The only category that is not informed by Table 8 is "Spatial navigation aids". According to Khana et al. (2017), they are a separate entity that improves spatial knowledge acquisition. Thus, it can be useful in both establishing the user's and the destination's locations.

Table 8. Wayfinding problems that Navigation aids address

		Does the navigator know their own location?	
Does the navigator know where their destination is located?		No	Yes
	No	Establishing the user's current location Establishing the destination's location	Establishing the destination's location
	Yes	Establishing the user's current location	

Each navigation aid is identified from design literature and classified into one or both categories. The division is made according to a technique's logical potential to solve one or both problems discussed. This study acknowledges that the list may be incomplete since no scholar has yet produced a definitive and all-inclusive taxonomy of Navigation aids.

5.2.1 Establishing the user's current location

There are two categories of techniques that designers can use to help players establish their location in the environment (apart from the Spatial Navigation aid). Compared to techniques for establishing the destination's location, methods for helping users identify their own location are scarce. People mostly rely on two principles: "identity," which is the distinction between different objects, and "structure," which refers to the way different objects are connected (Lynch 1960; Damayanti & Kossak 2016). These principles are determined by the construction of the environment. This selection presents ways to achieve the "identity" component, while the "structure" component is discussed in Chapter 6.

Making the location distinct:

This includes color-coding areas to make them easier to distinguish, as Siyanbola et al. (2023) found that color coding enhances navigational ability. Designers can

also use zone emblems (such as music, textures, or vegetation unique to each area), display the area name when the player arrives, or build locations around distinct landmarks.

Using orientational (identification) signage:
Sarihati et al. (2021) define orientational signage as panels of signs containing clear information about a person's position in the environment. They present examples such as maps, architectural references, and circulation lane plans to explain what forms identificational signage can take. Another form of orientational signage is somewhat social – if a person is told what location they are at by somebody else.

5.2.2 Establishing where the destination is located

This section is divided into two parts: goal salience and attention redirection. A salient goal naturally attracts players' attention (Li & Camerer 2019), while an inconspicuous or hidden goal may require attention redirection to guide players towards it. However, attention can only be redirected once it has been captured. This implies that both goal salience and attention redirection depend on strikingness, but in different ways. In the former case, the salient element directly draws players to the goal itself, while in the latter, it draws their focus initially, only to redirect it elsewhere.

This framework can also be understood in a way where attention redirection is the salience of the path. In other words, a designer can either make the goal itself salient or make the path to the goal salient (either continuously or discretely). Each category contains clusters of techniques designers use to create these effects.

Highlighting the goal (salience of the goal):
The goal can be highlighted perceptually (Li & Camerer 2019), contextually, or motivationally (Heintalu [2025] distinguishes between them in the academic

setting, which can also be applied to gaming since both strategies are related to human goal setting). Perceptual methods use environmental parts to make the goal stand out (visually or auditorily). Contextual methods connect the goal to players' existing motivations. Motivational methods create new motivation by appealing to players' innate drives and emotions.

Perceptually. Most foundational principles of how to make an object stand out come from art theory. The mentions of "focal points" and "visual emphasis" can be traced back as far as 1435 (de Zurko 1957). The principles of contrast, leading lines, sightlines, framing, and other compositional techniques can also be applied to creating games' areas and objects distinct. Similarly, the concept of "vistas," originating in architecture (Design Encyclopedia n.d.), is often mentioned in level design literature (Thuning 2018; Kremer, Sonnenwald & Walker 2022).

Contextually. Unlike perceptual ways of highlighting the goal, contextual cues are not a part of the game's physical world. They guide exploration based on the gameplay objectives and are usually hard to miss because they are tied to how designers want players to progress. The examples of contextual techniques designers can use are presented in Table 9.

Table 9. Contextual goal salience techniques

Name	**Description**
Cutscenes and scripted camera sequences	Somerdin (2014) states that cutscenes and scripted sequences in games tend to convey the narrative part and usually alternate with gameplay segments. However, they can also be used for navigation. Laurier & Reeves (2014) examined how camera movement in games produces perspectives that show the player their next move.
Quest markers	Bunting (2024) refers to quest markers as visual cues that overlay the geography to guide players' movement and objectives. While this is the only academic definition, it is worth adding that markers do not have to overlay geography

	– they are simply the signs that show the position of, in this context, quests (Cambridge University Press 2025).
Progress trackers	McCarthy and Tiu (2012) define progress trackers as digital tools that monitor users' progress throughout a game. This definition corresponds well with the view of a progression system as a path the player follows from the beginning to the end of the whole game (Browning 2023). In the context of navigation, progress trackers serve as indicators that confirm the user's progression throughout the game's world and assist in marking previously explored areas.

Motivationally. Motivational methods rely directly on human psychology to entice players to go in a certain direction. In that sense, they are beyond the games' worlds or gameplay; they are tied directly to the feelings and beliefs people have within them. Lim (2017), for example, suggests that prosocial behaviours in games are motivated by emotional factors. However, it is hard to say whether prosocial behaviours are informed by emotion or a desire to get a reward in single-player open-world games. The examples of motivational goal highlighting techniques are gathered in Table 10.

Table 10. Motivational goal salience techniques

Name	**Description**
Bait	Various sources describe what baiting means in video games differently. IT Land Kiev (n.d.) says that bait is the act of luring a player into a certain place by a friendly NPC. The Fighting Game Glossary (n.d.) defines it as a tactic to induce a certain move from an opponent. Applied to level design, bait is a part of the bait-and-switch technique that means luring players in with a false objective and then redirecting them to the true goal. The false objective is usually a promise of a reward, such as a treasure chest (Norberg 2020).
Helping NPCs	Helping characters can either be viewed as a positive prosocial behaviour (if they are real players, according to Lim 2017) or as an

	attempt to get a reward. Additionally, various scholars found that emotional attachment to NPCs may lead players to put higher investment in their quests (Burgess & Jones 2020; Burgess & Jones 2021). This allows for a conclusion that placing NPCs in need of assistance may draw players closer. This technique differs from completing quests because the said NPCs do not have to be quest givers – for example, trapped cloth pieces that are sometimes optional to free and do not give a numerical reward to the player.

Highlighting the path to the goal (salience of the path):

Continuously. Merriam-Webster (n.d.) defines the word continuous as of an uninterrupted existence. In the context of highlighting the path, it would mean that the guidance is constant and lasting. The examples of continuous path salience indication are presented in Table 11.

Table 11. Continuous path salience techniques

Name	**Description**
Breadcrumbs	In level design, breadcrumbs are understood as lines of collectible items or powerups visible in the distance (The Level Design Book 2025). The term originated from the Henzel and Gretel fairy tale, where kids were using breadcrumbs to be able to backtrack their way home. However, in the context of level design, breadcrumbs primarily show the direction of movement instead of helping to backtrack to the previously visited areas, like in UX design (ScienceDirect Topics n.d.).
Mini-maps	In addition to allocentric maps, games sometimes provide the user with an egocentric point of reference, otherwise known as mini-maps. Similar to GPS-like navigation, mini-maps are known for impairing the spatial skills of the player (Dahmani et al. 2020; Zagata, Dey & Sanorita 2025). Moreover, when egocentric maps have an arrow indicator, users rely on it almost exclusively, instead of gathering information from environmental

	cues or the map layout itself (Dey, Fu, & Karahalios 2019). Such aid, however, allows players to find their way to the destination more effectively (Dey, Fu, & Karahalios 2019; Zagata, Dey, & Sanorita 2025).
Community hints	Rockholz (2014) presents an example of how player community messages can support player choices. They present an example of the messaging system of Dark Souls that allows players to warn each other about dangerous paths. Community can also directly influence how players traverse environments by posting playthroughs and instructing others on how to reach certain places.
NPC guidance	Moura and El-Nasr (2014) state that NPC guidance is primarily a tutorial mechanic meant to teach movement in a diegetic, contextualized way. However, they also mention that such a mechanic may harness narrative and draw players' attention to landmarks and contextual cues useful for wayfinding.
Tropes	Merriam-Webster (n.d.) defines "tropes" as common or overused themes, otherwise called clichés. Applied to gaming, these are the principles that help players recognize patterns and change their actions accordingly. For example, knowing that behind the waterfall there is often treasure, a gamer would likely go through the water cascade to look for a reward. Pavlovian Pairing works not only with the existing gaming knowledge but also with architectural tropes. For example, a player may explore certain areas of the map if they recognize that they were constructed as an allegory to a real-world location.

Discretely. In contrast, "discrete" consists of separate elements (Merriam-Webster n.d). Therefore, discrete guidance gives path cues only at specific points or moments, rather than constantly. Placed in a row, discrete objects become

breadcrumbs and fall into the “continuous” category. The examples of discrete path salience aids are shown in Table 12.

Table 12. Discrete path salience techniques

Name	Description
Directional signage	Department of Health (Philippines) (2020) defines directional signs as those that have an arrow or other directional indicator, which show people the way they need to follow. Yandoh, Sangban, and Sackey (2023) claim that directional signage is by far the most efficient way to show directions.
Ambient NPCs	The Level Design Book (2025) proposes that NPC guidance can imply direction by letting the player follow ambient wildlife. Crowds can be used in a similar way to give the player an idea of where they should go. For example, in a superhero game, the player can realize that a villain they need to defeat is in the direction opposite to the running people, while in a horror setting, it would be wise to go with the crowd to safety.
Compass	Vembar, Blank, & Cohen (2004) state that just like mini-maps, compasses provide an egocentric point of reference to the player. Xiao (2020) analyzes applications of the compass in video games and states that all of them are used for navigation while taking different forms.

5.2.3 Spatial Navigation aids

To help players build spatial understanding of the environments, designers can use multiple types of Spatial Navigation aids. Khana et al. (2017) define effective navigation aids in spatial learning contexts as aids that facilitate the development of long-term spatial knowledge in large virtual environments. This research does not talk of the effectiveness but considers “spatial navigation aids” to be a category separate from the rest of the Navigation aids.

The most popular example of a spatial aid is a global map. For example, Sacco et al. (2022) state that they improve the general spatial knowledge acquisition skills of the player. Celestial bodies that act as prominent landmarks, atmospheric effects that can enable longer view distances, and height layering that adds clarity to environmental arrangement – all of these are examples of spatial navigation aids. Some of them may not be placed to enhance navigation, but since there is no way to tell, they are considered intentionally added.

5.3 Implicitness of Navigation aids

It is important to note that every technique can be executed in different ways. In film and literature, the terms “diegetic” and “non-diegetic” describe how a medium (music, narration, text, etc.) can either be a part of the world of a movie, play, book, or happen outside of it, respectively (Dykhoff 2012; Wakefield, Tan & Spackman 2017; Stilwell 2007; Johansson 2023). The terms are also adapted to classify UI in games. A design expert, Bowers (2019), refers to Stonehouse’s (2014) article, where he defines four types of user interfaces in games (Figure 4; Fagerholt & Lorentzon 2009).

Figure 4. UI classification in games (Bowers 2019)

Diegetic UI exists within the game's world and is a part of the game's story. Non-diegetic UI is the opposite – it includes "traditional" on-screen HUD that is completely removed from the game's fiction and geometry. In addition to diegetic and non-diegetic UI, Stonehouse (2014) mentions "meta" and "spatial" categories that lie between two opposites. Meta UI is part of the game's narrative, which is displayed as HUD, while spatial UI lies within the game's world but is not a part of the game's story. However, no academic sources confirm the effects of meta and spatial UI on user immersion.

These principles can easily be applied to describe even those Navigation aids that are not included in the UI category. According to Naro (2018), game characters, songs, sounds, or images all fall somewhere on the diegesis scale. In other words, this definition extends naturally to Wayshowing strategies as well.

This paper mentions the negative effects of non-diegetic navigation aids on player immersion in Chapter 2.2. In a nutshell, Iacovides et al. (2015) prove that the use of diegetic elements results in a more immersive experience for seasoned players. However, Khazanehdarloo & Mohamed (2023) state that diegetic UI is harder to use. However, it is impossible to say what effect each element has on the player's immersion and perception. Rather, this thesis aims to compile a list of Wayshowing strategies and later look for similarities in how different successful games execute them.

6 CASE STUDIES

6.1 Study 1: Elden Ring

Elden Ring is a game with a massive open map divided into distinct regions (Figure 5), which, despite the game's overall openness, are typically explored in a somewhat linear order as the player progresses through the story. It is important to understand the general structure of the map to define landmarks common across all regions and find similar patterns in how different areas are constructed.

However, a more detailed analysis (concerning the positioning of Gameplay sites and Navigation aids) is conducted on an area-to-area basis.

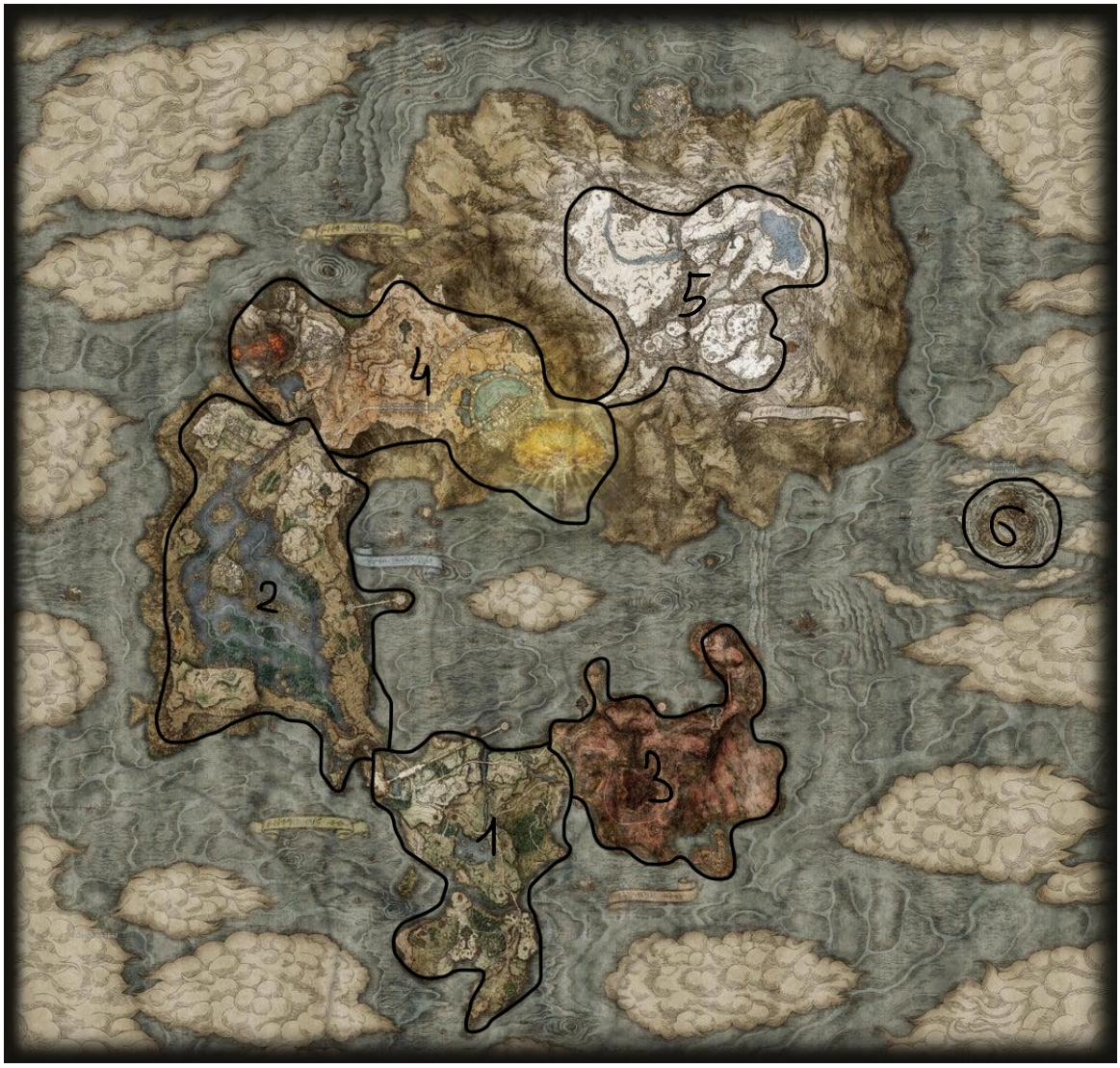

Figure 5. Elden Ring map regions (Fextralife Wiki n.d., edited by Vesna Grau)

The main areas of the game include (1) Limgrave + Weeping Peninsula, (2) Liurnia of the Lakes, (3) Caelid, (4) Mt. Gelmir + Altus Plateau + Capital Outskirts + Leyndell, (5) Snowfield + Mountaintops of the Giants, and (6) Crumbling Farum Azula. Each area is positioned higher from the zero point (the sea) than the previous one. They are easy to identify due to the color-coding and nameplates visible in the original game map. This thesis does not include the Underground

areas that are unlocked throughout the progression and are not visible on the main map (Figure 5).

6.1.1 Cognitive mapping elements

As stated in Chapter 4.1, to enable Wayfinding mechanisms in players, the world of an open-world game should be constructed according to the Cognitive mapping principles. This chapter examines how Elden Ring's environments incorporate and support these principles through positioning Cognitive mapping elements in certain ways. It is assumed that Elden Ring's spatial structuring contributes to the game's implicit wayshowing.

Edges. The edges of the map are clearly defined by water. The player's character cannot swim, so any deep water restricts exploration naturally. Similarly, the player's character does not have immunity to falling from great heights. Thus, any place where the ground below is not visible is clearly unreachable. Interestingly, each region is separated by atmospheric effects. They can be considered edges that do not let the player see the next area of the map.

Paths. Elden Ring has very few clearly defined paths. In every area (except for the pathless Mountaintops of the Giants), there are one to two main paths that ultimately lead the same way. The main path connects all game areas together, while its smaller branches link area-specific landmarks together. The starting areas of the game, Limgrave and Weeping Peninsula, have the most paths relative to the area size. This can be explained by abundance of the landmarks they are connecting and the level design accommodating beginner players.

The Snowfield area also contains implicit paths – spaces without formal roads but shaped by edges that naturally funnel the player in a specific direction. These pathways likely exist because the region lacks explicit routes. Similar funneling occurs in districts such as castles, manors, and towns, where corridors restrict exploration and guide players toward predefined combat spaces. Thus, even

without visible roads, players still follow structured paths from one room to the next.

Districts. Elden Ring's districts are manors, castles, towns, and settlements. The biggest one of them is Leyndell, the capital. All districts are very small but dense compared to the overall map size, and each has a visual identity separating it from the rest of the elements (district buildings have much lighter color than nature). Most of the gameplay happens inside the buildings or on the roads leaving to them in these areas. Each district is its own level that is somewhat cut away from the rest of the world.

Nodes. In most of the exploratory landscapes of Elden Ring, nodes are not common. The paths within the Lands Between only intersect at a couple of points, branching out to lead to meaningful Points Of Interest (POIs). The nodes formed from these intersections are not distinct and do not hold much significance. Elden Ring's vast exploration areas lie far beyond the charted roads, so nodes are rarely needed to support wayfinding.

Interestingly, nodes are common in the fifth area (Snowfield + Mountaintops of the Giants) that lacks any explicit paths. The player is often presented with the choice of going left or right at the intersection rather than being presented with the fully explorable area. Such a decision helps facilitate branching milestones and establish order in the environment where the player's vision is impaired and landmarks are scarce.

Nodes within districts (such as castles, manors, settlements, and towns) serve as reliable reference points in spaces designed for repeated visitation. Their uniqueness supports player orientation and helps structure the layout. They also function as branching milestones, similar to roguelike dungeon nodes, guiding players through interconnected rooms toward a final objective.

Landmarks. The original map (Figure 5) provides a clear overview of Elden Ring's paths, edges, districts, and nodes. However, it is hard to identify significant landmarks on it. The map lacks depth. Fortunately, Nalepa (2023) created a layered isometric map that indicates the most prominent features in scale (Figure 6).

Figure 6. Isometric Elden Ring map (Nalepa 2023, edited by Vesna Grau)

Examining this map reveals that the Erdtree, visible in each of the five regions, serves as a central POI. Although it is located closest to Leyndell, its position appears to be deliberately placed at the center of all five regions, as if the world is constructed around it. Because each region lies at a different elevation relative to

the Erdtree, it helps players determine not only the location of the world's center but also which region they are currently in.

The Erdtree's smaller counterparts (Minor Erdtrees) appear throughout the regions, providing area-restricted orientational help. Along with the Minor Erdtrees, Divine Towers that share a consistent design throughout the game are visible from almost every viewpoint of each region. Additionally, each area features one or two major region-specific landmarks (manors, castles, towns, sanctums, an academy, or a forge) that imply a general direction of movement, which is discussed further in the next chapter (Figure 6).

These, together with the minor Erdtrees and Divine Towers, remain visible from nearly any vantage point within their respective regions. Such persistent POIs provide continuous spatial orientation, making it difficult for players to lose their sense of direction. The diversity and visibility of these landmarks also allow players to compare them against one another to reorient themselves when navigating the world.

6.1.1 Gameplay sites

This chapter explores how the positioning of key gameplay sites corresponds with the world's environment and shapes it. It is assumed that Elden Ring's distribution of gameplay elements contributes to the game's implicit wayshowing. The breakdown of open-world gameplay sites is taken from Chapter 5.1.

Given the vast scale of Elden Ring's map, analyzing all six regions in detail would be impractical. Therefore, this study focuses specifically on Limgrave and Caelid. Limgrave, as the game's starting area, is expected to include more guidance elements to support new players. Caelid, on the other hand, is typically explored during the mid-game and thus provides a useful contrast to the introductory region.

Exploratory landscapes

Elden Ring has thirteen mandatory bosses the player should find and defeat to beat the game. There are shortcuts to skip half of them, since the game is constructed to be a truly open world, but the average player would likely stumble upon and defeat all or most of them. Those bosses determine the main quest of the game. Outside of the areas related to the main quest, all of the game's areas are Exploratory landscapes.

All thirteen bosses are located at major region-specific landmark locations (Figure 6; Figure 7), which are limited to castles, an academy, and a forge. Outside of those grand man-made POIs, outdoor natural landscapes provide plenty of space to explore, challenge skills, level up, complete side quests, or do sightseeing. It is fair to say that Exploratory landscapes accommodate both Combat arenas, Narrative hubs, and Travel zones in Elden Ring.

Each of the Exploratory landscapes (roughly two-three per area) is built around the concept of ascension. The player always enters a region at a medium elevation point, which provides a panoramic view of the whole area. From there, they descend to the lowest point (typically in the middle of the region), before ascending again to reach the area's highest elevation, where the "mandatory boss" encounter takes place (Figure 6; Figure 7).

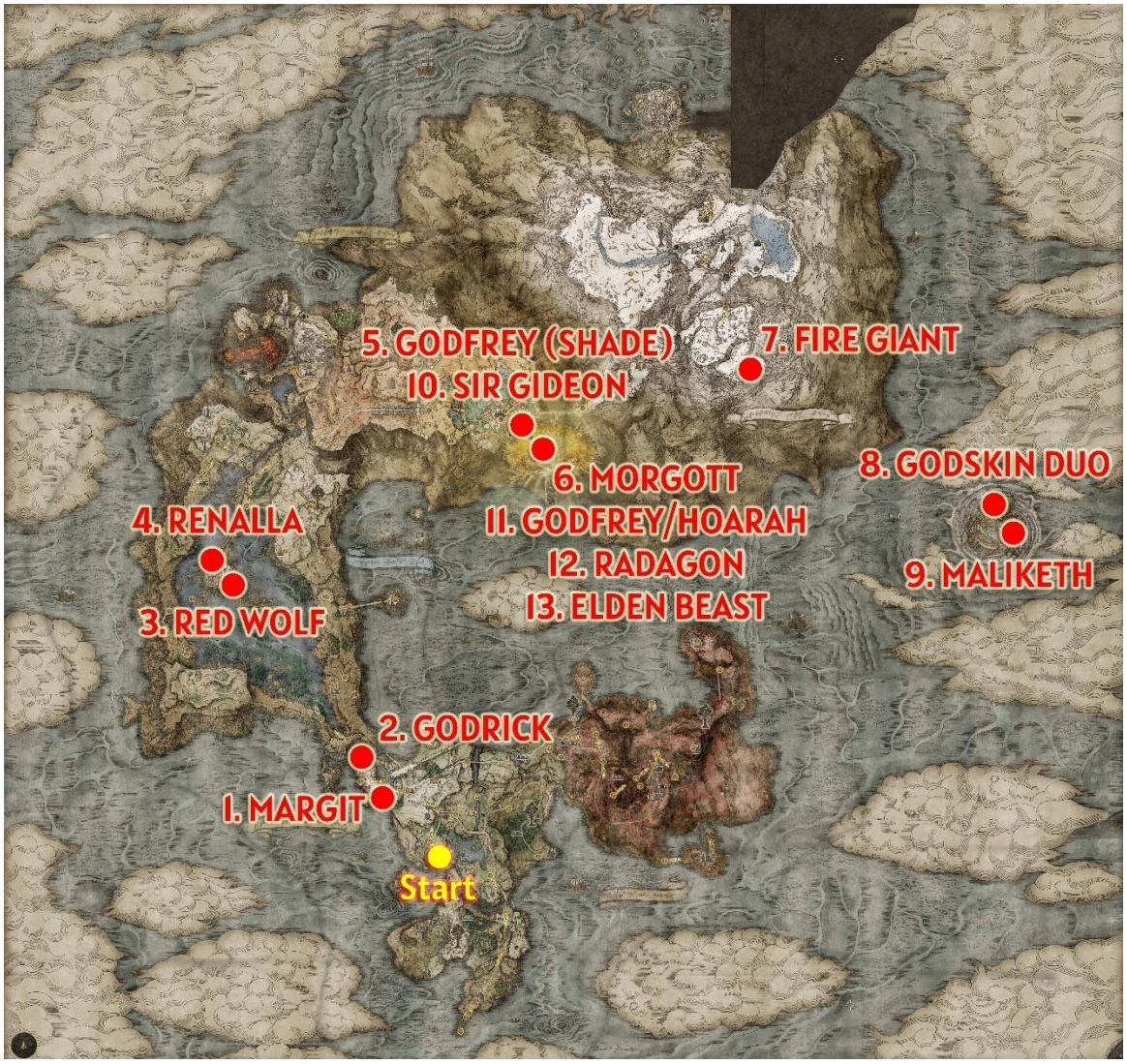

Figure 7. Elden Ring's "mandatory" bosses' locations (Franey 2024)

This vertical layering provides the player with an overview of the entire region (except for the Mountaintops of Giants, where the visibility is limited by a snow blizzard). As a result, exploration is purposeful: the player generally understands where they are heading and why, rather than wandering and wondering what lies ahead. Additionally, the ascension pattern makes the region's final objective clearly identifiable to the player. It allows them to distinguish between areas that advance the main story and those that can be explored independently. In this way, the terrain itself implicitly suggests a "golden path," guiding player movement and enabling informed decision-making throughout exploration.

Combat arenas

Aside from the mandatory bosses mentioned above (Figure 7), around whom the whole map is constructed, Elden Ring has numerous other Combat arenas (CAs). In fact, most of the game's gameplay is enemy fighting. Therefore, there are multiple types of recurring Combat arenas throughout all regions of the game:

- **Major CAs** (Castles/Sanctums) contain "mandatory" or other hardest optional bosses.
- **Evergoals** challenge the player.
- **Dungeons** (Catacombs/Graves + Forts/Lookout Towers + Caves + Tunnels/Ruin-Strewn Precipice) provide upgrade materials.
- **Settlements** (Ruins/Villages + Colosseums + Churches/Cathedrals) provide loot with a chance to unlock a side quest.

Figure 8 and Figure 9 provide an example of how the positioning of these elements looks within the map's terrain: white – Major CAs, red – Settlements, orange – Evergoals, pink/purple – Dungeons. The positioning of the Major CAs determines how the main road of the region lies. Settlements determine where the main road branches out, as well as where forests or big water reserves are. Evergoals and Dungeons influence the elevation of the terrain and the shape of the region.

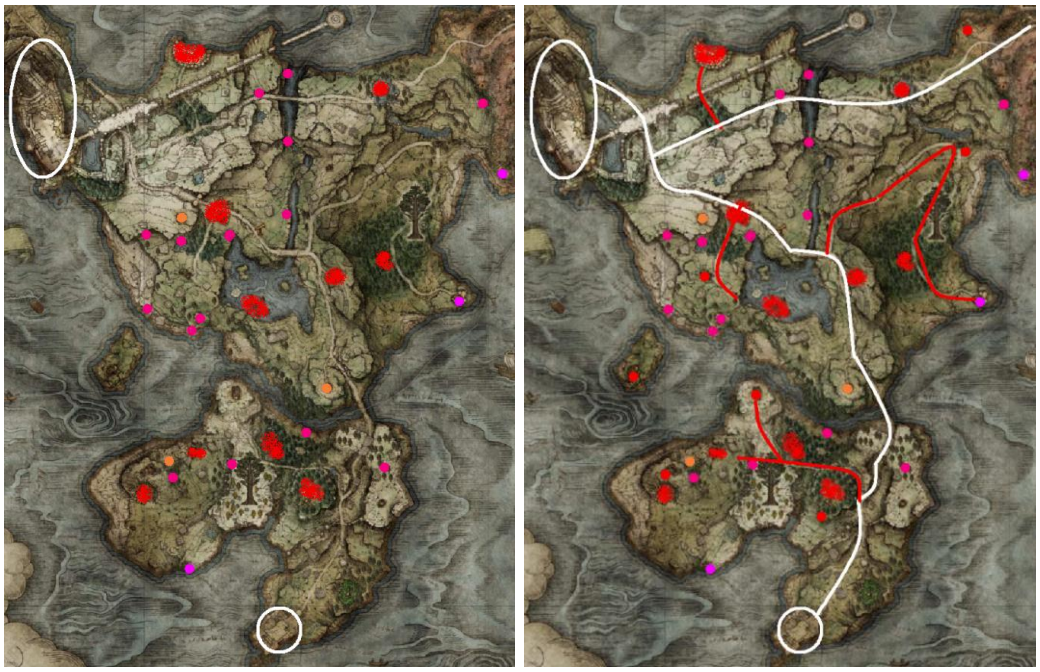

Figure 8. Limgrave's map of Combat arenas (Fextralife Wiki n.d., edited by Vesna Grau)

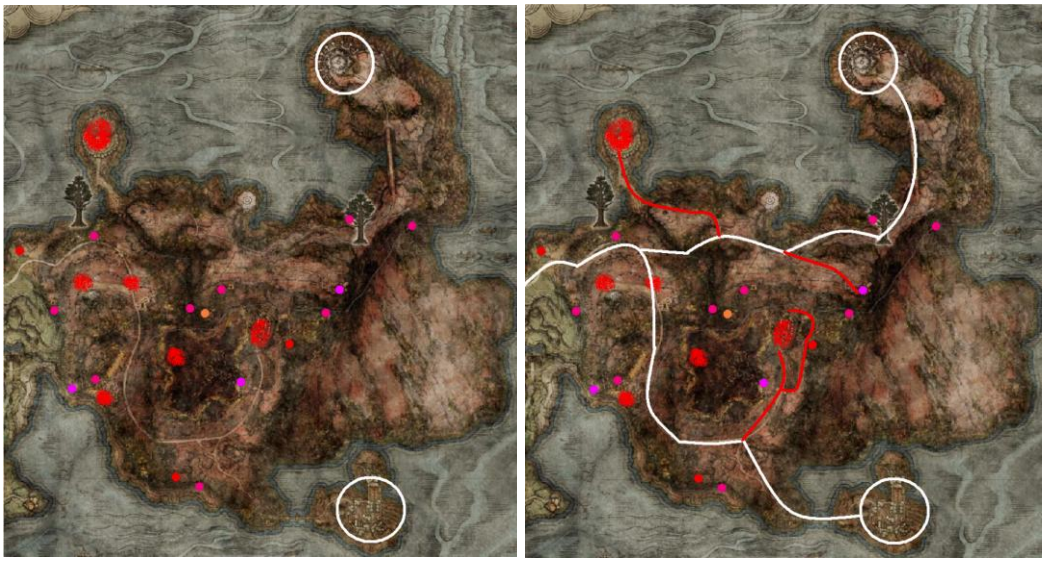

Figure 9. Caleid's map of Combat arenas (Fextralife Wiki n.d., edited by Vesna Grau)

Aside from the dedicated combat arenas, the world of Elden Ring is filled with individually roaming enemies, challenging the player during their travel. Upon analyzing the map, there are five types of locations where individually placed enemies roam:

1. Guarding dungeons (Figure 10)
2. At a landmark/weenie (Figure 10)
3. In an area related to a landmark/weenie narratively (Figure 10)
4. Next to an NPC location (Figure 11)
5. By a road (Figure 11)

Figure 10. Limgrave, Individual enemy placement example (Fextralife Wiki n.d., edited by Vesna Grau)

Figure 11. Caelid, Individual enemy placement example (Fextralife Wiki n.d., edited by Vesna Grau)

Such placement of combat arenas ensures that players encounter them not only when intentionally seeking combat but also while completing quests (3), exploring (1; 2), or traveling (4). This design choice is logical, as combat represents the core mechanic of Elden Ring. The world is intentionally structured to provide players with a continuous sense of challenge and survival, consistently offering opportunities for engagement in combat.

Narrative hubs

The game has fifteen NPC “side” quests. Since the main quest of the game is to slay the “main bosses,” all the NPC quests are considered side objectives. They progress side stories and reward the player with powerful weapons that make further progression easier. One quest may include multiple Narrative hubs. Additionally, the same NPC can spawn at multiple locations.

Figure 12 clearly shows that the majority of quest-related NPCs are located either on paths or near combat arenas (yellow dots). The main exceptions are the NPCs found in Shacks – isolated locations primarily created to accommodate Narrative hubs. In addition to quest NPCs, there are also merchants (green dots) and Sites of Grace that the player can interact with. Merchants are located by Combat arenas, Shacks, Settlements, and roads. In contrast, Sites of Grace

primarily serve as saving points and only rarely include NPC interactions, which excludes them from the Narrative hub analysis.

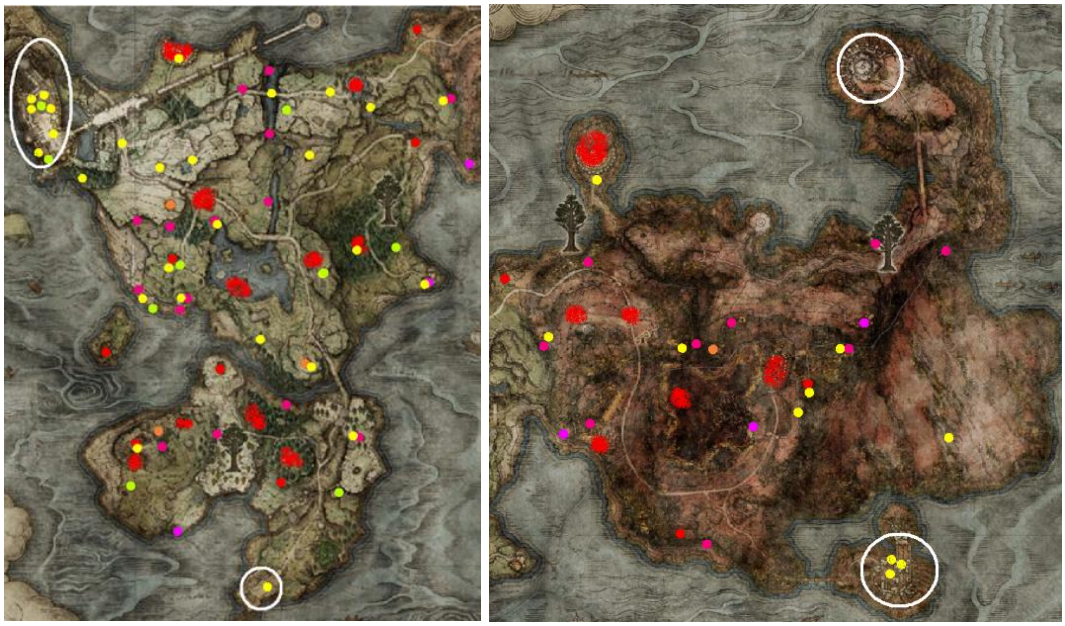

Figure 12. Narrative hubs of Limgrave and Caelid (Fextralife Wiki n.d., edited by Vesna Grau)

Travel zones

Since the travel zones are the negative spaces between Combat arenas and Narrative hubs (both of which are part of larger Exploration zones, as discussed earlier), it is important to examine the density of the activities across areas. To do so, all Combat arenas (purple) and Narrative hubs (yellow) are connected on the map, following two rules. Rule 1 states that lines must not intersect (for clarity). Rule 2 determines that the closest points are connected.

This model does not depict actual player movement, nor does it provide a representation of potential traversal patterns. Neither of those are possible to account for without additional data. The former requires player research and conducting playtests, while the letter one requires accounting for terrain elevation which is possible with neither the top-down, nor the isometric view. Instead, it depicts the density map of interactions and the structural skeleton of the world layout. Figure 13 illustrates the density map of Limgrave, while Figure 14 shows how activities are spread out in Caelid.

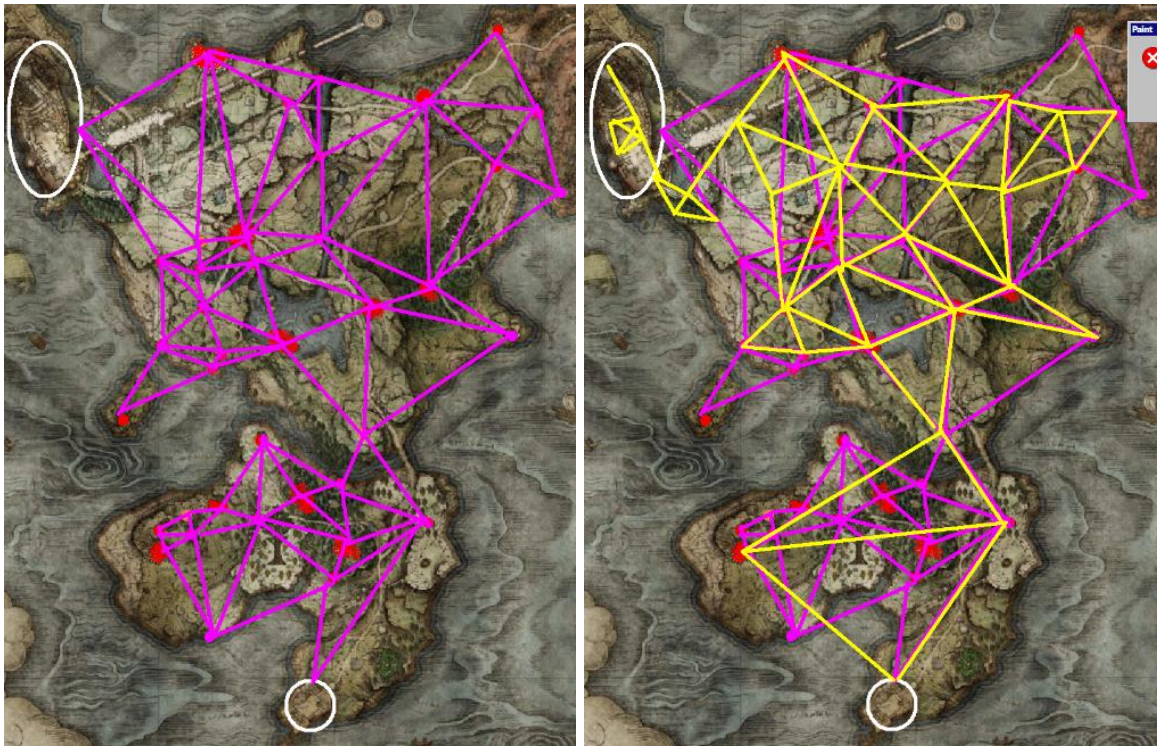

Figure 13. Travel zones of Limgrave (Fextralife Wiki n.d., edited by Vesna Grau)

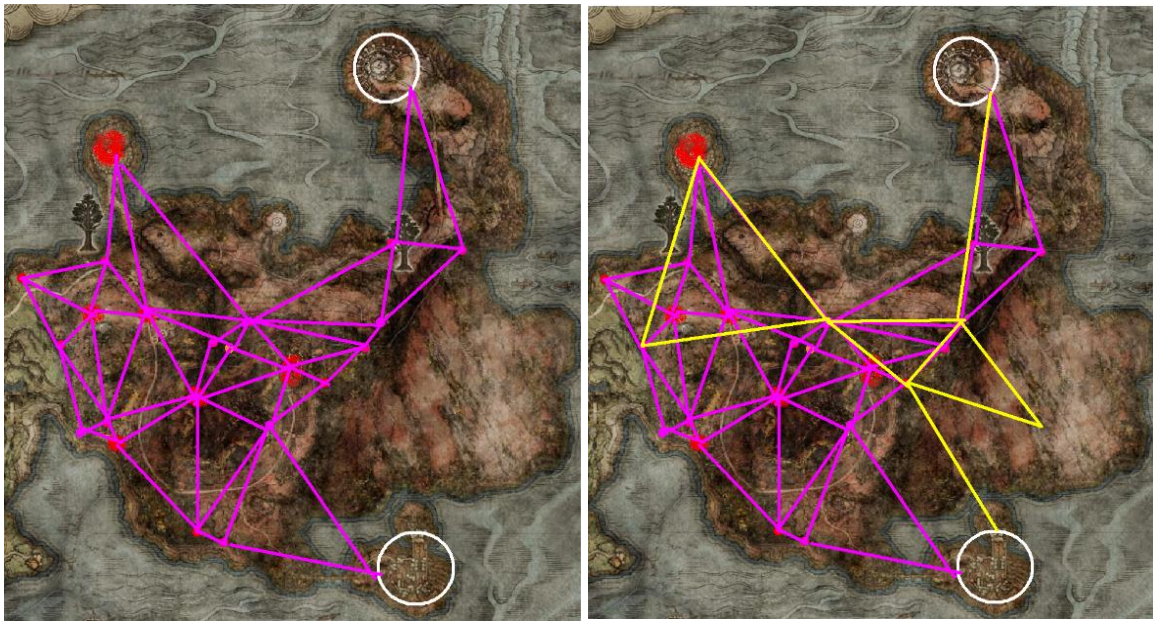

Figure 14. Travel zones of Caelid (Fextralife Wiki n.d., edited by Vesna Grau)

It is clear from Figures 13 and 14 that the placement of Combat arenas exhibits more irregular density, which makes travel times either very short or very long (as evident from the elongated shapes of purple triangles). This pattern implies that

Elden Ring's combat experience is intense but provides substantial periods of rest and exploration in between encounters. In contrast, while there are fewer Narrative hubs on the map, they are generally distributed at more even distances from one another (as indicated by the more uniform shape of yellow triangles). This suggests that players have a relatively consistent likelihood of encountering an NPC throughout their journeys.

While Combat arenas intersect with Narrative hubs at many points, it is apparent that Narrative hubs may sometimes lead players to the locations they would not otherwise explore. They may also help to break up long travel intervals between the Combat arenas, offering extended moments of rest and greater gameplay variety to the player. Together, these patterns demonstrate a balance between challenge and rest, reinforcing Elden Ring's idea of fight tension and recovery through exploration.

6.1.2 Navigation aids

This chapter analyzes what Navigation aids Elden Ring uses across all game areas. Table 13 is based on the breakdown established in Chapter 5.2. After the table, the results are analyzed within the framework of implicitness defined in Chapter 5.3.

Table 13. Elden Ring's Navigation aids

Establishing the user's location		Establishing the destination's location					Spatial
Distinct location	Orient. signage	Goal salience			Path salience		
		Perceptual	Contextual	Motivational	Continuous	Discrete	
Size contrast Color coding Zone emblems	Global map marker	Vistas Size contrast Pattern Language	-	Weenies Bait Quest NPCs	Breadcrumbs (Snowfield) Community hints	Compass Ambient NPCs Grace sites	Heightmap Global landmarks Global map

Most of the aids Elden Ring uses are diegetic. They are a part of the game's world and have a narrative reason to exist within it. For example, Quest NPCs' Goal salience instructions are presented as NPCs' own plans and aspirations to appear at certain locations. They do not give quests to players; they give them a choice to explore if their curiosity sparks. The same is fair for Bait and Weenies aids. Grace sites, through directly pointing the player towards their main objective, are narratively explained – they are a part of divine guidance that shows a path for becoming an Elden Lord.

There are, however, some examples of spatial (non-diegetic) NAVAIDS (Chapter 5.3). For example, the player only encounters Breadcrumbs when they enter the Forbidden Lands area. The breadcrumbs in that area exist within the game world, guiding players through the snow blizzard as a red glow. However, they have no narrative reason to appear. Same with the compass and community hints. The compass exists as a part of HUD, but it is not narratively explained, while community hints are a part of the game's physical world, yet are not explained through the game's story.

Interestingly, Elden Ring employs no directional signage or contextual aids to guide the player, reinforcing its narrative of complete freedom. The only form of signage present is the player marker on the map, which indicates the player's current location. The game avoids handholding or explicitly indicating the next objective, instead encouraging players to rely on their own reasoning and self-defined goals to determine where to go.

For example, certain areas become accessible only after defeating a specific number of major bosses. However, the player is free to choose which bosses to confront. Moreover, many of these encounters can even be bypassed through hidden routes, allowing for non-linear progression. In this way, players are not forced to follow a prescribed path but are instead granted full ownership over their decisions and play style. None of this is, however indicated through the

wayshowing techniques. The game expects the player to figure out these principles on their own.

Elden Ring's environment has exceptional height layering that greatly contributes to cognitive map forming, as it is a spatial navigation aid. Extensive layering, paired with global landmarks, makes it abundantly clear where to go (the player always ascends to progress, so the way up is always the correct way) and where they are (comparing their location to always visible global landmarks). A global map is acquired diegetically (can be found through the exploration of the area). However, it is represented in a meta way, where it is valid narratively, but exists outside the game's physical world, in the HUD (Chapter 5.3).

Elden Ring contains numerous secrets that are easy to overlook, as they are rarely communicated directly to the player. Their discovery often relies on the player's ability to recognize environmental patterns and irregularities. For instance, in areas where a room ends abruptly or there appears to be no exit, players may uncover secret walls that reveal hidden treasures or new paths when struck.

Elden Ring does not always conceal its treasures. Valuable loot is frequently placed in chests scattered throughout the world. However, some of these chests are mimics, bait enemies disguised as rewards. They appear both in dungeons and the overworld, making it impossible for players to predict which chests are safe and which hide danger.

6.2 Study 2: A Short Hike

A Short Hike is a small open-world game set on islands that can be divided into three regions (Figure 15). These regions can be explored in any order, regardless of the game's intended progression. Some areas feature gated progression that requires the player to "level up" to access them; however, these level-ups can be obtained non-linearly, as they are distributed across all regions. As with the Elden

Ring analysis, it is important to understand the islands' overall structure to identify landmarks common to all three regions and to recognize recurring patterns in how different areas are designed. A more detailed analysis (focusing on the placement of gameplay sites and navigation aids) is conducted on an area-by-area basis.

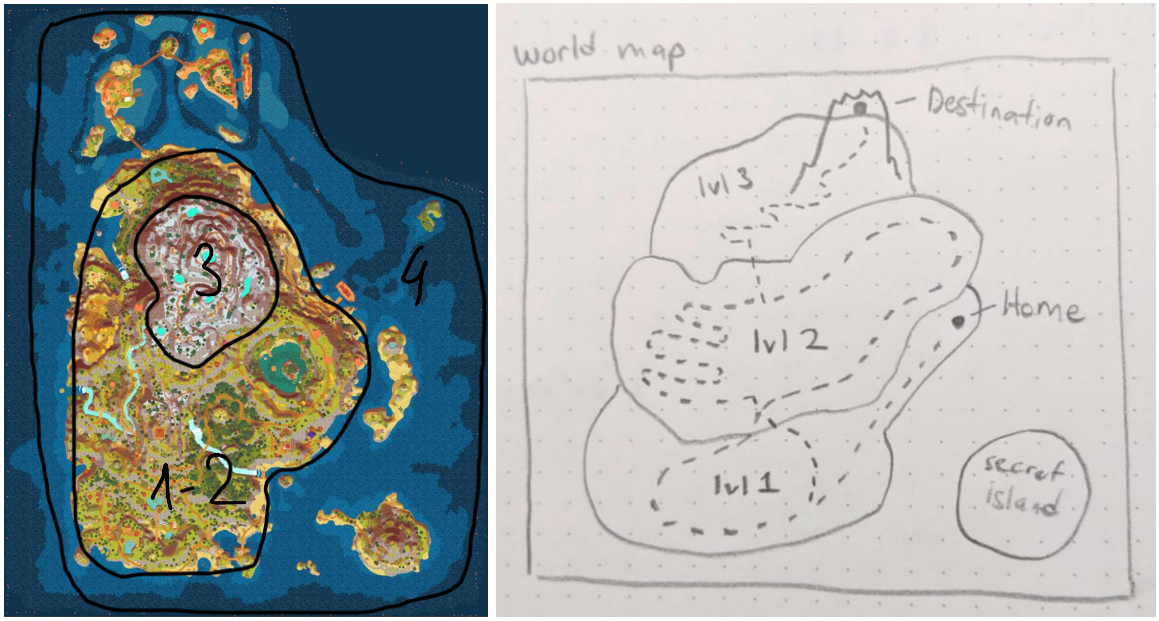

Figure 15. A Short Hike's game regions (FaithfulPotato n.d. [left] edited by Vesna Grau; Robinson-Yu 2021 [right])

Each region of A Short Hike is defined by distinct traversal mechanics and color coding (Figure 15). Robinson-Yu (2021) states that the "land" part of the game is divided into three regions, each "elevated to a different height above sea level." To climb into the next region, the player will need a specific amount of stamina (which is given via golden feathers) to get there. However, the game itself does not have a distinct gate between level 1 and level 2. Therefore, this thesis combines them into one big area.

As per this paper's breakdown, region 1-2 serves as the starting area, where most of the gameplay occurs, and introduces the basic movement and gliding mechanics. The peak of region 3 represents the game's final objective and features a gliding restriction mechanic that makes movement more challenging

and deliberate. Region 4 is an optional area that players can explore at their own pace and introduces an additional mechanic, boat rowing, for faster travel across water.

These regions are nested within one another. As a result, it is impossible to travel from region 4 to region 3 without first passing through region 1-2. However, the reverse is possible due to the gliding mechanic.

In every region, the mountain serves as the central landmark, providing players with a clear sense that, if they wish to stay on the right path, they should move upward toward it. Nevertheless, the mountain alone is not sufficient for precise orientation because the camera continuously rotates with the player's movement. Thus, players may always know their objective and the region they are in, yet still struggle to determine their exact position within the map (even when the mountain remains visible). The ways in which camera movement may influence wayfinding are further discussed at the end of the next chapter.

6.2.1 Cognitive mapping elements

As outlined in Chapter 4.1, to enable Wayfinding mechanisms in players, the world of an open-world game should be constructed according to the Cognitive mapping principles. This chapter examines how A Short Hike's environment incorporates and supports these principles through positioning Cognitive mapping elements in certain ways. It is assumed that A Short Hike's spatial structuring contributes to the game's implicit wayshowing.

Edges. The boundaries of the map are not clearly defined. When players go too far into the sea, they are stopped by an invisible barrier. It is difficult to predict exactly when this will occur, as the barriers are not at the same distance from land all the way through (Figure 15). It may give players a sense of uncertainty, especially in combination with not knowing their precise position within the map (Chapter 6.2).

Additionally, edges are frequently used within exploratory landscapes to guide player movement. They help define progression that depends on the player's stamina. By shaping accessible routes, these boundaries control how far players can explore until they acquire enough resources to continue.

Paths. Each region of the map contains multiple paths. Generally, there is one path (marked purple in Figure 16) that leads to the game's primary objective. Although this path includes several non-linear segments that allow for alternative routes, it ultimately directs the player along the same way. All other roads lead to landmarks, some of which are not necessarily connected to the main game objective.

Figure 16. A Short Hike, all paths (adamgryu 2022)

In area 1-2, there is no distinction between the main path and side paths, which can make it hard for players to distinguish between them. In area 3, however, the main path is clearly marked by trail flags. The side paths in area 3 form a navigational puzzle that challenges players to identify the correct route, as some segments are gated by progression mechanics. This design decision may stem from the fact that area 3 contains no side quests, unlike areas 1-2 and 4.

A Short Hike also uses funneling techniques, forming implicit paths through environmental edges rather than drawing roads on the ground. This occurs most notably around the mountain, where cliff formations can guide the player's movement even though no formal paths are marked. These natural boundaries can create clear routes without relying on explicit road design.

Districts. A Short Hike has multiple clearly defined districts within areas 1-2 and 4. In area 1-2, they are mainly grouped by color and vegetation (a forest, a big lake or an autumn landscape). In area 4, there is a district that is formed from the clustered islands. Each district contains a single main path that lies through it.

Nodes. Because A Short Hike is intersected by numerous paths, it naturally features many nodes. Most of them are situated in regions 1-2 and 3, while region 4 lacks branching paths and therefore contains no nodes. It can be hard to distinguish between individual nodes, as they are visually similar. Moreover, the fixed camera perspective limits the player's ability to see where each path leads after branching out from a node, further reducing their navigational utility. Consequently, while nodes are present in A Short Hike, their inconspicuous nature makes it hard to evaluate their role in helping players form cognitive maps.

Interestingly, the only area where the nodes are clearly distinguishable is snowy area 3. This region features fewer landmarks than other areas, which it compensates for by making the nodes more visually distinguishable. This is achieved through color-coded paths at intersections (brown for regular trails and

blue for icy ones) and by placing lakes as weenies directly along the paths, providing clear visual anchors that guide player movement.

Landmarks. In addition to the global terrain landmark, the mountain, A Short Hike features several secondary major landmarks (Figure 16). Moreover, there are numerous minor landmarks (marked red) that assist navigation between the main landmarks that are marked black (Figure 17). This way, the player encounters a new landmark shortly after leaving the previous one, which benefits the fixed-camera design by maintaining consistent visual cues for orientation.

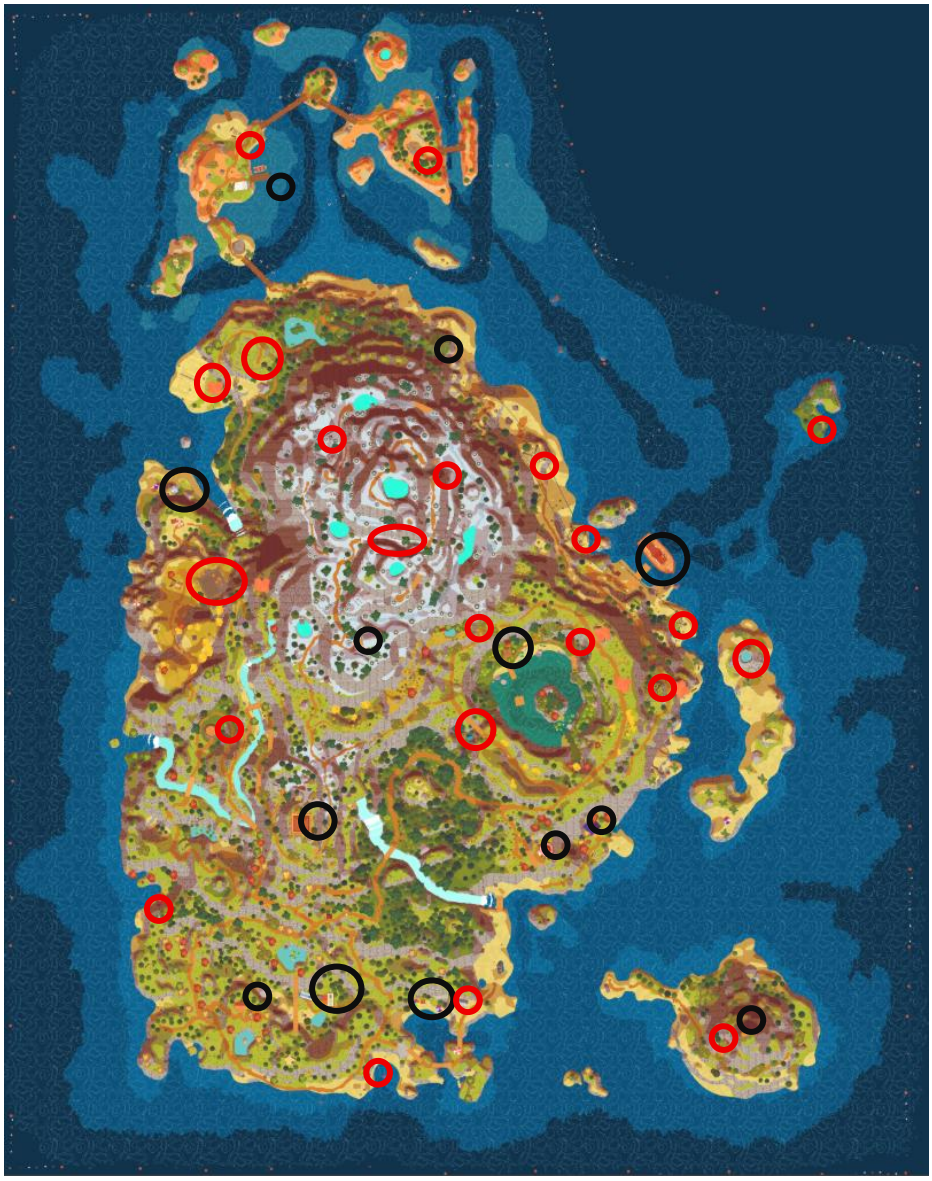

Figure 17. A Short Hike, all landmarks (FaithfulPotato n.d., edited by Vesna Grau)

Because players cannot freely look around, they cannot use a height advantage for navigation despite the game's layered structure. In Figure 18, the player (red dot) can only see within the camera's fixed range (square), leaving major landmarks that would otherwise be visible (crosses) out of the player's perception. Because of this limitation, the frequent appearance of landmarks may be helpful in sustaining navigational awareness.

Figure 18. A Short Hike, 3D view of the map (Robinson-Yu 2021, edited by Vesna Grau)

Interestingly, only one landmark in A Short Hike is naturalistic – an erupting geyser on one of the islands. The rest, despite the game's natural environment, are urban elements such as houses, campfires, or bridges. This contrast makes these landmarks stand out more clearly within the naturalistic landscape, enhancing their role as orientation cues.

6.2.1 Gameplay sites

This chapter explores how the positioning of key gameplay sites corresponds with the world's environment and shapes it. It is assumed that A Short Hike's distribution of gameplay elements contributes to the game's implicit wayshowing. The breakdown of open-world gameplay sites is taken from Chapter 5.1.

A Short Hike, unlike a lot of open-world games, does not have Combat arenas. The mechanics of the game only include traversal, talking to NPCs, and collecting things that either move the progression further or alter the environment to make exploration easier. Consequently, A Short Hike only includes Narrative hubs, Exploratory landscapes, and Travel zones.

Exploratory landscapes

A Short Hike's gameplay is centered entirely around exploration. The game's main objective, reaching the top of the mountain, requires exploration to both discover the correct path and collect the necessary resources for the ascent. In this sense, every area of the map functions as an Exploratory landscape.

A Short Hike is built around the concept of ascension. The player begins at the lowest point of the map and gradually climbs upward. Progression, however, is limited by a stamina system, which determines how far the player can climb at a time. Only by collecting additional stamina upgrades (represented by golden and silver feathers) can the player advance to higher elevations (Figure 19).

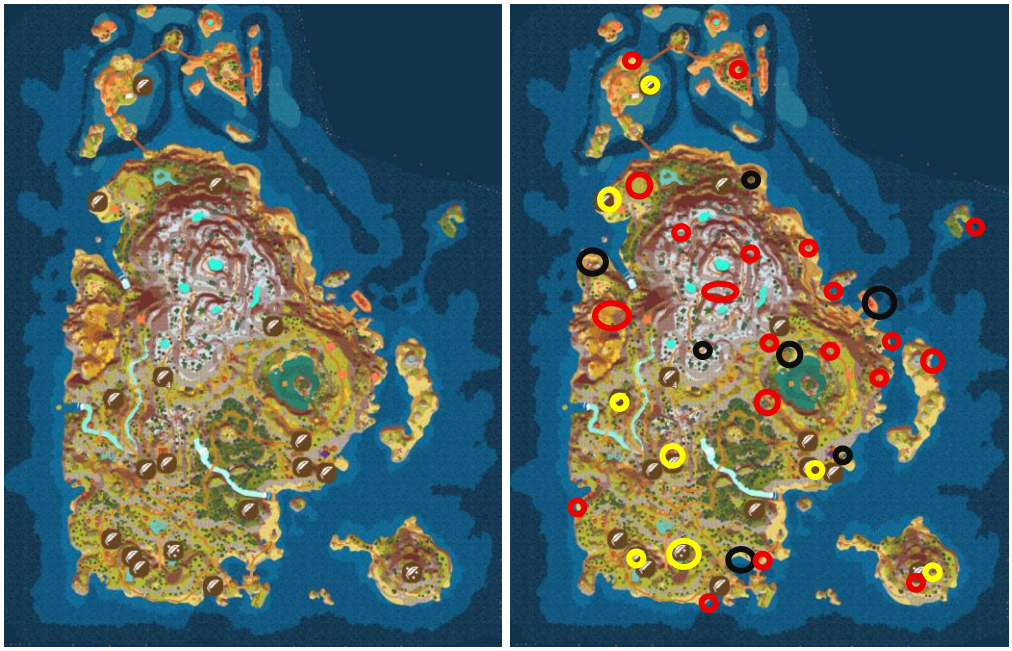

Figure 19. A Short Hike, map of golden and silver feathers (FaithfulPotato n.d., edited by Vesna Grau)

Only about 35% of these stamina points (nine out of twenty-two feathers) are located right on top of the major landmarks (yellow circles in Figure 19). The remaining feathers must be discovered through environmental exploration and terrain-based puzzles. Moreover, two out of the nine landmark-adjacent feathers must be purchased using coins, while three are obtained by completing quests. Both coins and quests themselves require further exploration, meaning that only four out of twenty-two feathers (18%) can be acquired with minimal effort. Since the game requires seven feathers to reach the main objective, exploration becomes not just an optional activity but a core mechanic of progression.

Narrative hubs

There are several types of NPCs that players can meet throughout the game. Some of them give out quests, others simply engage in a conversation, and a few offer items that enhance gameplay, such as progression points (feathers) or tools (e.g., the compass, the bucket of water). The distribution of these NPCs is illustrated in Figure 20, where the gameplay-altering NPCs are colored purple and the talk-only NPCs are marked yellow.

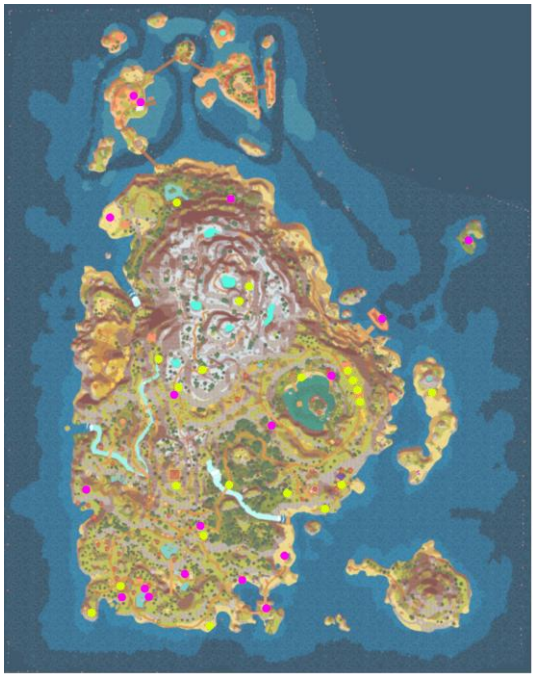

Figure 20. A Short Hike, all Narrative hubs (FaithfulPotato n.d., edited by Vesna Grau)

The majority of the gameplay-altering NPCs are located near landmarks, while the remaining ones are positioned directly along the paths. This makes them difficult to miss during natural exploration (Figure 21, left). In contrast, most of the talk-only NPCs are situated along the paths; one is positioned by a major landmark, and two more are scattered at random locations across the map (Figure 21, right). This only makes talk-only NPCs slightly harder to find, striking a balance between challenging the player with new mechanics and allowing moments of rest through dialogue.

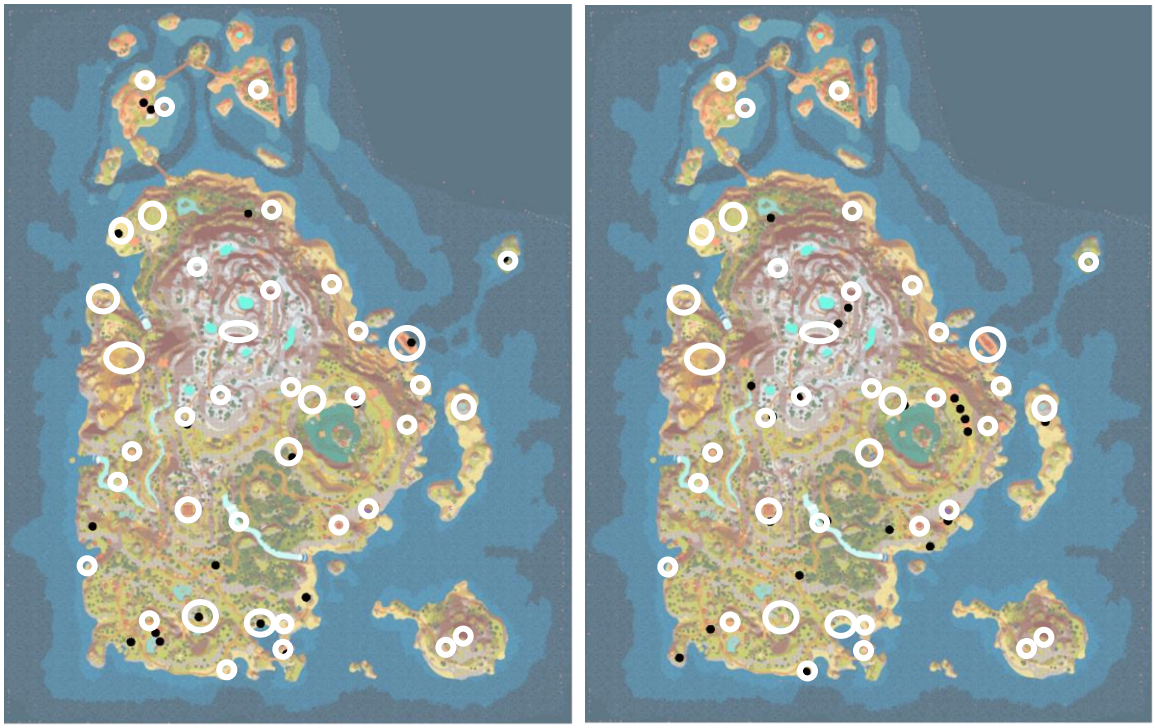

Figure 21. A Short Hike, types of NPCs (FaithfulPotato n.d., edited by Vesna Grau)

As a result, these conversational NPCs are easier to overlook, yet this design choice aligns with their purpose of organically filling in the game world. They contribute to the world's atmosphere and reward players who engage in deeper exploration. Moreover, this structure benefits player agency: those who are uninterested in dialogue can still progress, while players motivated to uncover more about the world are naturally drawn to these interactions.

Travel zones

The travel zones of A Short Hike lie beyond the two primary gameplay objectives: collecting feathers and gameplay-enhancing items, and interacting with NPCs. Figure 22 (left) illustrates the density of gameplay-centered Narrative Hubs. It becomes evident that most of these gameplay sites are concentrated in the southern section of area 1-2. Their density decreases as players move north, away from the spawn point. The irregularity in site distribution is visible through the elongated shape of travel triangles.

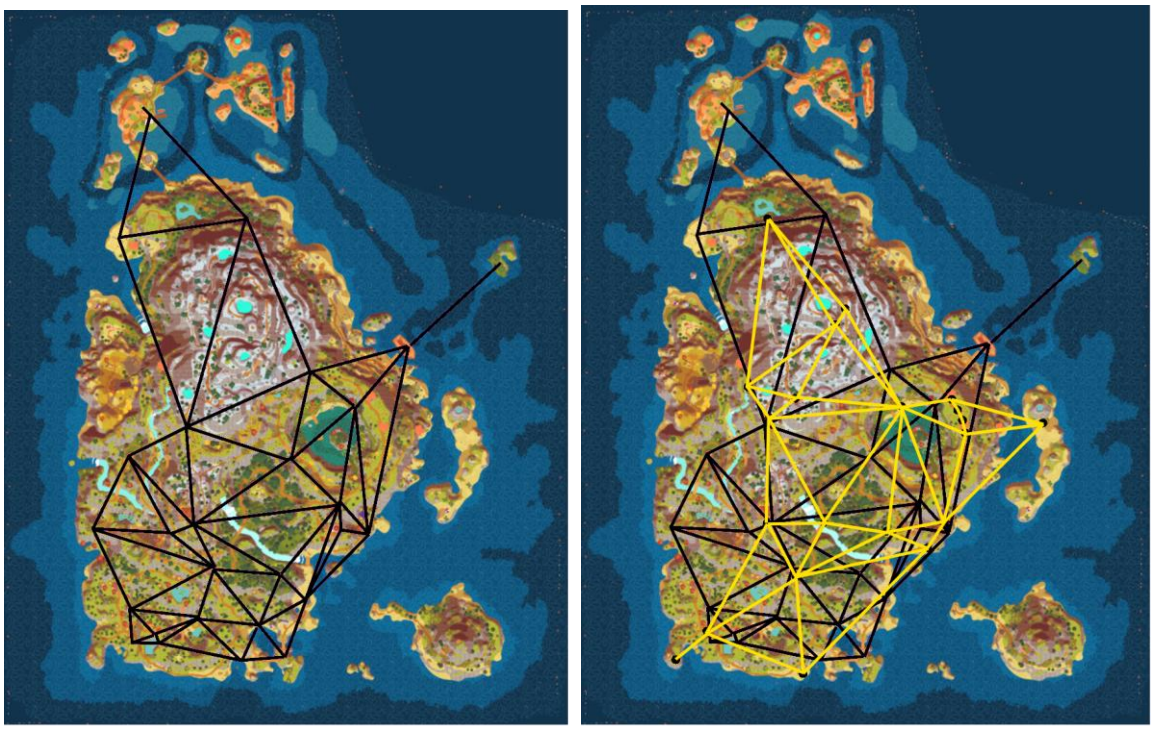

Figure 22. A Short Hike, travel zones (FaithfulPotato n.d., edited by Vesna Grau)

On the right (Figure 22), talk-based Narrative hubs overlay the gameplay-based ones. Their distribution is even more irregular and significantly sparser. However, it is noticeable that many of these talk-focused NPCs are positioned along the routes leading to gameplay-centered hubs, thereby possibly enriching the journey between core objectives. It is also evident that talk-only NPCs may lead players to distant locations outside of the main journey that they would not otherwise explore or find enriching.

Notably, Area 4 (the islands in the sea) lacks Narrative Hubs. Although it remains fully explorable, this absence of interaction points may cause it to feel less rewarding or meaningful compared to other regions. Despite its relatively large size, it offers minimal content, resulting in an area that functions more as a spatial extension than an active gameplay environment.

6.2.1 Navigation aids

This chapter analyzes what Navigation aids A Short Hike uses across all game areas. Table 14 is based on the breakdown established in Chapter 5.2. After the table, the results are analyzed within the framework of implicitness defined in Chapter 5.3.

Table 14. A Short Hike's Navigation aids

Establishing the user's location		Establishing the destination's location					Spatial
Distinct location	Orient. signage	Goal salience			Path salience		
		Perceptual	Contextual	Motivational	Continuous	Discrete	
Atmos. effects Color coding Zone emblems	-	Vistas + Framing	Treasure maps	Bait Weenies Quest NPCs	Breadcrumbs Trails NPC guidance	Direct. signage Compass	Terrain elevation Landmarks

All Navigation aids in A Short Hike are diegetic, apart from the compass, which appears as part of the HUD but is acquired diegetically (by talking to an optional NPC). This means that players who do not encounter or engage with that NPC may never obtain it. Other than the compass, the game provides no non-diegetic interface elements that tell the player what to do or where to go. Even basic gameplay information, such as the movement tutorial, is conveyed entirely through NPC dialogue. If the player attempts to bypass a tutorial NPC, that character will actively intervene and stop the player, ensuring essential information is still delivered in a natural, in-world manner.

The game does not include a map. The closest equivalent is the use of binoculars, which allow players to observe limited portions of the island from elevated positions. This mechanic creates vistas framed through gameplay, offering visual overviews that substitute for a traditional map while remaining immersive and exploratory.

There is no orientational signage indicating the player's position. Instead, directional signage is there to help players deduct their location, and areas are made distinct through color coding and zone emblems. Each zone has a unique palette, giving both districts and larger areas (1–2 and 4) visual identity, with sub-regional variations in the latter. Zone emblems include vegetation, water color, ground type (grass, sand, or snow), localized atmospheric effects, and names revealed through NPC dialogue or directional signage. They further distinguish the game's regions. For example, one rocky island is marked by constant rain, while areas near the mountaintop experience increasingly severe blizzards.

A Short Hike shows its main and secondary goals subtly. The mountaintop, representing the game's ultimate objective, is consistently highlighted by the terrain elevation – at almost any point of the map, players see cliffs that show where the mountain lies. Additionally, there are paths called "hiking trails" that lead both to the main and secondary objectives. These trails often have directional signposts appearing at intersections to indicate destinations.

Furthermore, certain NPCs provide verbal riddles or clues (referred to as "treasure maps") that hint at where hidden objectives are without revealing their exact locations. In rare instances, NPCs may physically guide the player to a destination, integrating NPC guidance into the gameplay outside the tutorial system. Secondary objectives are also often emphasized through coin-trail breadcrumbs. They mark challenging routes and attract attention through visual appeal and curiosity.

Many treasures are placed atop hills that are unreachable for inexperienced players. If players attempt to reach them by gliding from higher ground, sudden gusts of wind alter their course, causing them to fail. While not bait in the traditional sense, this mechanic still subverts player expectations and encourages several attempts.

6.3 Comparative analysis

This chapter follows steps 3–5 of Braun and Clarke's (2019) six-phase thematic analysis framework (Chapter 3). Namely, (3) searching for themes, (4) reviewing themes, and (5) defining and naming themes are the steps based on which comparative analysis is conducted. Each step is applied within the categories used for the Case studies: Cognitive Mapping Elements, Gameplay Sites, and Navigation Aids.

6.3.1 Cognitive mapping elements

Themes in the context of cognitive mapping are identified by examining similarities in the placement of each element across Elden Ring and A Short Hike (Table 15). Differences in implementation are intentionally ignored, even if one game appears to handle certain elements more effectively. Since there is no objective evidence to support such qualitative judgments beyond personal experience, these differences are excluded from the analysis.

Table 15. Similarities of Cognitive mapping elements of Elden Ring and A Short Hike

Element	**Similarity across Elden Ring and A Short Hike**
Edges	The edge of the world is in the water, while the main gameplay goal is at the highest point of the map
	In-level edges do not let the player into the next gameplay area before the previous one is explored
Paths	One main path connects all areas and leads to the final goal of the game
	Side paths connect landmarks

	More paths in the starting area
	Implicit paths are positioned within the areas where explicit roads are absent
Districts	Separated from the rest of the environmental elements by color
Nodes	Only appear at path intersections
	They only hold significance or have visual identity if an area is scarce for landmarks
Landmarks	Global terrain landmark is placed in the center of the map and is visible from any point of the map (Erdtree for Elden Ring and the mountain for A Short Hike)
	Major regional landmarks that assist navigation on an area-by-area basis
	Small regional landmarks that are visible during the traversal between the major regional landmarks
	Terrain acts as a landmark that suggests that the higher the player gets, the closer they are to the goal (ascension theme)

To examine these ideas within the context of implicit wayshowing, this thesis analyzes how each element contributes to implicit navigation and fulfills its individual cognitive mapping function described in Table 3. This approach helps determine whether the identified themes simply serve their natural environmental role or actively support implicit wayfinding. Elements that perform their primary cognitive function are further analyzed to understand how they contribute to implicitness. Subsequently, similar contributions are grouped, while elements that do not fulfill their cognitive mapping function are excluded from further analysis (Table 16).

Table 16. Review of commonalities between the Cognitive mapping element placements of Elden Ring and A Short Hike

Element	**Function**	**Similarity across Elden Ring and A Short Hike**	**Fulfills the function?**	**How contributes to implicitness?**
Edges	(1) Demarcate, (2) Control continuity, (3) Foster clarity.	The edge of the world is in the water, while the main gameplay goal is at the highest point of the map.	Yes, 3	Shows that the objective is not next to an edge with no explanation
		In-level edges do not let the player into the next gameplay area before the previous one is explored	Yes, 1 & 2	Facilitate gated progression with no quests involved
Paths	(1) Guide to destination, (2) Reorient “lost” players, (3) Link expansive areas.	One main path connects all areas and leads to the final goal of the game	Yes, 1 & 3	Creates a reason for different areas to be connected by leading to the goal
		Side paths connect landmarks	Yes, 1	Lead to the goal without using Navigation aids
		More paths in the starting area	Yes, 2	Raise the chances of players stumbling upon guidance when they need it
Districts	Making the space unique	Separated from the rest of the environmental elements by color	Yes	Aids in determining the position of self in an environment
Nodes	Reference points for the levels	Only appear at path intersections	No	-
		They only hold significance or have visual identity if an area is scarce for landmarks	Yes, only when they have a visual identity	Become localized landmarks when players need more orientation references
Landmarks	Orient from a distance	Global terrain landmark is placed in the center of the map and is visible from any point of the map	Yes	A reference that is always available, regardless of players’ positions
		Major regional landmarks that assist navigation on an area-by-area basis	Yes	Provide a reference to what region players are in
		Small regional landmarks that are visible during the traversal between the major regional landmarks	Yes	Provide a reference to what part of the region players are in

		Terrain acts as a landmark that suggests that the higher the player gets, the closer they are to the goal (ascension theme)	Yes	A reference that is always available, regardless of players' positions

According to Table 16, multiple themes that contribute to implicit wayshowing can be identified for each Cognitive mapping element. Some of these themes, however, overlap. Therefore, rather than listing them separately for each category, they are named and defined based on their implementation in the two Case study games and on how they support implicit wayshowing (Table 17).

Table 17. Common themes in Cognitive mapping elements placements that support implicit wayshowing in open-world games

Theme	**Implementation of the theme**
Boundary Contrast	World boundary position contrasts with the game's goal position
Main Path	One main path connects all regions physically, gives them a narrative reason to be connected, and leads to the main game objective
Branching Paths	Side paths branch out of the main path and lead to landmarks
Gated Terrain	Gated progression is implemented by placing initially unreachable terrain parts that can only be accessed after obtaining specific enhancements located within the player's current region
Ascension Terrain	Terrain elevation acts as a global landmark when a game is built around the theme of ascension
Central Landmark	A global landmark is placed in the center of the map to be visible from every point of the map
Node Landmark	In areas with a scarcity of landmarks, nodes appearing at path intersections act as landmarks
Landmark Specificity	The more localized a landmark is, the more precise information it provides. Landmarks visible from many viewpoints convey less

	about the player's exact position than those visible from a limited range
Start Density	The game's starting area has the most landmarks and paths
District Salience	Districts feature a unique visual identity that sets them apart from the surrounding environment

6.3.2 Gameplay sites

Themes related to gameplay site positioning are identified by examining similarities in the spatial arrangement of these elements across Elden Ring and A Short Hike (Table 18). However, the two games differ fundamentally in their core gameplay focus: combat is central to Elden Ring, whereas NPC interaction is central to A Short Hike. Consequently, instead of categorizing Table 18 by gameplay site type, it is organized according to the relative importance of gameplay sites within each game's structure.

The distinction between Main and Minor Gameplay Sites is not based on functional category alone but on how each game's mechanics express progression. In Elden Ring, Combat Arenas drive advancement, while in A Short Hike, gameplay-altering NPCs and Feathers serve the same role. Conversely, Narrative Hubs in Elden Ring and talk-only NPCs in A Short Hike act as Minor Gameplay Sites, providing variation and pacing rather than direct progression. The functions of Exploratory Landscapes and Travel Zones are defined according to Table 7, as their functionality is the same across both Elden Ring and A Short Hike.

Table 18. Similarities of Gameplay site positioning across Elden Ring and A Short Hike

Element	**Function**	**Similarity across Elden Ring and A Short Hike**
Exploratory landscapes	Cultivate understanding of the world by enabling sightseeing and discovery	Include every area of the game and require it to be explored to progress through the main quest
		Elements mandatory to beat the game are located on top of major region-specific landmarks

		The player enters the Exploratory landscape at a lower terrain level than the main quest goal is located
Main gameplay sites	Anchor progression by bringing the player closer to achieving the main goal of the game	The start and end goals of the region determine the position of the main road on the map
		Main gameplay sites are mostly located by landmarks and less frequently along paths
Minor gameplay sites	Sustain engagement and curiosity by adding variety to the base gameplay	Minor gameplay sites are mostly situated along paths, while very few are scattered around
		Some minor gameplay sites are situated outside of the main journey area
Travel zones	Bind the experience into a coherent flow by connecting other activities	Minor gameplay sites are positioned along the routes of the Main gameplay sites
		When positioned together, Main and Minor gameplay sites create a more even activity density, even if each site type is irregularly distributed on its own

To review the emerging themes of Table 18 through the prism of implicit wayfinding, this paper analyzes how the positioning of key gameplay sites supports their intended function within the game world. It considers whether each site fulfills its gameplay role (such as guiding progression, encouraging exploration, or providing variety) and, when it does, explores how these placements contribute to implicit wayfinding (Table 19). This approach allows for identifying recurring emergent themes and excluding those that do not fulfill fulfill an element's function.

Table 19. Review of commonalities between Gameplay site placements within Elden Ring and A Short Hike

Element	**Function**	**Similarity across Elden Ring and A Short Hike**	**Fulfills the function?**	**How contributes to implicit wayfinding?**
Exploratory landscapes	(1) Cultivate understanding of the world (2) Enable sightseeing (3) Enable discovery	Include every area of the game and require it to be explored to progress through the main quest	Yes, 3	Ensures exploration remains the primary task most of the time
		Elements mandatory to beat the game are located on top of major region-specific landmarks	Yes, 1 & 2	Ensures all players can find enough content to complete the game, regardless of navigational skill

		The player enters the Exploratory landscape at a lower terrain level than the main quest goal is located	Yes, 1	Clearly signals the goal, allowing players to decide not to follow it for the sake of exploration
Main gameplay sites	Bring the player closer to achieving the main goal of the game	The start and end goals of the region determine the position of the main road on the map	Yes	Physically leads the player to the goal from the very start
		Main gameplay sites are mostly located by landmarks and less frequently along paths	Yes	Ensures all players can find enough content to complete the game, regardless of navigational skill
Minor gameplay sites	(1) Sustain engagement (2) Sustain curiosity (3) Add variety to the base gameplay	Minor gameplay sites are mostly situated along paths, while very few are scattered around	Yes, 1 & 3	Ensure players encounter Minor sites between seeking Main gameplay sites, regardless of navigational skill
		Some minor gameplay sites are situated outside of the main journey area	Yes, 1 & 2	Clarifies game boundaries by designating all traversable spaces as playable
Travel zones	(1) Bind the experience into a coherent flow (2) Connect other activities	Minor gameplay sites are positioned along the routes of the Main gameplay sites	Yes, 2	Ensure players encounter Minor sites between seeking Main gameplay sites, regardless of navigational skill
		When positioned together, Main and Minor gameplay sites create a more even activity density, even if each site type is irregularly distributed on its own	Yes, 1	Consistently provides new anchors for navigation throughout the journey

Based on Table 19, a list of the most prominent emerging themes regarding how the positioning of elements contributes to implicit wayfinding is compiled. This list is presented in Table 20. Statements describing the effects of gameplay site placement on wayfinding were compared, and similar statements were grouped under the same theme.

Table 20. Common themes in Gameplay site placement that support implicit wayshowing in open-world games

Theme	Implementation of the theme
Exploration Priority	Exploration is linked directly to the game's progression system, ensuring that players actively engage with the environment
Ensured Game Completion	Essential gameplay sites are placed at landmarks, ensuring that all players, regardless of skill, can locate and complete key content
Ensured Variety	Optional gameplay activities are positioned along paths, guaranteeing a diverse play experience without requiring advanced navigational ability
Ensured Navigational Anchoring	Gameplay sites are spaced at regular intervals, so even in areas lacking strong landmarks, these sites themselves help orient players and prevent disorientation
Goal and Path Salience	The final goal and the main route to reach it are always clearly visible and signaled. This lets players focus on exploring side content with confidence, avoiding accidental progression or loss of direction
Boundary Clarity	All traversable spaces of a game are playable, clarifying the boundaries as not only the physically unreachable locations, but also as spaces with no content

6.3.1 Navigation aids

Based on Tables 13 and 14, it is easy to compile a list of the Navigation aids used in both Elden Ring and A Short Hike. However, it is also essential to provide context regarding how these aids are implemented in each game – how frequently they appear and whether they function as Cognitive mapping elements or merely clarify the presence of existing ones. Table 21 shows a visual representation of this analysis.

Table 21. Review of commonalities between Navigation aid placements within Elden Ring and A Short Hike

Aid	Category of aid	Frequency of appearance	Places of appearance	Diegesis of presentation
Color coding	Establishing the user's current location	Always	The area itself	Diegetic
Zone emblems		Always	The area itself	Diegetic
Vistas	Establishing the location of the destination	Once or twice per area	No similarities	Diegetic
Bait		Often in every area, in special cases	Random	Spatial
Weenies		Often in every area	At the ends of paths and between major area landmarks	Diegetic
Quest NPCs		Often in every area	Near landmarks	Diegetic
Breadcrumbs		In special cases	At parts where the player's vision is severely impaired	Spatial
Terrain elevation	Spatial Navigation aids	Always	Next to the end goal	Diegetic
Major area landmarks		Once or twice per area	Surrounding the end goal of the area	Diegetic
Global landmark		Always	Middle of the map	Diegetic

From the analysis of Table 21, several overarching themes were identified that describe how navigation elements are placed in the world, how they appear visually, and how frequently they occur (Table 22). While Table 21 alone is sufficient to address the research question of this paper, these themes were formulated to enable direct comparison with those identified in Chapter 6.3.1 and 6.3.2. This comparison is conducted in Chapter 7 to reveal shared patterns and differences across all categories.

Table 22. Common themes in Narrative aid placement that support implicit wayshowing in open-world games

Theme	Implementation of the theme
Diegetic Immersion	Most navigation aids are diegetic, which may reinforce immersion and may correspond with the findings that non-

	diegetic aids reduce player engagement (Bergman & Hermansson, 2023). The compass is the only always-visible non-diegetic element; while it could be “diegeticized” (e.g., as a north star), such solutions often introduce technical or aesthetic compromises.
Terrain-Centered Locational Awareness	Players are meant to locate themselves through the terrain rather than through isolated aids. Terrain shape, color, vegetation, music, and global landmarks act as cues for orientation. Through vistas, players can compare their localized mental map with how it relates to larger areas.
Terrain-Centered Goal Awareness	Most spatial navigation aids focus on making the goal salient through terrain-based cues. Since most goal-related aids (except for vistas) are not embedded directly into the terrain, approximately two-thirds of all spatial navigation aids are tailored more toward goal salience than to location recognition.
Motivational Lure	Reward-oriented aids (bait, weenies, quest NPCs) are positioned along likely travel routes to spark curiosity and incentive-driven exploration. They are meant to guide the player indirectly, maintaining freedom while motivating movement.
Breadcrumbs as Landmark replacement	In areas with limited visibility, where terrain cues fail, breadcrumbs replace landmarks to subtly guide navigation and maintain player orientation.

7 RESULTS

Based on the theoretical background, it was established that even though wayfinding is often considered in level design literature as a method (The Level Design Book 2025), it in fact describes the act of traversing environments rather than a design technique (Chapter 4.2). The design methods that enable or shape navigation are referred to as wayshowing (Chapter 5). This distinction is important, as it separates the behavior of the player from the intention of the designer, clarifying the scope of each concept.

During navigation within an environment, players build cognitive maps in their minds (Chapter 4.1). However, since there are multiple approaches to categorizing how people navigate (each tends to show limitations), this thesis proposes a new breakdown that classifies all Wayfinding strategies into four categories: social, semantic, spatial, and experiential (Chapter 4.3). The new approach encompasses not only the function of finding one's way but also regaining direction after being lost. More specifically, its applicability tends to involve navigating 3D environments to find a destination.

Wayshowing, on the other hand, varies greatly in definition across designers and is often informed by industry practice rather than based upon theoretical knowledge of how users move around in space. This thesis examined those practices through the lens of gameplay sites and navigation aids – two core spatial design elements. When designed with cognitive mapping principles in mind, they shape how players move through and interpret virtual environments. These two lenses allowed the study to connect the practical decisions of designers with the cognitive mapping processes of players.

For gameplay site categorization, Hughes' (2023) model was adopted (Chapter 5.1). Navigation aid typology was based upon analysis of how aids address two core wayfinding problems: locating the self and locating the goal (Chapter 5.2). During this process, it became clear that some aids primarily support cognitive mapping and can assist with both tasks depending on the context. These are acknowledged to belong to another category of Spatial Navigation aids (Chapter 5.2.3), whose function in enabling implicitness (the pivotal aim of this study) was explored later in Chapter 5.3.

The learnings of these theoretical foundations were applied to two case study games (Elden Ring and A Short Hike), which are both recognized as highly implicit and award-winning open-world titles (Chapter 3). Each case study analyzed the placement of cognitive mapping elements (from Chapter 4),

gameplay sites, and navigation aids (from Chapter 5). These results were then compared in Chapter 6.3 to identify overarching design principles in games across varying scales.

Each of the final tables (Tables 17, 20, and 22) independently answers the main research question. However, further categorization showed that their themes could be grouped under broader conceptual umbrellas based on the ideas they convey (Table 23). This comparison formed a fuller understanding of how separate gameplay and navigational design decisions contribute to the same underlying principles.

Table 23. Conceptual umbrella terms for the emergent themes of Tables 17, 20, 22

Conceptual umbrella	**Theme**	**Theme description**
Main goal	Goal Salience	The final goal of the game is always clearly visible and signaled
	Terrain-centered Goal Awareness	Most spatial navigation aids focus on making the goal salient through terrain-based cues
Progression	Exploration Priority	Exploration is tied to progression, ensuring players engage with the environment
	Gated Terrain	Unreachable terrain is unlocked by upgrades found in the current region
	Start Density	The game's starting area has the most landmarks and paths
	Ensured Game Completion	Essential gameplay sites are placed at landmarks, ensuring all players can reach key content
Gameplay variety	Ensured Navigation Anchoring	Gameplay sites are regularly spaced, keeping players engaged during traversal

	Ensured Variety	Optional activities are placed along paths, ensuring diverse gameplay without advanced navigation
	Motivational Lure	Reward-oriented aids are placed along routes to spark curiosity and exploration
Immersion	Diegetic Immersion	Most navigation aids are diegetic, reinforcing immersion
Landmarks	Central Landmark	A global landmark sits at the map's center, visible from all locations
	Landmark Specificity	The more localized a landmark is, the more precise information it provides
Non-landmarks acting as landmarks	Ensured Navigational Anchoring	Regularly spaced gameplay sites help orient players in landmark-sparse areas
	Breadcrumbs as Landmark Replacement	In low-visibility areas, breadcrumbs substitute for terrain landmarks
	Ascension Terrain	Terrain elevation serves as a global landmark in games built around ascension
	Terrain-centered location awareness	An entire area can serve as a landmark if its terrain is distinct enough to be recognized from afar
	Node Landmark	In landmark-scarce areas, path intersections serve as landmarks
Paths	Goal and Path Salience	The main route to the goal is always clearly visible and signaled
	Main Path	A single main path links all regions, provides narrative cohesion, and guides players to the main objective

	Branching Paths	Side paths branch out of the main path and lead to landmarks
Edges	Boundary Clarity	All traversable spaces are playable, reinforcing game boundaries
	Boundary Contrast	World boundary position contrasts with the game's goal position
Districts	District Salience	Districts are set apart from the surrounding environment by color

Notably, the cognitive mapping principles were the most clearly defined within these umbrellas, reinforcing their fundamental role in both wayfinding and wayshowing. This suggests that the essence of implicit wayshowing lies in helping players form clear mental maps by ensuring that each element contributing to those maps is itself legible and distinct. When an environment is structured to facilitate mental mapping, designers enable players to navigate intuitively without external guidance.

Another notable thematic cluster pertains to the core concepts of gameplay – the main goal, progression toward it, and the variety of experiences along the way. Here, the emphasis is not so much on the clarity of individual elements, but on achieving balance and engagement through spatial positioning. Two overarching conclusions can be made about the elements of this cluster:

1. Even if specific gameplay site types are distributed irregularly, the overall experience can remain cohesive if other sites fill the gaps, maintaining an even density of meaningful activities.
2. Gameplay sites are most east to find when positioned along paths and by landmarks. The closer a site is to these orientational features, the easier it is for players to locate and interact with it. This principle ensures that players remain engaged even when deviating from the main objective, as they naturally encounter secondary content through exploration.

Finally, immersion plays a subtle yet important role. A paradox emerges: the more immersive an element is, the weaker its explicit orientational properties tend to be. However, both case study games leaned toward diegetic presentation of

navigational information. Whether it is the implementation of diegesis itself or the coherence of environmental cues that makes their wayfinding implicit yet readable remains uncertain, but it is a compelling observation that opens paths for future research.

To conclude, implicit open-world games structure their gameplay sites and navigation aids according to cognitive mapping principles while balancing progression and gameplay variety. Each design element exists on a spectrum between diegetic and non-diegetic, influencing not only player immersion but also how effortlessly players navigate and understand the world. Together, these findings show that implicit wayfinding is less about hiding guidance and more about embedding it naturally within the environment and the player's lived experience of it.

8 DISCUSSION

This study demonstrates that implicit wayshowing in level design is not a single, isolated designer technique. Instead, it emerges as a systemic affordance resulting from interactions among terrain legibility, the spatial distribution of gameplay sites, and diegetic navigation cues. Rather than treating wayshowing as one tool among many, it should be viewed as an emergent property of level composition – determined by how many cues are available, how they overlap, and the extent to which they form channels for the same orientational information. This reframing explains why games with radically different scales and mechanics (a massive combat-heavy Elden Ring versus a micro-exploration A Short Hike) can nevertheless achieve comparable levels of implicit navigability.

Three primary design tensions were identified:

- **Immersion vs. Legibility:** Highly immersive diegetic elements can reduce player's orientational clarity. Designers must weigh whether an element's narrative impact justifies sacrificing some navigational function, or whether

the diegetic content can be visually simplified to maintain player orientation.

- **Challenge vs. Guidance:** Gated progression and hidden routes maintain player agency but may frustrate players who lack pattern-recognition skills. Balancing these elements depends on the desired difficulty curve and target audience.
- **Camera settings vs. Landmarks:** A freely rotating camera lets designers place fewer global anchors and local anchors to maintain player orientation. On the other hand, when the camera is fixed, designers and players must rely on denser, high-specificity anchors, as distant landmarks are less visually accessible.

Empirically, the claims of this thesis lend themselves to two complementary methods for validation. First, instrumented play analytics can be used to log player paths, revisit rates around landmarks, time spent between significant sites, and whether players collect optional rewards. Comparing these data across versions that alter a navigation mechanism (for instance, removing local landmarks) can test causal effects on wayfinding. Second, controlled user studies using tasks (such as “reach landmark X without opening the map”) and metrics (including completion time, path efficiency, and subjective orientation confidence) can measure how changes in anchor redundancy, visibility, or diegetic presentation affect navigational performance.

9 CONCLUSION

This study was designed to explore how players navigate open-world game environments and how games foster intuitive wayfinding through implicit guidance rather than overt instruction. The main results showed that implicit wayshowing is not a singular technique but an emergent property of level composition, arising from the interplay between terrain legibility, spatially-distributed gameplay sites, and diegetic cues. Specifically, games that

strategically place these elements enable players to construct clear mental maps while maintaining a sense of engagement.

The results supported earlier findings in the level design literature that underscore the value of Navigation aids and worlds constructed according to the Cognitive mapping principles for player navigation. Compared to prior studies that emphasized either explicit Navigation aids or isolated designerly solutions, this research advances the understanding of implicitness as a systemic and measurable attribute. It highlights that implicit wayfinding is not achieved through the absence of direction, but through the strategic integration of cognitive mapping, gameplay site placement, and terrain cues that naturally lead the player without overt instruction.

These findings suggest that games' environments that are intentionally composed so that the terrain itself is a major navigational cue, player orientation is supported without sacrificing narrative or challenge. In conclusion, the main implication of this study is that implicit guidance, when designed as an emergent system, can systematically enhance both immersion and navigability in open-world games.

However, this study's findings must be interpreted considering several limitations. Only two games are compared, which limits generalizability to other genres and aesthetic traditions. Additionally, the analysis is based on designer-visible artifacts and inferred player behavior, rather than large-scale analytics, which future research should address.

Further research should empirically validate these principles in a broader range of open-world games, as well as examine how visual Navigation aids such as color-coding or environmental emblems perform for cross-cultural player populations. Procedural generation also presents an avenue worth exploring to determine whether implicit wayshowing can be embedded into automated terrain and site placement algorithms.

In summary, implicit wayshowing emerges when designers intentionally compose the terrain, gameplay sites, and diegetic cues so that players can build clear mental maps while retaining a sense of freedom. Implicit designs do not wholly remove uncertainty; rather, they scaffold it – preserving agency while ensuring the player rarely feels lost. By understanding implicit wayfinding as a property of level composition, designers are empowered to create game worlds that are simultaneously immersive and navigable.

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