GFI: A Formal Approach to Narrative Design and Game Research

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Abstract. We present the GFI framework (standing for Goals, Feedback, and Interpretation), inductively developed to address the MDA framework's shortcomings as a lens and tool for modeling games. GFI stands parallel to MDA as a formal approach that offers bridging the gap between narrative design, game development, story analysis, and game research. Through GFI, we analyze foundational narrative design problems and systematically peek through the game design space, in order to evidence its analytical and generative traction. We believe these discussions signal GFI's potential to elucidate the narrative design process, making it easier for researchers and practitioners to decompose, study, and design a broad class of game artifacts.

Keywords: goals, feedback, interpretation, narrative design, games

1 Introduction

Narrative designers aim to better-integrate narrative and gameplay [26, 44], but the role remains contested. They are not necessarily "writers" or "authors," but are responsible for aspects of each; to different degrees depending on genre [28]. Is *environmental storytelling* [33] part of the job? What about writing cut-scene screenplays? Should they contribute to game design documents? [30] How should they manage the relationship between a game's ludic and narrative elements? [63, 77, 73] What knowledge should they possess? [74]

Thus, the scope and extent of a narrative designer's role remains unclear. This knowledge gap is critical: we cannot build a cohesive body of narrative design knowledge without knowing what its scope should be. As a consequence, we do not know how to best *support* narrative design. This paper articulates a framework of concepts we argue are central to this practice. To us, a narrative designer is concerned with elements beyond *Mechanics*, *Dynamics*, and *Aesthetics*, or MDA [47]—itself the dominant formal approach to game design and game research. We argue they *also* must be concerned with *Goals*, *Feedback*, and *Interpretation*, or GFI—our proposed formal approach to narrative design.

2   Related Work

GFI is most similar (and complementary) to the MDA framework. MDA decomposes a game into three design components: (1) Mechanics, "the components of the game at the level of data representation and algorithms" that reflect the rules, (2) Dynamics, "the run-time behavior of the mechanics acting on player inputs and each others' outputs over time" that reflects the system, and (3) Aesthetics, "the desirable emotional responses evoked in the player, when she interacts with the game system" that reflect the "fun."

Current works that conceptually describe interactive narrative games are often interactive narrative-specific accounts of MDA. Aarseth's [2] Narrative Theory of Games is an (interactive narrative-specific) model of the Mechanics: it describes components of games across a narrative-theoretic ontology that includes the story world (space), events, and entities (objects and agents). Koenitz's [54] SPP framework is a model of the Dynamics: it describes the behavior of games relative to the player's interaction with a System (of potential stories), which triggers a Process (of interactive story-refinement) that concludes as a Product (the effected narrative). Punday [71] characterizes Involvement, Interruption, and Inevitability (III) as central to the emotional force that an interactive narrative game carries; III is a model of the Aesthetics. Because they focus on different components of MDA, these works by Aarseth, Koenitz, and Punday are complementary; between themselves and to our work. GFI fills in vocabulary necessary to describe phenomena relevant to all—but crucial to interactive narrative—games, whose elements we posit are central to narrative design.

Game design schemas (and MDA in particular) conflict with narrative design ones [36, for example]: "...by separating narrative and game modes as distinct phenomena, integrated use has been thwarted...a siloing of game development roles, and ultimately, functions within a game" [26, p.33]. Designing games like this leads to the *narrative wrapper* [26]: narrative that "wraps around the gameplay to make it transportable and attractive," ultimately "unattached and disposable" [23]. We briefly discuss *how* MDA falls short of describing elements relevant to narrative design, propose GFI as a framework for describing those elements, and evidence GFI's analytical utility through several case examples.

3   GFI

GFI complements MDA. In MDA, *Mechanics* describe how players can act, not why they would want to. In GFI, *Goals* (§3.1) models player motivations and intentions, which are key for (ludic [38] and) narrative engagement [9, 65]. Further, MDA's *Dynamics* describe what system behavior results from player inputs, not how to elicit inputs that are supported by the system. These inputs are determined by the tight-coupling of players to the perceivable features of their environments [61]. In GFI, *Feedback* (§3.2) models these features, critical to structuring the player's activity. Finally, MDA's *Aesthetics* describe what players feel, not what leads to it. Evoked emotions arise from what players think about, which presupposes an *Interpretation* (§3.3) of their experience [21].

3.1   Goals

Goals are conditions players are expected to meet to succeed at a game. They are widely thought of as structurally key to games [79], and have two broad senses (*player-defined* [12] ones are out of scope). *Ludological goals* are codified and recognized in-game [25]. *Narrative goals* are player-interpretations of ludological ones [19]. We discuss their ludological sense next; the narrative sense is in §3.3.

There are two kinds of ludological goals. All games have *ultimate goals* that determine their end conditions [84]. There are at least three (Table 1): *Win* a game (of *Chess*), *Finish* a game (of *Super Mario Bros.* [27, *SMB*]), or *Prolong* the act of playing (*e.g.* by surviving in *DayZ* [50]).

Table 1. Ultimate goals: conditions that determine a game's end [84].

Ultimate	**Description** ("Games with this ultimate goal...")
Win	Effect an evaluation when a predefined state is reached.
Finish	Effect *no* evaluation when a predefined state is reached.
Prolong	Conclude against the designer or player's intent.

Achieving a game's ultimate goal requires satisfying the *proximate* [78] or *imperative* [25] goal, that it necessarily decomposes into, whose accomplishment entails the ultimate's. These *imperative goals* more-concretely require the player to effect a particular game state of affairs codified in the game itself [25]. There are at least 10 types (Table 2): *Choose, Configure, Create, Find, Obtain, Optimize, Reach, Remove, Solve,* and *Synchronize*. An imperative links game elements such as space, time, and entities [24]. Each one has a logical dual: its *prevention*.

Table 2. Imperative goals: conditions necessary to achieve a game's ultimate goal [25].

Imperative	**Description** ("This imperative requires players to...")
Choose	Select one element from a finite set of elements.
Configure	Manipulate elements such that they are in a "correct" state.
Create	Bring an element into existence that was not before.
Find	Locate a particular element.
Obtain	Bring a particular element under control.
Optimize	Accumulate a requested amount of a particular element.
Reach	Navigate to a particular location.
Remove	Eliminate an element from existence that existed before.
Solve	Select one "correct" element from an infinite set of elements.
Synchronize	Bring one or more elements into spatial/temporal unity.

Imperatives may infinitely decompose into more-specific others, creating a *Ludological Goal Hierarchy* [19]. The hierarchy's base maps onto a moment in gameplay. Fig. 1 illustrates this idea: to *Finish SMB*, one must *Remove* (the agent depicted as) Bowser. To do so, one must *Reach* the axe. To do so, (in Fig. 1's state) one might want to *Prevent* (spatiotemporally) *Synchronizing* with the fireball. To do so, one might need to *Reach* the platform. And so on.
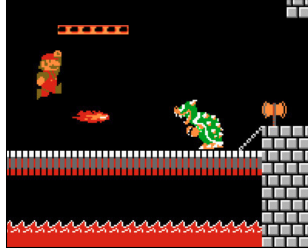

Fig. 1. *Finish SMB* requires *Remove*-Bowser via the more-specific imperative *Reach*-Axe, closer to the needed gameplay.

Fig. 2. The *Denotational Feedback* at the end of *SMB* elicits one interpretation of its ultimate goal: "Save the princess."

Analytically identifying a game's full hierarchy is challenging, since it must encompass all ludological goals a player may face in all possible playthroughs. However, ludological goals (and their hierarchy) are under the direct control of a designer who specifies what conditions "count" to satisfy the ludological goals. Next, we discuss how careful construction of feedback is required such that goals are *communicated* to the player in order to motivate their activity.

3.2 Feedback

Feedback is the designed multi-modal stimuli intended to convey perceptual information about the game's structural elements: its underlying ends (goals) and the available means to achieve them (mechanics). This may include things such as graphics, music, sound, text, and more.

Crafting feedback is arguably a narrative designer's most critical responsibility, and is what makes the practice of narrative design relevant to all but the most abstract games, including ones that do not necessarily place a primacy on narrative. (Narrative designer) Dansky [23] argues that people only think of *explicitly denoted* narrative elements as *the* game's narrative. However:

> There's also implicit narrative built into every game through the choice of setting, items, character design [...]   Or, [...] think about the archetypal tool you get in *Minecraft*. It's a pickaxe. It's not a tricorder. It's not a Black and Decker multi-tool. It's a pickaxe, and through its very pickaxeness - low tech, implied manual labor, etc. - it tells part of the story of the world it exists in. [...] As soon as you decide what a game asset is, you're implying the narrative that allows it to exist and function. [23]

One way to conceptually model feedback is per a typology (Table 3) imported from linguistics [20], which parallels Genette's [39] tripartite model of narrative: the story, the discourse, and the narration.

Table 3. Typology of feedback available for narrative design.

Feedback	Examples ("Feedback of this type includes...")
Phonological	Textual symbols, lines, shapes, haptics, sounds, lights, colors.
Lexical	Words, images, vibration patterns, voices, music notes, sound effects.
Grammatical	Texts, image sequences, camera shots, dialogue, music.
Denotational	Description, exposition, narration, characterization.

Phonological feedback is at the level of narration: the sounds, signs, and haptics that can be structured to convey meaning. *Lexical feedback* is at a higher-level of meaning within narration: a language inventory of the smallest units of meaning. In *SMB*, phonological colors contribute to Fig. 1's depiction of the axe, which is lexical. *Grammatical feedback* is at the level of discourse: stimuli structured according to a corresponding syntax. Adherence to that syntax facilitates story sensemaking [18] and licenses inferences about underlying meaning. In *SMB*, image sequences are structured from left-to-right, which Grammatically suggests that the player progresses by going right-ward, potentially giving a clue on how to defeat Bowser for players who have never faced him before. Finally, *denotational feedback* is at the level of story: it includes stimuli that communicates the plot's event structure, and it most-closely matches the discussed sense of "explicit narrative." Fig. 2 depicts exposition that is denotational: it signals to the player that their gameplay has concluded.

The content of Fig. 2's feedback reinforces a particular interpretation of the player's activity. This interpretation and the process that gives rise to it is the last element of GFI, which we discuss next.

3.3   Interpretation

Interpretation is both: (a) the situated *process* of deriving meaning from enaction [76], and (b) the *outcome* of that process. When discussing interpretation in games, what is usually meant is the outcome of the player's game experience. We typically want to answer: what is *the* narrative of a game?

Is it the space of *potential* narratives [54] the system affords? What of games *about* story creation [56]? In describing the interpretations of a game, we want to move away from false dichotomies like *ludology v. narratology* [32, 35] toward a more nuanced understanding of how these mutually inform and constrain each other. For narrative design, we propose that it is important to shift the discussion from the *outcome* of a player's interpretation, to the *process* that gives rise to the outcome. This process is what crystallizes the defining function of **narrative design**: structuring feedback relative to mechanics and goals aimed at guiding a
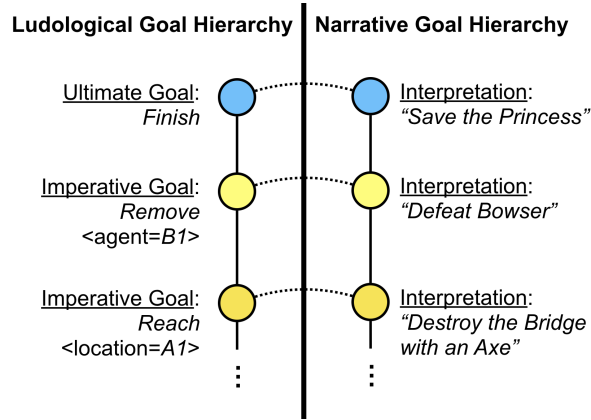
Ludological Goal Hierarchy | Narrative Goal Hierarchy

Ultimate Goal:
Finish

Interpretation:
"Save the Princess"

Imperative Goal:
Remove
<agent=*B1*>

Interpretation:
"Defeat Bowser"

Imperative Goal:
Reach
<location=*A1*>

Interpretation:
*"Destroy the Bridge
with an Axe"*

Fig. 3. The parallel goal hierarchies of *SMB* [19]. The suggested readings are: *To Finish SMB* means to "Save the Princess" (Toadstool); to *Remove-Bowser* means "Defeat Bowser"; and to *Reach-Axe* means "Destroy the Bridge with an Axe."

player's *existing* interpretation of the game's narrative into a *preferred* interpretation. In this definition, the narrative designer (or whomever they represent) is who prefers the interpretation. Further, "structuring" is broad: narrative design *may* encompass changes to mechanics and goals, so long as these are intended to effect changes to the interpretation that players may derive.

The interpretation *outcome* is what defines a **narrative goal**: the meaning derived from a ludological goal (§3.1) as experienced in a game. The feedback in Fig. 2 scaffolds the player's interpretation of their accomplishment: the player's *quest* – a prominent element in primarily-narrative games [46] – is over. Thus, one way to narratively make sense of *To Finish* is as "Save the Princess."

Because narrative goals are interpretations of ludological ones, they both entail the **Parallel Goal Hierarchies** (Fig. 3). The *Ludological* side reflects the sub-ordinate goals needed to *satisfy* super-ordinate goals; *i.e.* the "how." In tandem, the *Narrative* side reflects the super-ordinate goals needed to *motivate* the sub-ordinate goals; *i.e.* the "why." The ludological side is best read top-down (you finish *SMB by* removing Bowser) whereas the narrative side is best read bottom-up (you defeat Bowser *for the purpose of* saving the Princess).

The hierarchies and their mapping is relative to the individual, and depends on both the game and its surrounding context. For instance, our interpretation of *SMB*'s *To Finish* as "Save the princess" is plausible due to its (discussed) quest-like nature *but also due* to the game's packaging, which asks: "Do you have what it takes to save the Mushroom Princess?" (Fig. 4).

However, interpretations can be fragile. For instance, nothing indicates that the player is in fact "destroying the bridge with an axe:" the corresponding animation is of such low framerate that a player may walk away with an alternate interpretation (*e.g.* the bridge retracted). Further, *is* the object at the location to reach even an axe? Its feedback suggests that via a *prototypical* [57] appearance,

Fig. 4. *SMB*'s packaging asks: "Do you have what it takes to save the Mushroom Princess?," which supports interpreting *SMB*'s ultimate goal as "Save the Princess."

but the authors disagree: the third author sees it as a lever. In both cases it is the task of narrative designers to match feedback for a ludological goal to narrow the players' potential (existing) interpretation down towards the designer's intended (preferred) interpretation (conversely, a game designer might need to craft a ludological goal that aligns with the narrative designer's intended feedback).

Dena [26] offers one way to conceptually model interpretation: the *Sequence Method* [58], which is an established method for television (TV) series narrative design. This method models the player's interpretation as a *reader-response process* [51], driven by unanswered-questions, with an (eventual) *outcome* of answers, possibly inciting curiosity [26, p.43]:

> [The Sequence Method] divides the experience into a series of questions for the audience [...] the overall question introduced at the beginning and answered near the end, and [...] multiple short-term questions to keep driving the audience's interest. "[when] answered, the [TV] series is forced to either introduce new central questions or end." [58, *op. cit.*]

This method has been endorsed by several narrative designers within the games industry. Bryant and Giglio [15], who have designed for both movies and games, argue that the method is useful to structure objectives for level design. Further, Bernstein [10], who has designed for movies, games, and television, argues that this method works better than the 3-Act Structure [34] *because* it is objective-driven ("What's going to happen *next*?") and fits well within gameplay loops.

4   GFI as a Lens

GFI groups three analytical, separate, causally-linked, and perspective-dependent lenses (Fig. 5). Through them, we straightforwardly unpack several thorny narrative design issues that are potentially challenging to analyze with MDA alone; these analyses lend support to the utility of GFI.
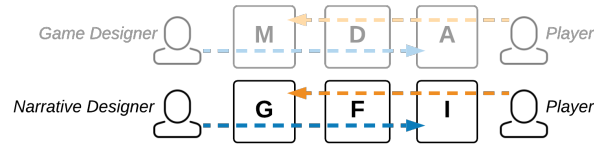
Fig. 5. Goals (like mechanics) are closer to the designer perspective. Interpretation (like aesthetics) is closer to the player. Feedback (like dynamics) bridges between these.

4.1 Ludonarrative Dissonance and other Forms of Incoherence

(Game designer) Hocking coined the term *ludonarrative dissonance* in describing playing *Bioshock* [37]: "[it suffers from] a powerful dissonance between what it is about as a game, and what it is about as a story" [45, p. 256] The term has since been widely adopted, critiqued [80], and reformulated [81, 8]. In view of GFI, it manifests via a mismatch between the ludological and narrative goal hierarchies.

For example, games with the ultimate goal *To Prolong* often suffer from a certain amount of incoherence when they also include a "campaign" or "story mode" with an overarching conclusive narrative goal. The incoherence arises because there is no clear narrative goal that makes sense of the ultimate one. In *Destiny* [5], once players achieve the narrative goal of "Defeat Atheon" (the final boss of the games' raid), they return to the gameworld where nothing has changed and the raid remains available to complete. Even once all of the game's most significant narrative goals have been achieved (*e.g.* side-quests and secondary missions), the player should still continue *To Prolong* their play. The lack of an "infinite narrative" (that aligns with *To Prolong*) poses a challenge if we want to see games without this fundamental incoherence, and perhaps directly motivates the use of procedural narrative generation [62].

There is also often dissonance/incoherence in games with multiple endings. *Nier: Automata* [68] has 26 different endings and (although many are optional) the player is required to successively complete the first 5 in order to witness all of the scripted narrative [52]. This creates dissonance: the game "indicate[s] to the player that an ending has been reached, only to enable continued play afterward, while coding the post-end portion of the game not as something extraneous, repeated, or additional, but an actual part of the game" [6].

Each time the player feels like they've *finished*, they learn that its narrative counterpart has not been fully realized: "[the game] continually deprives the player of a sense of narrative closure" [52] with successive playthroughs requiring a re-interpretation of the games ultimate narrative goal as new elements are introduced. For example, "reaching the B ending is a matter of following the same core narrative events from the perspective of the android 9S instead of 2B, with only small narrative additions and gameplay alterations" [52].

4.2 Edge-cases of the Parallel Hierarchy

What if the Parallel Goal Hierarchies are imperfectly mapped? We consider two cases: there is a ludological goal with no evident narrative goal and *vice-versa*.

When a ludological goal has no evident narrative goal, the player has no interpretation and thus no way to know the ludological goal exists. The only way for this ludological goal to be achieved is for the player to meet it by chance. There are at least two contexts in which this happens regularly.

The first is via cheat codes and the second is through meta-reward structures such as secret trophies or achievements [42]. From the player's perspective, these ludological goals are met, but the player had no way of anticipating them from anything communicated via the game. Consequently, the player has no way to make sense of what happens other than appealing to conventions of the medium ("PS4 games have trophies" or "Konami games often have the Konami code").

Conversely, when a narrative goal has no evident ludological one, a player has no way of achieving said goal in the game. This can lead to player frustration, confusion, or disappointment ("The game asks that I do this thing, but it's impossible!"). This might be the result of a mistake or flaw in the game's implementation. Perhaps a player is told to activate a light switch, but it doesn't work due to a software bug [60]. Sometimes, it might be the result of purposeful design. (Narrative designer) Ramanan describes a scene in *Before I Forget* [1], a game that "takes place in the soft pastel-colored home of Sunita, a woman with early onset dementia" [83] in which players were reasonably confused:

> [Players can't find] the bathroom, and [...] every door [they] open turns up in the same place, no matter which... [Players] were trying to see a system and a logic when dementia doesn't have any." *Ramanan as cited by Webber [83]*.

4.3   Localization, Remakes, and Sequels

Localization, when a game is modified in order to be sold in a new market [66], is different from translation because:

> ...localizing a video game may involve making technically or culturally motivated changes that go beyond its textual structure, such as modifying the game code to accommodate the graphical discrepancies between source language and target languages [...] or even adjusting the game's marketing strategies. [22]

Thus, localization often results in transcreation: departing from the original source to an extent such that the target is significantly different [66].

In view of GFI, localization requires transforming a game's Narrative Goal Hierarchy to preserve the relationships between narrative goals and their ludological counterparts. When done poorly, the intended meaning of the player's activity can become opaque. Czech's [22] study of the Polish game market demonstrates how the narrative goal of "obtaining a killing spree" – *Removing* (defeating) a certain number of opposing players while *Preventing* your own *Removal* (defeat) – can become disassociated from its ludological goal, due to poor localization: it reads as obtaining "a series of victims" or "a series of donations."

Osu! Tatakae! Ouendan! [48, Ouendan] is a rhythm-action game first released in Japan, later localized by the same developer into *Elite Beat Agents* [49, EBA] for the North American (NA) market. The developer aimed to provide an experience comparable to Ouendan for NA audiences [59]. Interestingly,

> ...the localization team was not afraid to modify many of the aspects of Ouendan that were not part of the core gameplay. The result is a game with new characters and stories, [and] a new soundtrack – [...] one of the most relevant components in a rhythm game. Nevertheless, the Japanese game and the localized version feel strikingly similar, as the gameplay is virtually unchanged. [...] [EBA] retained the concept, mechanics and general atmosphere of [Ouendan], but involved a complete overhaul of both the textual and audiovisual elements. [59]

GFI explains how Ouendan and EBA are *ludologically* the same but *narratively* different: localization effectively replaced the narrative goal hierarchy, but mapped it onto the same ludological one.

5   GFI as a Tool

In addition to its analytical traction, GFI *also* has generative traction to help us design games. Fig. 6 illustrates a game-centered *interaction framework* [4]; it charts how GFI fills in gaps in the MDA model that must be filled to account for narrative design-related phenomena. In it, the (game) System contains the Ludological Goals that must be achieved for players to succeed at the game. These are presented to the player via Feedback that the Player observes and interprets. Intepretation yields the player's mentalization of Narrative Goals that motivate which tasks they end up pursuing, which forms part of their Aesthetic experience. Players attempt to carry out those tasks by articulating them through the game's afforded Mechanics, which result in run-time Dynamics that perform an update on the underlying game's System.

Under this framework, we propose that (1) *interpretation* is what should be considered as the end result that guides narrative design refinement, and (2) *goals* (with corresponding *mechanics*) and *feedback* are what should be refined to effect change in that interpretation. How to do so is beyond our scope; we briefly chart design challenges around player *expectations* [65] that GFI helps us grapple with.
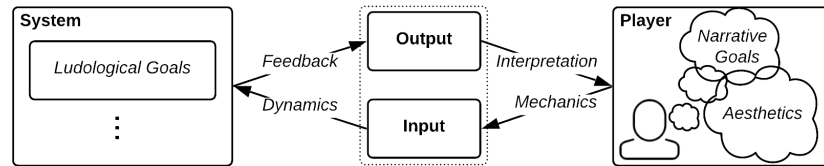

Fig. 6. An interaction framework for games that identifies how GFI fills in conceptual gaps in MDA that must be filled to account for narrative design.

5.1   Setting Up and Satisfying Player Expectations

Games are communicative acts [17]. In them, players/audiences expect designers/authors to "cooperate," as in dialogue [41]: speakers are tacitly expected by hearers to be as detailed as they *need* to be, truthful, on-topic, and clear [40]. Authors rely on or flaunt these expectations for communicative effect. For example, a seemingly random element of a story may have its purpose revealed later in the discourse (*e.g. Chekhov's Gun* [72]) or may lead audiences astray (the *Red Herring* [82]). The Parallel Goal Hierarchies give us the language to describe how designers can *also* setup and manipulate player expectations. Succinctly, players might be offered feedback to scaffold certain narrative goal interpretations, creating expectations about gameplay via the ludological goals they motivate, which in turn may be satisfied or subverted.

At the edge of a particular waterfall within *The Elder Scrolls V: Skyrim* [11, *Skyrim*], players are prompted with feedback that sets up a player's expectation: an audio cue with associated textual overlay that reads "Bard's Leap Summit Discovered." Given the prompt's timing (expectation of relevance) and content (expectation of detail), one rational interpretation is "Jump off the waterfall," with the implied (and dangerous) ludological goal *Reach*-Base of waterfall.

The interpretation emerges because in *Skyrim* that kind of overlay appears whenever a player enters a significant place (*e.g.* a city). Only if the player acts to satisfy the implied ludological goal (*i.e.* by jumping off the waterfall), does the player land safely in a pool, encounter a ghostly bard who describes their unsuccessful dive, and get an in-game skill-boost. That the player cannot encounter the ghost by simply exploring the base of the waterfall suggests a designer's *intentional* structuring of the feedback to elicit the narrative goal.

This is related to *narrative affordances* [16], action opportunities that players imagine will continue their unfolding story. In GFI, this is tantamount to eliciting and *satisfying* a player's expectations by way of a narrative goal that motivates a ludological one, the latter then recognized (possibly rewarded) by the game.

5.2   Subverting and Shifting Player Expectations

In contrast, the story of *Spec Ops: The Line* (*SpecOps*, [29]) diverges from the conventional hero story. It leads U.S. Army Captain Walker – the player-controlled protagonist – into taking ethically fraught actions [53]. As it unfolds, the player's interpretation of the ludological goals is shifted: expectations of the medium [14] ("You're a hero, so hurting enemies is the right thing to do") and of the genre [3] (third-person shooter) are narratively questioned and then *subverted* ("You're a war criminal who has just harmed civilians").

This is possible because actions in stories can be *functionally polyvalent* [31]: in *SpecOps*, "Soldier harms enemies" narratively *functions* [70, 69] as "heroism" in the player's initial interpretation and is shifted to function as "villainy" via feedback that reinforces an *anti-hero* [75] interpretation.

Similarly, Brenda Romero (née Brathwaite), leveraged multiple interpretations in her boardgame *Train* [13] via the use of purposefully ambiguous mechanics and game elements. In *Train*, players are tasked with efficiently loading

and delivering boxcars with yellow meeples to a terminal station only to learn the name of the destination towards the end: Auschwitz. Many players "realize" the intended meaning of the game's narrative goal, and then subversively act against the game's lugolodical goals: "Some of these players would derail the cars, while others would create virtual 'Denmarks' to give refuge to the tokens" [13].

6   Conclusions

GFI supports systematic design iteration: anticipating how changes to the game's structure will manifest in effects on players. By traversing GFI's three levels of abstraction, we expect designers can better conceptualize games, which might help "control for undesired outcomes, and tune for desired behavior" [47].

Throughout this paper, we decomposed games writ large, including ones that are not necessarily narratively-centered. This speaks to a fundamental claim that GFI buys into: all games afford to be interpreted *as* stories. This is vacuously true because we are narratively intelligent [43] and as Aarseth [2] has stated: people can narrativise anything. *Tetris* [67] is sufficiently representational [7] to afford discussing as symbolizing American life [64] or bodies in a grave [55].

However, the *point* of articulating GFI is to suggest that, while all games "tell" stories, some stories are more *intended* than others. (Game designer) Bateman [7] argues that everything that is representational – *i.e.* all feedback – contributes to the narrative. Thus, a game's potential for narrativization is proportional to the degree it communicates non-abstract information. The story in *SMB* is interpretatively simpler than that of *Skyrim*, but they are *both* stories nonetheless by virtue of being communicated via non-abstract feedback (*i.e.* phonological, lexical, grammatical, and denotational information). Thus, to elicit *intended* stories instead of alternate player-narrativizations, designers should center on manipulating the game's feedback. Our future work will explore *how*.

By formally understanding game design, we are better able to analytically describe particular game experiences, systematically investigate and predict causal determinants of those experiences, and better articulate the relevance of these research efforts to game design practice. GFI helps make sense of *how* game experiences are intrinsically narrative ones; we use it to reject the long-standing "antagonistic" relationship between story and gameplay as a false dichotomy.

GFI bridges narrative and game design and development, interactive digital narrative studies, and game research. In this paper, we use it to articulate what the activity of narrative design *is* and to explain phenomena that emerge from this design activity. We have presented GFI as a framework of modellable components, and have also presented models for each component; Goals are modeled with our Ultimate/Imperatives typology from prior work [84, 25], Feedback is modeled with a typology imported from linguistics summarized in Table 3, and Interpretation is modeled via the question-answering focused Sequence Method [58]. We expect GFI to clarify and strengthen the iterative processes of developers, scholars, and researchers alike, facilitating the decomposition, study, and design of a broad class of game-based narrative experiences.

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