

Mapping the Synesthetic Interface

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ABSTRACT

Synesthetic interfaces—interfaces that enact a sensory substitution by translating information normally accessed through one sense modality into the phenomenal forms associated with another—constitute a fascinating and little-theorized corner of videogame UI design. Frustrating the distinctions laid out in dichotomies of “diegetic” versus “non-diegetic” UI elements, or “ecological” versus “emphatic” elements, synesthetic interfaces have been poorly served by the terminological frameworks that have typically dominated discussions of the functional and fictional status of game UI. This paper examines two employments of synesthetic interfaces—to communicate human perceptual expertise, and to depict the experience of nonhuman organisms—as a way of illuminating aspects of synesthetic interfaces that evade more terminologically rigid approaches.

Keywords

videogames, synesthesia, sensory substitution, expertise, nonhuman, fiction

INTRODUCTION

The recent 2D stealth game *Mark of the Ninja* (Klei Entertainment 2012) is a dark game. Graphically, the game limits what is rendered onscreen to what the game’s ninja protagonist can see from his given position. The further from the center of the screen one looks, the more visuals drop off into hazy wisps and inky blackness, as walls, ledges, and closed doors obstruct our ninja’s vision. When crawling in vents, this blackness becomes oppressive, threatening to swallow the entire screen beyond the meager white outlines of our avatar and the surface the clings to. The blackness can be broken, though, by one of the least expected visual elements to ever intrude on a screen: the sight of footsteps. As unsuspecting guards clomp back and forth along their patrol routes, the sound of their shoes lights up the screen, erupting in a cascade of expanding and dissipating circles rippling through the darkness.

What does it mean to see a sound? This paper turns to the subject of *synesthetic interfaces*, game interfaces that translate information normally accessed through one sense modality into the phenomenal forms normally associated with another. These sorts of sensory substitution in game interfaces raise important questions regarding players’ understanding of the exploratory actions they undertake in games, the interrelation of gameworlds and their interfaces, and the fictional status of various aspects of the player-avatar relation.¹

Unfortunately, synesthetic interfaces have been poorly served by the prevailing terminology used within games studies today to discuss game interfaces. Although

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various alternative approaches exist within this sphere, game interface terminology is too often burdened with grand dichotomies—the “diegetic”/“non-diegetic” dichotomy, for instance, or the “ecological”/“emphatic” dichotomy more recently suggested by Kristine Jørgensen—that present a poor fit to the slippery substitutions and suggestive nuances one often finds in well-designed synesthetic interfaces. Getting to the heart of what makes synesthetic interfaces a fascinating site of analysis, then, first requires working through the problems of our existing terminology and models.



Figure 1: An example of a synesthetic interface in *Mark of the Ninja*: visual ripples on the top of the ledge spatially indicate the footsteps of a patrolling guard with which visual contact has been recently lost.

PRIOR MODELS

The Diegetic/Non-diegetic Distinction in Fagerholt and Lorentzon

Traditionally, as employed within literary and film theory, the word *diegesis* refers to the world in which the events of the story’s actions occur (Genette 1980; Bordwell and Thompson 2013). *Diegetic* elements of a literary narrative or of a film, then, are those that are assumed to exist within the depicted world, available for the experience of characters situated within it. *Non-diegetic elements* are those elements we assume to be inaccessible to the characters of a story’s world; in cinema, typical examples include titles and credits along with musical score or voice-over narration by an omniscient narrator.

The *diegetic/non-diegetic distinction* has been carried over by various authors into the analysis of games, particularly the analysis of game user interfaces (UIs). Its employment, however, has not been uniform. Some authors take a fairly blunt approach. Alexander R. Galloway, for instance, uses the term “diegetic” to refer to the geometrical space of a 3D game, reserving the use of the term “non-diegetic” for two-dimensional overlays (Galloway 2012, 39–45). Although this distinction is fairly easy to apply consistently, it is not entirely obvious what gains are to be made from it, as it merely serves to re-label two categories that are already fairly easily distinguishable.

Other authors, however, have pushed the employment of the diegetic/non-diegetic distinction within the analysis of game UIs further, arriving at more complex and nuanced versions of the distinction that better account for the specific properties of games as a medium, and of 3D games in particular. The work of Erik Fagerholt and Magnus Lorentzon on UI design in the first-person shooter (FPS) genre, for instance, represents

what is perhaps currently the most refined use of the distinction in game user interface analysis (Fagerholt and Lorentzon 2009).

Fagerholt and Lorentzon map the UI design space of FPS games along two axes: An interface element's status within the game's depicted *space* (as existing within the 3D geometry of the game, or exterior to it, present as a 2D overlay) is considered separately from the element's status within the game's *fiction* (as fictionally accounted or unaccounted for) (Fagerholt and Lorentzon 2009, 46–52).

This creates a quadrant of categories marking off the UI design space: fully *non-diegetic* elements (unaccounted for in the game's fiction, and presented as a 2D overlay), *geometric* elements (not in the game's fiction, but presented as augmentations penetrating the 3D geometry of the game space), *meta-representations* (accounted for in the game's fiction, but visualized in a manner exterior to the 3D geometry of the game space), and finally fully *diegetic* elements (accounted for in the game's fiction, and fully present within the 3D game space). Fagerholt and Lorentzon also add two more categories—*signifiers* are classified as “a sub-group of diegetic elements” that use environmental attributes to present subtle informational cues, while *meta-perceptions* (such as blood splatter on the edges of the frame to indicate damage taken) are exterior to the game space while ambiguously straddling its fiction (Fagerholt and Lorentzon 2009, 51–52).

In keeping the diegetic/non-diegetic distinction, but refining it so as to consider the categories as distinct quadrants in a two-dimensionally conceived design space rather than a one-dimensionally conceived binary, Fagerholt and Lorentzon do a good job of retaining the distinction's strengths while rendering it more appropriate for the nuances required when approaching videogame interfaces. Despite the fact that Fagerholt and Lorentzon limit their study to FPS games, the categories they emerge with are generally broad enough to be applicable to the UIs of 3D games across a variety of genres, and the strengths of their map of UI design space have helped it become an influential model in UI design over the past half-decade (see e.g. Andrews 2010; Stonehouse 2014).

There are, however, authors that resist the use of the diegetic/non-diegetic distinction *tout court*, even in the refined form Fagerholt and Lorentzon propose. Here, I will examine the objections of one of the distinction's most vocal opponents, Kristine Jørgensen.

Jørgensen and the Ecological/Emphatic Distinction

Jørgensen's resistance to the application of the diegetic/non-diegetic distinction in games is deep-seated, and, overall, her proposed model for considering the subject of the interface in games diverges sharply from Fagerholt and Lorentzon's. Whereas Fagerholt and Lorentzon generally consider a game's UI to be a distinct category of inquiry, able to be considered separately from, for instance, a game's spatial geometry (even in instances when the former penetrates the latter, it can still be isolated as a specific object of analysis), Jørgensen considers the *gameworld* itself—a category that includes both explicit game-system information and broader elements such as the environmental layout of a game's spaces—as an overarching interface. For Jørgensen, the entirety of games' representations of worlds should be considered as *gameworld interfaces*, the function of which is to communicate game-system to the player (Jørgensen 2013, 3–7, 21–24, 55–56).

A crucial component of Jørgensen's conception is the claim that games, as a medium, should not be understood as employing the so-called “fourth wall” common to fictional

depictions in other media forms (particularly visual forms such as cinema and theater, from which the term derives). In order to fully account for the functional characteristics of the gameworld-as-interface, Jørgensen argues, we must recognize that the representational conventions of the medium of videogames do not code metareferences as abnormal or aberrant in the same way other media do. The metareferential presentation of game-system information in videogames, according to Jørgensen, is “not a disturbance or an unwanted shortcoming or side effect of the human-computer interaction. Rather, it is part of the conventions, the function, and the aesthetics of the digital game medium” (Jørgensen 2013, 6). In contrast to historical conventions that have taken hold in other media forms, “metareferences in games are not understood as an exception or a curious break from realist tradition, but rather as a conventional and expected feature of this medium” (Jørgensen 2013, 125).²

If Jørgensen’s positions on the interface status of gameworlds—and her related positions on conventions of game address—are accepted, the diegetic/non-diegetic distinction begins to break down. For Jørgensen, the distinction is too deeply imbricated within traditions of the narrative analysis of literature and cinema, in a way that “obscures the actual functional characteristics of the gameworld.” Coming bundled with the assumption that there exists “an imaginary fourth wall that can be broken between the audience and the actions onscreen,” the distinction needlessly constructs an “ontological problem about information that addresses a spatial dimension other than the one in which this information is being produced” (Jørgensen 2013, 66). In short, in sharp contrast to Fagerholt and Lorentzon, whose occasional hesitations towards the efficacy of the diegetic/non-diegetic distinction in games hinges on “gray areas” that may occur between the two, Jørgensen is more radically skeptical of the idea that it makes sense to speak of an isolated, self-contained “diegetic” world in games whatsoever. Once the gameworld is considered as functioning as an interface between player and system, it makes little sense to insist on the sort of ontological separation the use of the term “diegesis” implies.

With this alternate account established, Jørgensen proceeds to propose her own conceptual categories for differentiating different elements of the visual, auditory, and haptic design of games and their UIs. Unsurprisingly, these cleave along somewhat different lines from those of Fagerholt and Lorentzon.

Jørgensen proposes the term *ecological information* to refer to “information that is represented as existing in the gameworld environment in a way that corresponds to how information exists in the real, physical environment” (Jørgensen 2013, 79). This term functions as a rough substitute for Fagerholt and Lorentzon categories of “diegetic elements” and “signifiers.” In place of Fagerholt and Lorentzon’s categories of “meta-perception,” “meta-representations,” “non-diegetic elements” and “geometric elements,” Jørgensen proposes the overarching label *emphatic information*, which she defines as any element of the game that “highlights or reinforces information that is not easily communicated through ecological means” (Jørgensen 2013, 85).

Taking a critical view to Jørgensen’s proposed division, we could note how Fagerholt and Lorentzon’s design space model allows for more fine-grained distinctions between terminological categories. A more charitable view, however, would emphasize the differences in the philosophical outlooks of each approach: Whereas Fagerholt and Lorentzon see the potential inadequacies of the diegetic/non-diegetic distinction as a problem to be *solved* via a proliferation of categories, Jørgensen instead sees it as a problem to be *dissolved* through a fundamental change in conceptualization, enabled by

the adoption of new language unencumbered by old problems. Where some may see willful obtuseness in Jørgensen's dismissal of the supposed ontological problems that cluster around game interfaces, others may see the elegant transcendence of what is ultimately a false problem.³

Having just laid out two competing conceptual and terminological models for discussing game interfaces, two obvious next moves would be to either pledge allegiance to one over the other, or to propose a new model that retains the strength of each, while addressing their weaknesses. However, I will be resisting such a move, as, at this point, it would be both premature and a distraction. Instead, I will be plunging into a critical look at the ways in which synesthetic interfaces challenge the limits of both conceptual models. In refusing to reduce the analyses ahead to a sales pitch for my own model, I hope to treat the following case studies with the care and nuance they deserve.

PERCEPTUAL EXPERTISE AND THE LIMITS OF THE DIEGETIC/NON-DIEGETIC DISTINCTION

One of the major sources of pleasure offered in videogames is their placing of players into the roles of experts. Whether playing as Samus Aran, Solid Snake, or Tony Hawk, player characters in videogames often arrive with a reputation for prowess that precedes players' stepping into their role. If players rise to the challenge of controlling these experts, hold up their end of the bargain, and steer these bodies—in peak physical condition, and endowed with extensive knowledge of relevant techniques—to victory, games, at their best, invite their players into expertly-woven and supremely satisfying fantasies of *mastery*.⁴

Offering players control of a character endowed with primarily *physical* expertise—acrobatic grace, athletic adroitness, impossible levels of stamina—provides few challenges to developers. As H. M. Collins points out using the example of expert athletic ability, a “good part of the champion tennis player's tennis-playing ‘knowledge’ is ... contained in the champion tennis player's body” (Collins 2000, 181). Games developers—including those working far outside of the tennis game genre—have taken ample advantage of this insight. Embodied knowledge, after all, can be easily handled via what Rune Klevjer refers to as the “radical transformation and amplification” of player input frequently on display in games: the translation of the relatively “unimpressive actual skills” of button-pressing into “the most spectacular manoeuvres” of onscreen characters (Klevjer 2006, 141). Given the ease in which impressive animations can be mapped onto simple button presses, depicting the physical expertise of player-characters while simultaneously requiring little of players is a generally unchallenging task for competent developers.

Not all kinds of expertise, however, can be represented simply via character animations. Forms of *perceptual expertise* require divergent, more complicated solutions—solutions that often pose obstacles to any clean division between “diegetic” and “non-diegetic” elements of game interfaces.

We might call this cluster of conundrums the “*Mirror's Edge* problem,” in reference to a game that Fagerholt and Lorentzon acknowledge tests the limits of the diegetic/non-diegetic distinction. *Mirror's Edge* (DICE 2008) employs a UI feature dubbed “runner vision,” in which objects presenting movement possibilities are colored red in order to give players a clear idea of what can be interacted with in order to continue moving along a recommended path during its rooftop chase sequences. This red coloring, Fagerholt and

Lorentzon acknowledge, “could be said to represent the main protagonist’s ability to pick up valuable information from her surroundings,” leading to a gray area in which the question “Is this Runner Vision non-diegetic?” lacks a clear answer (Fagerholt and Lorentzon 2009, 48). During focus group testing, Fagerholt and Lorentzon found clear resistance among players to UI elements that seemed to suggest “the game character might know things that seemed impossible to know.” However, this resistance was lacking in the case of runner vision, as players seemed to accept its function as presenting “some kind of higher ability to scan the environments available to the main protagonist Faith” in the game’s fiction (Fagerholt and Lorentzon 2009, 57). (This interpretation is encouraged by Faith’s voice-over monologue accompanying the game’s opening cutscene: “Runners see the city in a different way. We see the flow. Rooftops become pathways and conduits ... possibilities, and routes of escape.”⁵)

It is precisely examples such as *Mirror’s Edge* that cause Fagerholt and Lorentzon to abandon the conception of “diegetic” and “non-diegetic” as a strict, single dimension conceived of in binary terms, and re-work the terms as distinct coordinates in a two-dimensionally conceived design space. Rather than being “non-diegetic,” Fagerholt and Lorentzon instead characterize runner vision as a “geometric element” of *Mirror’s Edge*, positioned within its 3D geometry but not fully accounted for as an entity within its fiction. This re-classification of runner vision as “geometric” rather than properly “non-diegetic,” however, does not adequately solve the problems that Fagerholt and Lorentzon acknowledge—it merely obscures them through a multiplication of the available terminology. Slotting runner vision into the category of “geometric element,” while useful for the purposes of maintaining a consistent vocabulary for UI design, does nothing to actually address its fictional status, which still remains richly suggestive and not easily delineable. Runner vision may not be an “entity” populating the environment of the fictional world of *Mirror’s Edge*, but it is still an attempt to portray an aspect of Faith’s expertise—something the fiction of *Mirror’s Edge* very much accounts for. Runner vision is not so much extra-fictional as it is an attempt to represent an element of the diegetic world of *Mirror’s Edge*—Faith’s expert environmental acumen, honed by her own tacit knowledge of the scope and limits of her *parkour* abilities—that is simply impossible to portray using the traditional means of visual, auditory, and haptic display capabilities that videogame platforms typically have at their disposal.

We find a demonstration of the ways in which synesthetic interfaces can run into the *Mirror’s Edge* problem in turning to *The Last of Us* (Naughty Dog 2013). *The Last of Us* places players in control of Joel, a weathered survivor of a disease-spurred apocalypse, and, like Faith, another expert. Some of Joel’s forms of expertise—his rough but highly capable hand-to-hand combat skills, his horse riding skills, his skills at crafting and weapon modification—are easy to implement via input amplification: players mash a button, and Joel throws a series of powerful punches, or cobbles together an impromptu nail bomb. Others, however, are less easily handled through such means. One of these is Joel’s keen hearing, which, paired with the expertise gained over two decades worth of stealthy survival as a smuggler, results in an ability to perfectly pinpoint the locations of people surrounding him based on sound alone.

Fictionally, Joel is an expert at careful auditory observation. In real life, players most likely are not (and may not have the proper sound system setup to allow for such careful listening, even if they are adept at such things). *The Last of Us* bridges this gap by turning to a synesthetic interface. When the player activates a specialized “listen mode,” Joel “focuses his hearing,” and the game’s interface transforms. On the soundtrack, the

game's score and ambient audio fade to a whisper. On the visual display, alternately, sounds that Joel attends to become phenomenalized in visual terms. On the edges of the image (now darker and de-saturated), the locations of nearby sounds show up as grey smudges, emanating from the direction of their source. As the in-game camera is turned in the direction of these smudges, non-player characters (NPCs) making noise eventually become visible as white outlines superimposed within the game's geometry, allowing players to determine the locations of hostile NPCs. "Listen mode" also informs players as to how NPCs are giving away their position, by visually distinguishing those who are speaking (the voices of which show up as concentric "halos" clustered around their heads) from those who are moving (the footsteps of which are visualized as circular ripple-like patterns). Astute and responsive players, then, can increase the usefulness of listen mode by pointing the game's camera in the direction of speaking NPCs: upon doing this, their voices become clear, and whatever tactical orders they are barking to teammates becomes audible, allowing players to react accordingly. Auditory awareness and auditory attention are thereby emulated by a combination of synesthetic translation of sound into image and responsiveness of the game's actual soundtrack to player-controlled camera movement.



Figure 2: Listen mode in *The Last of Us*. Pointing the camera in the direction of the speaking NPC (marked with "halos") allows player to overhear the dialogue, "I'll look over there—you check over that way."

We could, as Fagerhold and Lorentzon do with *Mirror's Edge*, simply classify listen mode as introducing "geometric elements" into the UI of *The Last of Us*, and be done with the matter. However, as with runner vision, although this label may offer a handy category to delineate the visual design strategy at work in listen mode, it does little to actually distinguish and clarify its liminal fictional status and functional capabilities. Again, the problem: listen mode pervades the 3D geometry of *The Last of Us*'s spaces, and does not quite qualify as a fictional entity in the gameworld—but it does not quite *not* qualify, either. We could say, following a distinction that Fagerhold and Lorentzon at one point attempt to uphold when discussing more traditionally "non-diegetic" head-up display (HUD) elements, that the *referent* here is "diegetic," while the *UI element* that acts as an information vehicle is not (Fagerholt and Lorentzon 2009, 47). But this is not really a tenable distinction, as listen mode does not possess only one referent. On a

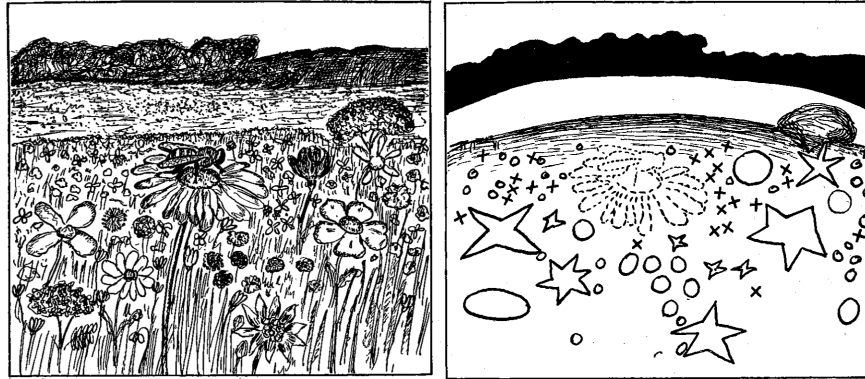
certain level, its referent is environmental sounds (fully embedded in the game's space, and fully fictionally accounted for—and, furthermore, usually accessible in audible terms for players aiming their cameras at relevant NPCs), but, on another level, its referent is Joel's *expertise* in stealth and careful auditory observation (itself an element of the game's fiction). The two arrive packaged together, inseparably, as listen mode attempts to portray to players how Joel conceptualizes the space that surrounds him, given his extraordinary hearing abilities.

We must say, then: Sounds encountered in listen mode are fictionally accounted for—though not, of course, in the visual terms listen mode translates them into. Joel's expertise is fictionally accounted for. The specific geometric elements that penetrate the 3D space of the game are not fictionally accounted for—although we, as players, are invited to understand them as functionally isomorphic to the information that Joel gleans from his expert hearing alone, even if we do not assume that the world shows up for him *exactly* as it does for us when listen mode is engaged. Where does the notion of “diegetic” end up here? Where did “non-diegetic” end up? We have followed a trail of split hairs into the murkier depths of Fagerholt and Lorentzon's design space, and that neat binary has long ago ceased to be a useful guidepost. Even Fagerholt and Lorentzon's more specialized categories seem to be in need of further revision and refinement. Perhaps it is time to turn to an alternative—Jørgensen's more elegant ecological/emphatic distinction. Here, too, however, we will find that synesthetic interfaces pose an obstacle to terminological tidiness.

ANIMAL AVATARS AND THE LIMITS OF THE ECOLOGICAL/EMPHATIC DISTINCTION

To reiterate, Jørgensen defines *ecological information* in games as “information that is represented as existing in the gameworld environment in a way that corresponds to how information exists in the real, physical environment” (Jørgensen 2013, 79). Its employment, she writes, signals a design philosophy “based on the assumption that signs corresponding to objects in the actual world are easier to understand than more abstract forms of representation” (Jørgensen 2013, 81). This begs the question, though: Whose environment? Whose “actual world”? After all, not all avatars and player-characters have the same worlds, or same environment fits, as their players.

Take, for instance, animal avatars. As noted by the biologist and pioneering biosemiotician Jakob von Uexküll, different species of organism possess such drastically different ranges of perceptual experience and available actions that they effectively exist in different “perceptual worlds” (*Merkwelten*) and “effect worlds” (*Wirkwelten*), which together form their respective *enviroming worlds*, or *Umwelten* (Uexküll 2010; Uexküll 2001). “Every subject,” writes Uexküll, “spins out, like the spider's threads, its relations to certain qualities of things and weaves them into a solid web, which carries its existence” (Uexküll 2010, 53). Within each organism's *Umwelt*, features of the environment are perceived and shaped in terms of their relevance to the organism's needs, and the specific scope and limitations of the organism's sense capabilities. For ticks, finding a warm-blooded host takes precedent over other concerns, and so ticks live in a world in which warmth and the smell of butyric acid are the only signals that matter, and attentiveness to these signals is the only perceptual experience that matters. Honeybees, on the other hand, live in a world of open blossoms and closed buds; these are the paramount features that define their perceptual experience.



Figures 3–4: Illustrations by Uexküll—on left, the “surroundings” of a bee, on right, the *Umwelt* of a bee (Uexküll 2010, 85)

Although the history of videogame player-characters is littered with frogs, hedgehogs, and bandicoots (and, more recently, Pomeranians, badgers, and octopi), games employing nonhuman avatars have rarely arrived with attempts to present genuinely nonhuman *Umwelten*, to place players into robust simulations of the sensoria of other creatures. This is, of course, perfectly understandable. As Thomas Nagel famously pointed out in his landmark essay “What Is It Like to Be a Bat?,” any attempt to imagine the *Umwelt* of another organism necessarily brushes up against how radically alien the phenomenal experience of nonhuman organisms really is. Take the example of bat sonar: though clearly a form of perception that shares some overlap with our own sensory modality of hearing, bat sonar “is not similar in its operation to any sense that we possess, and there is no reason to suppose that it is subjectively like anything we can experience or imagine” (Nagel 1974, 438). To consider the question of how other organisms perceive the world is to butt up against the absolute limits of our imaginations, as we approach forms of experience that are fundamentally inaccessible to us.

Occasionally, though, developers rise to the challenge, and make real attempts to portray the phenomenal experience of nonhuman avatars in their games. Here, again, the synesthetic interface becomes a crucial component in the developer’s toolbox.⁶

In attempts to portray the *Umwelten* of animal avatars, one of the most frequent uses of synesthetic interfaces is the translation of information animals pick up through the sense of *smell* into visual terms. Smell is an attractive option for a synesthetic interface: Given that a rudimentary language is already in place for its “depiction” in visual media (for instance, the long-standing use of visual conventions of “stink lines” and gaseous clouds in pictorial forms such as cartooning), it presents fewer hurdles than alternate sensory modalities such as sonar. “Scent trails” present a good opportunity to provide straightforward guidance to the player, offering an orientation system that can feel more fictionally relevant and grant a greater sense of agency to players than the simple use of waypoint markers or compass arrows. The employment of olfactory-to-visual synesthetic interfaces also requires less elaborate justification than alternatives such as auditory-to-visual synesthetic interfaces do—after all, developers have no choice but to translate olfactory information into another sense modality, as contemporary game display technology generally lacks olfactory outputs.⁷

Dog's Life (Frontier Development 2003) places players in control of Jake, a hound. Although the view offered in the game's standard graphical option is in third person, showing Jake bounding through colorful environments, in order to complete many of the minigames offered in *Dog's Life* players must switch over to a special vision mode referred to in-game as "smellovision." When this vision mode is engaged, the colorful third-person view of the game's standard visuals is swapped for a first-person peek into Jake's *Umwelt*. Here, colors in the surrounding environment are de-saturated (in what seems to be a rough approximation of canine dichromatic vision), but this de-saturation is countered by the synesthetic tactic of rendering surrounding smells as fluorescent-colored clouds and trails dotting the game's environment. Mechanically, smellovision opens up new minigame opportunities, including races against the clock to "collect" smells of a certain type, as well as simple "follow-the-trail" challenges. Considered as a vision mode, it accomplishes many of the functions Jonas Linderoth has delineated as representative of the feature: providing player guidance by highlighting interactable objects and important NPCs, while removing extraneous and potentially distracting visual detail from less relevant portions of the environment (Linderoth 2010). Between these features, Frontier Development wring quite a bit of functional mileage out their attempt to present Jake's *Umwelt*, more than justifying a technique that goes above and beyond the usual use of much more anthropomorphized animal avatars in other games.



Figure 5: Smellovision in *Dog's Life* (an odor can be spotted as an orange cloud on the left side of the frame)

The Legend of Zelda: Twilight Princess (Nintendo EAD 2006) offers a similar example. Here, the player character Link shifts between human and wolf forms, with each form having its own abilities and obstacles, requiring different strategies. Link's human form has access to the use of weapons and items, while his "beast" form grants access to the "sense" vision mode. The "sense" mode of *Twilight Princess* overlaps significantly with *Dog's Life*'s smellovision in both function and implementation, although steps are taken to greater emphasize the alien dimensions of the *Umwelt* of Link's beast form. Whereas *Dog's Life* simply de-saturates the surrounding environs, *Twilight Princess* introduces a black fog that drastically reduces draw distance, shifts the entire color palette towards blue-green, and muffles ambient sound by adding an intruding layer of low hissing when players switch to "sense" mode. Beyond these more drastic changes, however, the synesthetic dimensions of sense mode are identical to those of smellovision: Again, scents are visually phenomenalized as brightly colored trails, guiding players to pertinent objects and NPCs. (Given that Nintendo had already experimented with the visual phenomenalization of scent six years earlier in *The Legend of Zelda: Majora's Mask* [Nintendo EAD 2000]—in which the "Mask of Scents," when donned similarly allowed

players to see smells—it is possible that the additional emphasis on the alien qualities of Link’s nonhuman *Umwelt* here stem from an attempt to go above and beyond their previous foray into the realm of synesthetic interfaces.)



Figure 6: “Sense” vision mode in *The Legend of Zelda: Twilight Princess*: note scent trail

We find a different—and potentially more ambitious—synesthetic translation of the sense of smell in *Geist* (n-Space 2005). *Dog’s Life*, *Twilight Princess*, and *Majora’s Mask* all straightforwardly phenomenalize scent as visual clouds and trails, accessible through a dedicated vision mode and performing guidance-providing functions such as highlighting and orientation marking. *Geist*, on the other hand, breaks all three of these trends: It renders smell across multiple output channels (rather than just strictly visualizing it), it treats a nonhuman *Umwelt* as an unavoidable consequence of inhabiting a nonhuman body (rather than as a vision mode to be toggled on or off at players’ convenience), and it treats scents as a potential obstacle to players (rather than merely a guiding feature).

In *Geist*, players find themselves in the role of John Raimi, a counterterrorist operative reduced to spectral form when his consciousness is separated from his body through occult means. As a nomadic spirit, players are granted the power of possession: possession of humans, possession of inanimate objects, and the possession of various animals. Although some of the game’s attempts to portray the *Umwelten* of possessable animals are decidedly lacking (the player’s possession of a bat, for instance, takes no serious stab at Nagel’s famous imponderable, as it does not attempt to portray the experience of sonar), its portrayal of the *Umwelt* of a rat is an exception. When occupying a rat, re-tracing the steps they took just moments ago in the body of a human, players suddenly discover that the once-innocuous cheese-baited rat traps dotting the map are now deadly hazards. When positioned within scent-range of these traps, players are greeted with two cues—a graying of the edges of the screen, simulating tunnel vision, and a heartbeat-like pulse emanating from the GameCube controller’s haptic feedback—synesthetically signaling the dangers of falling sway to the attractive odor of the traps’ bait. Furthermore, once within the “orbit” of these olfactory sites, players begin to lose control of the rat body acting as their vehicle: The rat’s involuntary and base attraction to the smells of the environment becomes expressed as a gradual drift towards the traps, one that players must actively compensate for by yanking the controller’s left analogue stick in the opposite direction. “Every animal is surrounded by different things,” writes Uexküll; “the dog is surrounded by dog things and the dragonfly is surrounded by dragonfly things” (Uexküll 2001, 117). For a human body, these traps were incidental environmental details. For a rat body, they become dangerous sensory attractors, basins

of perilous desire. Rather than simply granting trails that conveniently guide player exploratory action, scent within the *Umwelt* of a rat is portrayed as a powerful and primal force, one that blurs vision, raises heart rate, tingles extremities, and must be actively fought against if one is to stay on-task. In utilizing a synesthetic translation that is primarily disruptive rather than helpful, n-Space shows the potential breadth of options open to developers devoted to seriously pursuing the presentation of nonhuman *Umwelten* in games.



Figure 7: Tunnel vision while being dangerously attracted to a scent as a rat in *Geist*

Jørgensen lists interface features such as illumination and color-filtering as straightforward examples of *emphatic information*, defined as any interface element that “highlights or reinforces information that is not easily communicated through ecological means” (Jørgensen 2013, 85). The use of color highlighting or illumination, Jørgensen argues, can be distinguished from the use of fictionally-appropriate *signifiers* in that “in the former the emphasis itself cannot be understood as part of the gameworld ecology—instead, it is a purely emphatic feature used as a marker added to something that exists in the ecological environment” (Jørgensen 2013, 87). The synesthetic presentation of scents in games with animal avatars disrupts this neat division. Scents are most certainly a part of the ecological world of the animal avatars that populate *Dog’s Life* or *Twilight Princess*. The portrayal of such scent-centric *Umwelten* via technological forms that generally lack olfactory outputs will necessarily require acts of translation and approximation. Rendering a smell visually as a cloud trail certainly does not, of course, correspond to how scent-derived information “exists in the real, physical environment.” But simply stating this, while overlooking the fact that any attempt to portray animals’ perceptual experience of their environment will necessarily require some degree of imaginative transformations, gets us nowhere. The synesthetic substitution of vision for smell in animal avatar games represents the breaking point of the “ecological”/“emphatic” division: the point at which it becomes impossible to represent a genuinely ecological feature of an environment by anything other than emphatic means, and an abstract “either/or” division dissolves into a “both/and” reality.

CONCLUSION

When doing analytical work, the temptation to erect totalizing terminological or conceptual frameworks, designed to address every possible facet of a given realm of game design or player experience, can be strong. However, such frameworks always inevitably contain blind spots, leaving unexplored areas that have fallen between the

cracks, and do not fully conform to the terms of analysis on offer. I have argued throughout this paper that synesthetic interfaces are one such blind spot, unable to be fully described or accounted for by contemporary vocabularies of game UI design.

Here in this conclusion, I could offer up a revised universal terminological framework, newly patched to account for synesthetic interfaces, with new compartments and categories designed to solve the *Mirror's Edge* problem and the issue of nonhuman *Umwelten* once and for all. I will, however, refrain from doing so. Patching can only get us so far. Ultimately, we must acknowledge that any framework will have its limits. Perhaps sometimes the best thing to do is to turn our attention away from our grand terminological projects, and towards what they leave out. Sometimes, the best way to account for what has fallen through the cracks is not to hurriedly suture it into the framework, but rather attempt to appreciate it on its own terms, and ask what blind spots in our understanding of games it evinces. Perhaps we should do less work trying to terminologically tame troublesome examples, and spend more time thinking speculatively about what possible incipient innovations in design they might be marks of.

Synesthetic interface have an interesting range of uses—from animal avatars to human experts. What is the thread of continuity here? What claims of congruence are implicitly being made by developers in adopting a similar mode of depiction for expertise and animal consciousness? The chief claim, it seems to me, is one of *epistemic otherness*. Animals, *Dog's Life*, *Geist*, and *Twilight Princess* suggest, come to know their world by different means than humans do. Experts, *The Last of Us* and *Mark of the Ninja* suggest, no less come to know their world by different means from the rest of us. Sounds and smells mean different things to them than they do to us; they impart knowledge to them in ways they do not to us. Game interfaces must endeavor to account for this.

If this is the common thread underlying employments of synesthetic interfaces, then what sorts of evolutions of these interfaces might we come to see in the coming years? How, for instance, will technological change bring about new developments? The renewed interest in head-mounted display technologies that has arrived with the Oculus Rift has resulted in a number of projects built around the fantasy of stepping into bodies unlike one's own, from the *Machine to Be Another* project (BeAnotherLab, 2013–) to the *Birdly* simulation experiment (Zurich University of the Arts Institute for Design Research, 2014–). Conceivably, head-mounted visual displays could also lead to new innovations in synesthetic interfaces, allowing users to inhabit the sensoria, as well as the bodies, of radically different others. However, there are reasons to suspect that the greatest innovations in synesthetic display will not arise from head-mounted visual display technologies. Already throughout the examples I have offered in this paper, a clear visual bias is evident: interfaces that transform sound or smell into visual terms are much more prevalent than other modality substitutions. Perhaps, then, when considering the future of synesthetic interfaces, we should instead turn towards other recent technological innovations, such as the head-mounted haptic display developed by Eddo Stern for his *Darkgame* (Stern 2006–). Perhaps we have seen enough sounds and smells: perhaps the most exiting frontier can be found in displays that allow us to feel the rumble of sounds and the tingle of sights. In addition to stimulating our imaginations in new ways, and inviting us to experience new facets of player-character psychology, innovations such as Stern's represent a leap forward in game accessibility design that projects such as Oculus cannot hope to match. Perhaps, one day, a game will finally allow us to know what it is like to be a bat. And perhaps this game will be one in which those without hearing and

those without sight will find themselves on equal ground, through the final perfection of the synesthetic interface.

ENDNOTES

1 My use of the formulation “sensory substitution” here takes cues from the important work of Paul Bach-y-Rita, whose famous tactile-vision substitution system for use by people suffering from vision impairment represents perhaps the greatest leap forward in our understanding of the possible interconnections in our brain’s understanding of information arriving from various sense modalities (Bach-y-Rita 1972).

2 Here, Jørgensen finds a fellow traveler in Rune Klevjer, who has forwarded similar arguments regarding the inapplicability of usual conceptions in the “fourth wall” in videogames, bluntly stating that “game fictions are not delineated by a ‘fourth wall’ as in film or literature” (Klevjer 2006, 59).

3 It should be noted that, in her suspicion toward the diegetic/non-diegetic distinction, Jørgensen finds herself in good company within contemporary film theory, which has been showing signs of increased skepticism the categories in recent years. Considering the use of different film stocks to mark off flashbacks, for instance, George M. Wilson notes that the color of a flashback sequence could be considered as “fictive information about an aspect of the story and so could count as broadly ‘diegetic.’” In the end, Wilson admits, “the distinction between diegetic and non-diegetic *color* in movies is often hard or even impossible to make” (Wilson 2011, 96).

Even the study of music in cinema—long the bastion of enthusiastic use of the diegetic/non-diegetic distinction—has been a site of newly voiced skepticism in recent years. Ben Winters, for instance, notes how the label “non-diegetic” seemingly fails to account for the way the employment music in film, though not emanating from on-screen musical performance, still “may be considered to be produced by the characters themselves (either as a result of their physical movements, as with mickey-mousing, as an expression of their emotional state, or as a musical calling-card), or by the geographical space of the film.” Winters attempts to solve this problem by offering up a plethora of more nuanced and transitional categories, such as “extra-diegetic” and the “intra-diegetic,” to overcome the needlessly blunt divide of the “diegetic”/“non-diegetic” binary (Winters 2010, 237). (In this regard, Winters’ work is especially similar to Jørgensen’s earlier writings, in which she attempted to overcome the shortcomings of the division by adding the term “transdiegetic,” before ultimately abandoning the vocabulary altogether [Jørgensen 2009].)

4 James Paul Gee describes players’ relations to their player-character’s expertise well in his discussion of “projective identity” in games, where he writes that it is “not uncommon” for players of the single-player campaign of *Halo* games to “redo a given fight scene because they felt they have ‘let their character down,’” bowing to a desire to “pull off the victory more spectacularly, as befits a superhero” such as Master Chief (Gee 2007, 53).

5 Whether by design or by coincidence, the monologue that opens *Mirror’s Edge* shares some notable similarities with philosopher Maurice Merleau-Ponty’s description of expert sports performance in a famous passage from his book *The Structure of Behavior*:

“For the player in action the football field is not an ‘object’.... It is pervaded with lines of force (the ‘yard lines;’ those which demarcate the ‘penalty area’) and articulated in sectors (for example, the ‘openings’ between the adversaries) which fall for a certain mode of actions and which initiate and guide the action as if the player were unaware of it” (Merleau-Ponty 1963, 168).

6 In what follows, I have benefited greatly from investigations that have already begun to be undertaken into attempts in various visual media to present nonhuman *Umwelten* to human viewers, in particular David Herman’s work on representations of nonhuman consciousness in comics and graphic novels (Herman 2011; Herman 2012), and Inga Pollman’s work on depictions of animal *Umwelten* in cinema and museum displays (Pollmann 2011, chapter 3).

7 *Leisure Suit Larry: Love for Sail!* (Sierra 1996), with its “CyberSniff 2000” feature, presents a rare exception here.

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