

A Sequence of Possibilities

Constructive fictions, quantum authoring,
and the search for an ideal story system

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ABSTRACT

The rise of the interactive story over the past few decades has presented theorists and authors with a number of significant conceptual challenges, among the most foundational of which is the question of how to produce compelling experiences with nondeterministic and participatory narratives. While some preliminary attempts at creating taxonomies to catalogue the space of interactive stories have been advanced, there is still a confusion in both terminology and practice of what to call and how to understand the interactive story. I propose to define a particular subset of interactive story which I find most fascinating, the *story system*, a machine that enacts an ergodic multi-form story using procedures to both vary the narrative and encourage complete traversals. I profile several existing story systems, including *1893: A World's Fair Mystery*, *Echo Bazaar*, and *Balance of Power: 21st Century*. I then discuss a set of experimental interactive narratives I created or helped author content for as part of my MFA thesis work, discussing both how they function in relation to existing paradigms such as interactive fiction and hypermedia, and how they relate to the new concept of the story system. Several insights arose out of these experiments, including the concept of *quantum authoring*, where authors must keep a number of possible story states superimposed in their heads while creating content, and the need for better tools and high-level systems for authoring and managing procedurally narrative stories.

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“For the artist the [interactive] environment augurs new relationships with his audience and his art. . . . The computer acts much as an orchestra conductor controlling the broad relationships while the artist provides the score to which both performer and conductor are bound. . . . But the artist’s responsibilities here become even broader than those of a composer who typically defines a detailed sequence of events. He is composing a sequence of possibilities . . .”

—Myron W. Krueger, *Responsive Environments*, 1977

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1 Defining the Territory: The Problem of Interactive Stories

1.1 The rise of interactive art

Artworks that demand participation from their audiences were a growing concern of artists and theorists throughout the twentieth century, and are becoming the dominant medium of the twenty-first¹. Many scholars have begun formulating theories and aesthetics to help understand these new forms of art. The field of conceptual art, which “doesn’t produce works, but only virtualities, which can then be actualised, at each time and in each place, as unique performances” (Holmes, 2007, 353) was one of the first to begin grappling with the problems introduced by “an active ‘user’ who experiences not a static completed work, but an intelligent, responsive environment,” placed within a system “in explicit anticipation of its user: it is always becoming and never completed” (Birringer, 2008, 179). Umberto Eco traced the history of these “works in movement” as far back as the Renaissance, where “for the first time, man opts out of the canon of authorized responses and finds that he is faced (both in art and science) by a world in a fluid state which requires corresponding creativity on his part” (1989, 7).

1.2 What do we call the interactor?

One of the difficulties in understanding these new works is the question of what to call them and their participants. New media theorist Johannes Birringer catalogues some of these attempts when he speaks of grappling “with allocating new ‘roles’ to the former audience now called active visitor, user, immersant, participant, inter-

¹The video game industry, for example, began outgassing the film industry sometime in the first decade of the 2000s, perhaps around 2004 (Grover and Edwards, 2005). The question of whether video games count as artworks can still be a subject of debate, especially in debates involving people connected to the film industry.

actor, co-author, player, gardener, etc.” (2008, 180). Other proposed terms include “spect-actor” (Boal, 1979), “operator” (Aarseth, 1997), and the delightfully awkward “beholder-manipulator” (Bourriaud, 1998). Central to all these terms is the struggle to clearly label an agent who both observes and takes action, the “former audience” who must now assist in the realization of the drama.

The importance of this agent becomes even more relevant in the domain of participatory stories, which this thesis will discuss. The terms *interactive story* and *player* will be used to refer to these entities in the broadest sense, though we will define more specific terms later. While these terms have been highly contested for, among other reasons, not giving enough primacy to the capability these artifacts have for producing potential narratives (Montfort, 2003, 14), they have been selected here as more natural alternatives to awkward portmanteaus like “game-story” (Murray, 1997) or “rule-based objects that narrate” (Douglass, 2007).² While “player” in particular usually suggests games more than stories, we might keep in mind its sense denoting an actor in a theatrical company, and also its sense referring to “one who is playful,” willing to explore and experiment, a vital characteristic to help successfully navigate an interactive story.

1.3 Difficulties merging game and story

These linguistic battles reflect a fundamental conflict between two formerly separate entities, the game and the story. A debate between ludologists (game theorists) and narratologists dominated academic discourse on interactive stories around the turn of the current century (Pearce, 2005), and not all participants believed it was possible for game and story to be equal collaborators. DOOM co-creator John Carmack once famously said: “Story in a game is like a story in a porn movie. It’s

²I would hate my only citation of Jeremy Douglass’s excellent dissertation *Command Lines* to be a swipe; Douglass carefully catalogues years of criticism of the term *interactive* and his precision of language is illuminating.

expected to be there, but it's not that important" (Kushner, 2003, 120). Theorist Espen Aarseth expressed similar sentiments in a claim that narrative is the most disposable component of an interactive story, and attempts to analyze the medium under the rubric of narrativism will hinder true progress towards a hermeneutics of simulation, which is "bottom up and emergent where stories are top-down and preplanned" (2004).

Jesper Juul describes a similar tension between games offering an emergence structure versus a progression structure in his book *Half-Real* (2005, 71), and cites design pioneer Chris Crawford's similar distinction two decades earlier between games with low and high *process intensity* (1987). This tension between interactive stories that are primarily systems and those that are primarily narratives is perhaps the fundamental challenge facing authors of these stories, and only tentative steps have yet been made towards resolving it.

1.4 *Minecraft and Portal 2*

Two video games released during the final year of my MFA degree, *Minecraft* and *Portal 2*, demonstrate the still-sharp boundary between these two types of play experiences. Both are on the edge of what we might define as an interactive story. Both have been extremely popular among gamers. The differences between the two are illuminating.

Minecraft presents players with an open world of blocks of different materials arranged in a world of mountains, oceans, and deep cave systems. This world is populated by enemies, animals, plants that grow, fires that spread, and detailed systems for crafting new objects and materials. Players are given only a simple high-level goal (survive) or no high-level goals at all in "classic" mode, and are free free to explore, find treasure, share their creations with others, fight off hordes of enemies, or, most distinctively, reconfigure the world through constructing land-

scapes, architecture or machines. Despite the presence of narratively suggestive elements such as gold and monsters, *Minecraft* has no story, not even one implied by documentation or cover art. Its richly emergent play space makes it a stage for potential narratives, but it has none of its own. Nevertheless, it has been wildly popular, winning numerous “Game of the Year” awards and selling 2.3 million copies as of May 2011 (Persson, 2011), six months before its planned official release date.

In contrast, *Portal 2*, another wildly successful 2011 video game, is blessed with an abundance of story: it takes players through a tightly scripted adventure featuring several major characters, elaborately choreographed action sequences, and all the reversals and plot twists we might expect from a clever Hollywood film. The story is funny, well-written and -acted, and highly entertaining to experience. But it unfolds in the same way regardless of the player’s actions; the player’s agency is entirely on the ludic level of manipulating a special device to solve spatial puzzles. The way the player solves these puzzles, or how long it takes him or her to do so, does not affect the ongoing plot, which is always experienced in the same order for every player.³ As an interactive narrative, *Portal 2* functions more or less identically to *The Seventh Guest*, an interactive story released nearly twenty years earlier which also features a collection of puzzles embedded within a narrative framework—in fact, the older game is arguably *more* narratively interactive, since its puzzles can be solved in an arbitrary order or can even be ignored entirely in favor of environmental exploration. While both narrative framework and puzzles in *Portal 2* are certainly better produced and more entertaining, they still don’t interact with each other in any significant way.⁴ *Portal 2* successfully creates both compelling gameplay and a compelling narrative, but only as discrete entities that

³Sometimes characters will speak additional dialog while they wait for you to continue, but the fact that (for example) you spent ten minutes keeping a character waiting before continuing forward is never remembered past the moment you choose to acquiesce.

⁴In fact, both the original game’s portal mechanic and the sequel’s physics-changing colored gels were adopted by the development team from student game projects (*Narbuncular Drop* and *The Power of Paint*); in neither case was the mechanic developed in association with the story.

never, and can not, intermingle.

These two popular games are a contemporary demonstration that successful experiences can be created by ignoring one end of the game/story spectrum, or even by developing each one as separate entities, but marrying the two into a novel and compelling experience is still a challenge that frequently eludes both indie and mainstream designers. I believe, however, that truly revolutionary work will require game and story to work together.

The question of how to combine the magic of storytelling with the power of simulations—the compelling narrative progression of *Portal 2* with the emergent joy of *Minecraft*—is central to my thesis work. But there’s no commonly accepted term to distinguish these from experiences like *Minecraft* and *Portal 2*. Before moving forward, I would like to more precisely define the space I’m interested in, of interactive stories that both tell strong narratives and involve procedurality in the determination of how those narratives play out. I propose to call these artifacts *story systems*.

2 The Story System

2.1 Modes of Interactive Narratives

Over the past thirty years, interactive narratives have self-organized into a number of different *genres*, such as the first person shooter, real-time strategy, interactive fiction, and alternate reality game. But we mean something different by genre here than we do when we speak of a literary genre, like gothic, science fiction, or romance. While for readers the primary substance is the content, for players it becomes the set of skills needed to successfully progress: “if you’re good at shooters, you play more shooters. Communities of players form along the boundaries of the games they like to play. . . .the views and standards of those communities affect

new games. A genre evolves” (Plotkin, 2011, 60).

On a more deeply structural level than genre, however, we also can place literature in certain *modes*, such as the comic, ironic, or didactic modes. Literary modes are a “critical term usually identifying a broad but identifiable literary method, mood, or manner that is not tied exclusively to a particular form or genre” (University of Richmond Writing Center, 2010). Understanding that a work is written in a particular mode offers insights into the intentions of its creator and tools for understanding its aims and how it goes about advancing them. As with genre, interactive narratives can certainly use techniques from traditional literary modes. But also as with genre, we might find uniquely interactive storytelling modes which help us understand how procedurality affects narrative. My concept of the story system is one such proposed mode.

2.2 Prior Attempts to Categorize Interactive Stories

Prior theorists have attempt to taxonomize or catalogue different types of interactive stories in the past. I will make use of many of these definitions in order to more precisely define the mode of the story system.

2.2.1 Montfort’s IF Definitions

Though writing about a subset of interactive stories, text-based interactive fiction (IF), Nick Montfort defines a precise terminology for discussing these interactive narratives, and several of these terms are useful to our project here (2003, 31-2). Specifically, the terms *traversal* (a complete playthrough of an interactive narrative from a beginning to an ending) and *final situation* (the state of the story world at the conclusion of a particular traversal) will both be useful. Montfort also proposes the term *successful traversal* to mean a final situation that corresponds to “winning”; rather than invoke questions of what it means to win or lose a narrative, I will here

use the terms *complete traversal*, where the author and player are in general agreement that a fully formed and satisfying narrative has been told, and *incomplete traversal*, for situations where the narrative has been brought to an abrupt, unsatisfying end (as when a player dies halfway through, or otherwise concludes in a way not dramatically satisfying).

Montfort also notes: “A work of IF is not itself a narrative; it is an interactive computer program. . . . [A narrative] can result from an interactive session but does not describe any IF work itself” (2003, 25). This is important both because, like a single interactive fiction, a story system can produce narratives, but also because it is narratives they produce: I’m excluding for discussion in this thesis such artifacts as poetry generators and chatbots. A story system should be capable of producing something that most people would recognize as a complete, satisfying story.

2.2.2 Aarseth and Wardrip-Fruin’s categorizations

Espen Aarseth’s term *ergodic* is useful to know: an ergodic narrative is one requiring nontrivial effort from the player to continue advancing the story (1997). Turning a page does not count as ergodic, but being asked to pick a page to turn to does. Aarseth goes on to rate 23 texts using seven variables to posit a typology of ergodic literature, then performs a multiple correspondence analysis to determine the most significant variables. While Aarseth is attempting to map a much larger space than I am interested in, my concept of story system fits within the categories he labels as dynamic, controlled, and explorative: they can vary significantly from one traversal to the next, are not revealed at random but in a pattern establishing some sort of narrative progression, and are revealed in concert with the player’s decisions.

In a more recent project, Wardrip-Fruin also notes the utility of dividing the large and fuzzy category of “interactive narratives” into more precise subdivisions,

to engender “greater specificity about the forms and roles of computation involved” (2006, 397). Rather than developing a full framework, he instead proposes several dichotomies, such as distinguishing between works whose processes vary the output and those that do not, or those that require external input versus those that do not. In this thesis I will pose similar dichotomies in attempting to define the space of interactive narratives I’m most interested in pursuing, but like Wardrip-Fruin I will not attempt to create an overarching taxonomy. I will position the story system as an intersection in a Venn diagram, rather than a leaf in a taxonomy.

2.2.3 Murray and Mateas’ Poetics

In “A Preliminary Poetics for Interactive Drama and Games,” Michael Mateas defines interactive drama as the subset of interactive stories where “the player assumes the role of a first-person character . . . is immersed *in* the story” (2004). He also cites Janet Murray’s three aesthetic categories for the analysis of interactive story experiences: *immersion*, *agency*, and *transformation*. While I do not require a story system to be immersive, and thus have not adopted the term interactive drama here, I do feel the concept of agency is important. Mateas says a player will feel agency “when there is a balance between the material and formal constraints” of the system; that is, “when the actions players desire are among those they can take (and vice versa) *as supported by an underlying computational model*” (Wardrip-Fruin et al., 2009). If the range of actions the player can take is well-matched to the things he wants or is expected to do in the story world, he will feel agency. This echoes interactive fiction author Andrew Plotkin’s assertion that adventure games must make clear to the player which parts of a fictional world can be manipulated: “The interface’s capabilities must *match* the player’s options,” and frustrating mismatches must be solved by increasing the game’s affordances or making the interface more clear (Plotkin, 2011).

Murray's concept of *transformation* relates to an artwork's ability to change its audience by provoking new revelations into oneself or the world. Mateas finds agency and transformation potentially incompatible, but proposes to resolve this conflict by requiring interactive stories to function both on the level of a first-time player's immersive experience, and an *n*th-time player's more reflective, exploratory, holistic perspective of the system as a whole. To gain a complete perspective of a *multi-form story* (Murray's term; 1997, 30) that can generate multiple variations on a core narrative, a player must be able to rise above immersion in a particular variation and comprehend the system as a whole. Mateas' project *Terminal Time*, for example, is explicitly structured such that the audience experiences it three times; part of the rhetorical gesture is the understanding of how the system attempts to reframe historical stories to satisfy the whims of semi-hypothetical audiences. While I find this notion fascinating, I am not ready to limit my discussion only to works that explicitly allow such a change in perspective, or require an embodied player character. I would like to keep open the possibility that some interactive stories might be effective for immersed players who are blind to an ideal view of the underlying system, or omniscient players not viewing the narrative through the eyes of a specific character.

2.3 The Story System defined

Starting from these earlier categorization attempts, I define a story system as a machine that enacts an ergodic multi-form story, using procedures to both vary the narrative and encourage complete traversals.

2.3.1 "Story" and "System"

It is important to note that I use *story* here in the sense of *a particular story*, not *storytelling*. This distinguishes a story system from what others have called a *sto-*

ytelling system (Sullivan et al., 2010), such as the *Dungeons & Dragons* tabletop roleplaying set.⁵ We also want to set aside tools for the construction of traditional stories (such as screenplay-writing software), and tools for the construction of story systems (such as the Aurora Toolset, for authoring story systems that run within the *Neverwinter Nights* engine). A story system tells a single, but always multi-form, story.

A story system might, however, be enmeshed in or communicating with other interactive narrative systems. For example, we might say that a particular mission in *Fallout 3* with multiple solutions is its own story system, embedded within the larger story system comprising the whole game. A different mission in the same game that offered no branch points or other narratively significant procedurality would be a mere story—perhaps an ergodic story, but not a story system itself.

2.3.2 Machine

By using the term *machine*, I wish to restrict story systems to environments in which the narrative-making rules are enforced entirely by procedure (usually computer code), and do not require human intervention. This eliminates many compelling modes of interactive story such as tabletop and live-action role playing games, alternate reality games (ARGs), some storytelling board games, and dinner theater murder mysteries. These are not excluded because I find them uninteresting, but rather because each allows a human actor to change or override the system's rules. A game master might fudge a die roll to produce a more compelling outcome; a murder mystery actor might ad-lib new lines if a plot point becomes derailed due to unforeseen consequences. This human intervention is key to making these systems work, but it complicates the question of whether the underlying systems themselves can create compelling experiences. For this reason I exclude these systems from my

⁵A specific *D&D* module comes closer to being a story system, although see sec. 2.3.2.

definition of a story system.

At the same time, I do not wish to reject humans entirely from the equation, and am also limiting story systems to those that involve at least one human player. Aarseth's term *cyborg literature* (Aarseth, 1997, 134), referring to texts that can be actualized only through a combination of human and mechanical activities, is a close match to the aesthetic I'd like to capture (although not limited purely to the domain of literature).

2.3.3 Narratively Procedural

Story systems must involve simulations, but more specifically *those simulations should observably affect the narrative being told*. This creates an interesting distinction that often crosses existing genres in subtle ways. For instance, some interactive fictions are story systems, such as *1893: A World's Fair Mystery* (discussed in 3.1), where the player's movement through the story world significantly affects the content of their traversal. Others, such as *Photopia*, are not story systems; while traversals may vary in their descriptive details, the story always unfolds in the same way, progressing from the same beginning through the same series of plot points and always culminating in the same ending. The systems at play have no power to affect the narrative structure, only its presentation. Similarly, I would not classify *Portal 2* as a story system, as the player has no way to affect the plot; but I would include *BioShock*, which does offer the player a choice—albeit a simple one—that affects which of two narratively distinct complete traversals the player can experience.⁶

⁶The judgment of what counts as a narratively distinct traversal is certainly subjective; if *Photopia*'s code were to change one descriptive adjective in the final scene based on the way the player behaved in an earlier sequence, would it become a story system? Indeed, without access to its source code, how can we be sure it does not do exactly that? Both questions point back to the interpretive nature of the label; as film theorists might quibble over whether *Six String Samurai* functions as a western or is best interpreted as a satire, we might disagree over which interactive storytelling mode best informs traversals of *Photopia*, which (to me) does not seem to function as a story system.

2.3.4 Encouraging Complete Traversals

A story system should have procedures which enable and encourage players to enact complete traversals of the story. Many interactive stories, such as most gamebooks, offer one (or at best a small handful of) correct, “winning” endings and dozens of unsatisfying ones, often involving the sudden and dramatically unjustified death of the protagonist. In narrative terms, they are not complete or whole⁷ stories, and are not terribly compelling; the player is expected to start again in search of a better ending. Using the terminology defined above, we could say these interrupted stories are incomplete traversals.⁸ An interactive narrative framework that produces more incomplete than complete traversals is not an effective story system, because such a narrative is not meaningfully ergodic. An interactor interested only in choices that affect whether or not he experiences a compelling story might as well just read a good old-fashioned book, deciding at intervals whether the narrative is interesting enough to keep reading. Children’s author Amanda Goodenough, who created picture-based interactive narratives for the original Apple Macintosh, had realized this key point well over twenty years ago when she was interviewed for the visionary BBC documentary *Hyperland*:

“It’s possible to combine storytelling with interactivity if you take the

These questions also highlight a focus on player experience. As reader-response criticism focuses on the reader’s reaction to a work rather than the unknown (or unknowable) authorial intent (Tompkins, 1980, xv), here we focus on the player’s experience with the work instead of the possibly unreleased (or definitively lost) source code.

⁷We might go back as far as Aristotle’s concept of *wholeness* in drama in his *Poetics*; essentially, that a whole is that which has a beginning, middle, and end. More recent definitions of complete stories include the notion of a dramatic arc, with a primary character who undergoes a significant change while following that arc to a meaningful conclusion (Egri, 1960).

⁸While we earlier classified *BioShock* as a story system, doesn’t it also allow for many incomplete traversals such as the multiple times the player character will be killed by enemies? Other than not being explicitly delineated, how does this differ from a gamebook like *The Cave of Time*? I think the important distinction is that gamebooks tend to offer no way to predict which choices will lead to successful traversals and which will not. A shooter’s test of skill is better read as an obstacle in the way of a single ongoing narrative, whereas a set of explicitly branching paths implies an equality to those paths that is not supported by the narrative infrastructure. Note that a shooter with no significant narrative branches is not a story system, but a gamebook with more than one successful traversals could be.

story apart and make sure that each thread or each branch that allows a choice is a story in itself. If you have three branches that all lead to the same ending, each one has to be an equally valid story. And that is the challenge.” (Adams and Whitby, 1990)

Following this logic, I contend that most interactive stories designed to never end, including MMOs like *World of Warcraft* or story generation systems such as *Universe* (Lebowitz, 1984), also fail to be story systems.⁹ While Juul has claimed there is “no compelling argument demonstrating that a well formed narrative would be a more interesting player experience” (2005, 15), he later notes the applicability to gaming of Mihaly Csikszentmihalyi’s concept of *flow*, an ideal state where the player is consistently challenged with problems matching his or her skill level, becoming neither bored nor frustrated (ibid., 112). Yet the concept of flow can just as easily be applied to narratives which remain interesting enough to occupy the reader or viewer’s attention without straying too far from familiar forms and conventions (Sherry, 2004, 336). Interactive stories that never reach satisfying dramatic conclusions, or which let the narrative stall out between long sequences of *grinding* (repetitive, usually uninteresting gameplay) fail to keep the player in a state of narrative flow. In a well-formed story system, game flow and narrative flow should be both be possible to achieve and work in synergetic lockstep, affecting and complementing each other in the creation of a compelling experience.

2.4 What are the most interesting story systems?

Having defined the court I wish to play within, I now want to become more precise and describe the most interesting games we can play on that court. What are the most compelling types of story systems? Or, put in a more personal light, what are the story systems that will best allow me, as an author, to tell compelling interactive narratives?

⁹Although, as discussed in sec. 2.3.1, they may have story systems embedded within them.

2.4.1 Smoothly mutable stories

Mateas expresses a preference in his *Poetics* for “smoothly mutable” plots rather than binary, explicit choices (2004, 28). An unbounded, exploratory space invites the player to interact with a story system as world, not as a mechanical set of options, which is crucial for successful engagement with the narrative level of the system. For this I favor story systems that allow for smoothly mutable interactions, that feel analog rather than digital in the player’s engagement with them. Interactive fiction can offer this sensation, when well-designed; the lack of explicitly delineated choices can create a feeling that “conjures the unbounded richness of real action” (Plotkin, 2011). Augmented reality is another vehicle for creating this non-binary feeling of freedom, a tool I explored in my project *what if im the bad guy* (discussed below).

It should be noted that these surface-level sensations are not always matched by system-level affordances. An ideal story system both feels smoothly mutable to play and is matched by a smoothly mutable narrative structure under the hood.

2.4.2 Complex, Interesting Systems and Choices

Many story systems are procedurally narrative, but with only minimally interesting procedures. Take, for example, the story system created by Eric Zimmerman’s *Life in the Garden*. This physical product includes a number of cards with illustrations and short sentences. A procedure is followed to select a random subset of cards and place them within the covers of a book containing an opening and closing sentence, creating a temporary story.

Garden is a story system, but as a story system I have two main problems with labeling it an interesting one. The first is that the player’s role is simply to enact the given procedure. In *Half-Real*, Juul discusses the common game trope of *quests*, defining them as “a predefined sequence of events that the player then has to actu-

alize or enact” (Juul, 2005, 17). This enactment stretches far beyond the domain of RPGs; 2010’s breakout narrative game, *Heavy Rain*, in large part consists of enacting a series of movements with the game controller that make the player character take the next action in the story, from shaving in a bathroom mirror to dodging cars on the freeway. This literal enactment is ultimately boring for the same reason *Garden*’s ergodism is uninteresting; the player is simply following instructions, and is unable to challenge them within the bounds of the system.

The second reason I find *Garden* an uninteresting story system is that its procedure is simplistic. In an upcoming book on narrative systems, Wardrip-Fruin makes a case for interesting processes: as interactive storytellers, “our task should be to craft processes that contribute to the meaning of our works. . . . while altering one page of a Choose Your Own Adventure leaves most of its story material unchanged, altering one behavior rule or fact about the world can lead to wildly different . . . fictions” (2011). *Garden*’s narrative procedure is a simple random function, the shuffling of cards. The interesting processing happens in the player’s head: “The reader, stumbling across these narrative fragments, invents ways to connect them, imparting to them additional meanings” (Zimmerman, 2007). This is fascinating not because of the system itself, but because of the human capacity for meaning-making. The authorial work to make the experience compelling went not into the system, but towards creating recombinable, meaning-laden texts to produce. Zimmerman acknowledges the experience would feel robbed of its power were it implemented in digital form, and calls it a “magic trick,” a ritual act designed to imbue its randomness with significance. While this makes it no less interesting or unique as an artifact, it puts it outside the realm of interesting story systems, which ideally should contain complexity in both their content and their procedures.

Zimmerman’s approach implies an evocative but rarely explored collaboration between human imagination and digital narrative systems. Author and scholar D.

Fox Harrell proposes merging the power of human meaning-making with computational systems in his essay “Phantasmal Fictions” (2010). First noting that much of the human experience explored in traditional fiction is based on phantasmal mental constructs like gender politics and racial and social identity, he proposes:

“Modeling aspects of these cognitive processes that are regular enough to be amenable to procedural description, and crucially leaving the rest up to the facilities of human artists, can undergird a range of types of computationally expressive works. . . . If we see that substantial aspects of our experiences are, in fact, cognitive fictions as opposed to objective realities, the implications are profound.”

Here, systems modeling both narrative and human understanding work in synergy with the artist’s intentions and the player’s imagination to explore complex, meaningful fictional spaces. Harrell has used his GRIOT system for “conceptual blending” of metaphorical concepts and narrative elements (2007) to produce interactive experiences such as the “Living Liberia Fabric,” a non-fiction story system exploring and “supporting the goal of lasting peace” in Liberia after decades of civil war (Harrell et al., 2010). Crucially, the framework of phantasmal fictions makes explicit that narrative is not the only component of story our simulations might want to encode: character and metaphor can be equally fruitful subjects of simulation and help differentiate a compelling story system from an uninteresting one.

2.4.3 Authorability

Finally, as an author, I’m interested in story systems that offer authors ways to create compelling experiences for players. A system based on branching paths, for instance, meets all the requirements of a story system, but quickly becomes unauthorable as the amount of content required grows exponentially. Methods to cheat this, such as recombining branches, also cheat the player’s choices of significance, and at their worst extreme reduce the player’s agency to enactment (2.4.2).

On the other hand, a purely open sandbox world like *Minecraft* has very few tools an author can leverage to tell a specific story. We can imagine creating a *Minecraft* world with narratively significant elements (say, a glass castle filled with gold bricks and spiders) but there are no tools to help us craft a dramatic, narratively satisfying traversal for an audience, or create a dramatic arc that might tell a complex story.

Drama management has been offered as one solution for making meaningfully interactive story systems authorable (Weyhrauch, 1997); however, it is still not clear that this approach genuinely reduces authorial burden in non-trivial implementations, or provides any meaningful authorial leverage (Chen et al., 2009). Academic projects to incorporate drama management have all required scaling back an existing interactive story to a simplified form in order to produce an authorable experience.¹⁰ Search-based drama management also can come with a high computational burden, as the time required to forward-project interestingly large possibility spaces can easily become intractable.¹¹

An ideal story system will provide authors useful tools that allow them to create compelling, richly narrative experiences in a reasonable timeframe.

3 Analysis of Prior Work

I would like to briefly discuss a few existing story systems that offer (in my opinion) compelling experiences, in the hopes of teasing out patterns in their successes and failures.

¹⁰Weyhrauch's *Tea for Three* is a simplified version of the IF *Deadline*, while more recent academic projects have been based around simplified versions of *Anchorhead* (Mateas and Nelson, 2005) or a *Zelda*-style adventure game (Sullivan et al., 2008) that is smaller in scale than even the original 1986 *Legend of Zelda*.

¹¹*Façade*, discussed in 3.3, uses unit-selection drama management which does not suffer from the computational overhead of search-based drama management. This approach, while promising, still suffers from problems with authorability, as discussed below.

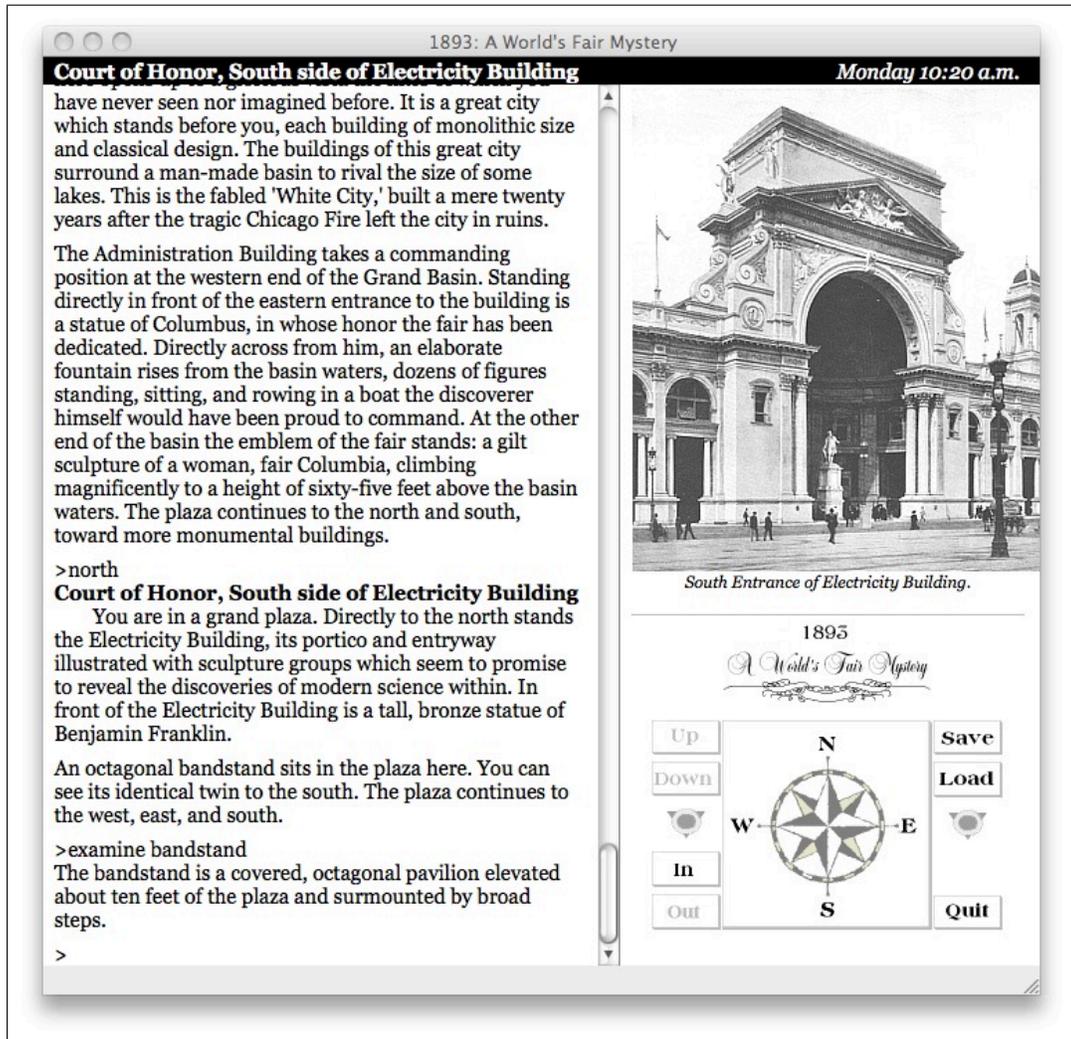


Figure 1: *1893: A World's Fair Mystery* in action.

3.1 *1893: A World's Fair Mystery* and open worlds

1893: A World's Fair Mystery (Fig. 1) is an interactive fiction offering an immaculate recreation of the 1893 World's Fair in Chicago. Playing a detective investigating a fictional diamond heist in the midst of the fair, the player can wander through a well-researched and immense story world recreating the monumental fairgrounds, and perform a wide range of actions reasonable for either a tourist (a role which at first the player character must adopt to orient himself) or a detective. Items can be purchased, demonstrations watched, and suspects followed. Systems for

money, food, weather, sleep, hints, mass transit, and time are all simulated, alongside standard interactive fiction world model features such as spaces, objects, and movement. Successfully traversing the story to its ideal final situation requires enlisting the help of non-player characters, exploring and mapping over three hundred locations, solving a number of adventure game style puzzles, and observing rules of time and space (certain events only happen at certain times). *1893* is one of the most complex interactive fictions yet written.

As a sandbox for exploration, *1893* fits into the group of games categorized as *open world* simulations, along with other such as *The Elder Scrolls IV: Oblivion*, *Grand Theft Auto III*, and *Fallout 3*. These games are characterized by their high degree of local player agency, giving players free reign to explore a story world and take a set of actions appropriate to the character they are given (usually a member of the criminal underworld in the GTA games) or create (ranging in Oblivion from reptilian thieves to elven battle mages). It is important to remember the point made in 2.3.1, however: open worlds are not necessarily themselves story systems. Most open worlds advertised as games have one sometimes multi-form story embedded within them, usually referred to as the *main quest*. Often there are opportunities for a number of optional *side quests*, which are standalone narratives whose completion is rarely relevant to the outcome of the main quest. Open worlds without embedded narratives, such as *Minecraft*, are not story systems. Some open worlds that offer a strict main quest that cannot be deviated from, and thus are not procedurally narrative, might also not count as story systems.¹²

1893 has a more complex narrative structure than most open worlds. As with some but not all open worlds, its main quest of recovering the stolen diamonds and catching those responsible can be pursued before, during, or after a pure exploration

¹²The *Final Fantasy* series has been approaching this extreme for years. I'm not sure if it's ever actually reached it, although the phrase "on rails" seems to come up more and more often in reviews of its newer entries.

of the fairgrounds, or ignored entirely. Each of the seven missing diamonds can be recovered in any order, and its multiple villains can also be tracked down and defeated in a variable order. At least some of the puzzles have multiple solutions, and the story can continue even if, for example, one of the three villains escapes (Welbourn, 2002). All story branches converge at a single “correct” final situation (except for incomplete traversals brought about by player death or mistakes). *1893*’s relative complexity compared to other single-author story worlds was partially made possible by its implementation as a textual interactive fiction¹³ rather than a resource-heavy graphical realization, which would have required massive amounts of content in the form of 3D models, textures, animations, voice acting, and other resources. Representing such a world with only text and procedures vastly reduces the number of person-hours required. Interactive fiction is also perhaps inherently suited to open worlds due to its built-in support for low-level player agency, and it is surprising that open world IF is not more common.

Many open worlds try to combine the best of both emergence and progression by alternating high-agency exploration with low-agency narratives, but where these systems most often fail is in the lack of interaction between the two. The many interesting choices offered by an explorable, manipulable environment are too often linked to a linear, inflexible, and ultimately entirely optional story. We can see this by imagining how easy it would be to add a main quest to *Minecraft* without perturbing anything about the systems simulating the world; the two could be entirely independent. This frustration between emergent world simulations and strictly hand-authored quest and story opportunities creates the desire for a system that could incorporate emergent story behaviors with the same elegance as emergent physics behaviors (Sullivan et al., 2010). The tight coupling of *1893*’s open world to the narratives embedded within it offers a noteworthy approach towards

¹³A commercial version of the game features period music and several hundred photos of the actual fair integrated into the experience, although these are not essential to complete it.

this ideal—much information you need to advance the plot can only be learned by exploring the environment, and the systems simulating the world directly relate to the motivations and backstory of many key characters—but this still remains a rarely explored corner of the interactive story space.

3.2 *Echo Bazaar* and subtractive hypertext

Echo Bazaar (Fig. 2) is a browser-based casual game with a surprisingly sophisticated narrative framework (Arendt, 2010). Unlike similar games with a narrative patina but gameplay consisting of mostly repetitive combat (such as the recently cancelled *Legends of Zork*), *Echo Bazaar* has an interesting story world and a large amount of hand-authored content.¹⁴ Players move between (initially) half a dozen locations, each of which offer a different and slowly changing group of “storylets” to participate in. Players spend a daily allotment of action points to play these storylets, or draw from a set of random event cards, which they can play immediately or hold in a small hand until later. Combined with the ability to both cosmetically and mechanically customize their character, interact with other players and in-game NPCs via Twitter, and trade items in the titular bazaar, the game offers players a great deal of local agency.

Echo Bazaar players are defined by an unbounded set of “qualities” that can increase or decrease mostly through interaction with storylets. While four qualities are of prime importance and are presented much like RPG attributes, in fact: “Every object in EB is a quality. If you have 4 Jade, your Jade quality is 4” (Ibid.). Qualities control access to the storylets, each of which offers a self-contained narrative event with one or more possible responses. These are mostly non-combatitive in nature and have a great deal of variability. For instance, presented with a drunken suitor,

¹⁴approximately 400,000 words as of early 2011, according to the official site: echobazaar.failbettergames.com/



Figure 2: *Echo Bazaar* in action.

the player might choose to seduce him, rob him, or publically humiliate him. Some solutions are only opened up if the player has reached a certain quality threshold. Some may be more difficult than others. Both failure and success produce changes to qualities, more often positive than negative (failing usually raises a relevant primary quality, while success often gains the player qualities representing currency or other in-game valuables). Some storylets are designed to be interactions between two players: when these appear, a player can invite another player to participate, and the receiving player can choose their course of action when they next log in, which can have results for one or (usually) both parties.

Bazaar also features a mid-level organizing structure, “ventures,” which consist of a linked chain of storylets: usually a beginning, a middle which must be performed multiple times to raise a temporary quality to a threshold value, and an ending tested against the temporary quality. Success often results in a significant material reward that might open up new storylets, ventures, or locations. The creators have codified at least sixty different design patterns for the interaction of qualities, storylets, and ventures, ranging from simple concepts such as barring a venture from appearing while the player has too much of a certain quality (like “insane”) to more complicated structures such as the one called “Faust’s Tea Party,” where a player initiates an interaction with another player where both individuals will gain some amount of a desirable quality but lose some amount of another desirable quality.

While these interlocking systems produce compelling ambience, agency, and short-term narrative progression, *Bazaar* lacks longer-term dramatic structure. The creators characterize this as a “fires in the desert” approach: they have provided interesting points of light in an imagined narrative journey, but not the connecting lines between them. I feel *Bazaar* fails to be engaging over long term interaction because of this lack of forward narrative momentum. While later versions of the game

introduced the “ambition,” one of several long-term plot arcs with multiple ventures advancing an ongoing story, the player must engage in many hours of grinding between ambition-related ventures to raise primary qualities to values that will unlock new content. Grinding is a problem for many aspiring story systems. Juul has noted that “with sustained playing of the same game, the player may become less interested in the representational/fictional level of the game and more focused on the rules of the game.” Once a story system stops acting like a story and becomes only a system, it has been reduced to a mere game. *Echo Bazaar* makes a noble effort to transcend this limitation, but does not quite achieve a state of narrative flow.¹⁵

Bazaar’s infrastructure is similar to the proposed “sculptural hypertexts” speculated about by Mark Bernstein and Diane Greco (2004) called *Card Shark* and *Thespis*. These hypothetical story systems would selectively and procedurally remove connections between linked story nodes based on a set of cards held by the player; the latter system proposed a more complex alternative with multiple characters drawing and playing cards. In this way the overwhelming and narratively frustrating multiplicity of connections in a hypertext fiction can be simplified to only the narratively interesting choices by a set of procedures designed to create a stronger narrative. *Echo Bazaar* has the cards, locations, restricted connections (via qualities), and multiple actors, and can in many ways be read as a possible implementation of this system. When I first encountered Bernstein and Greco’s proposal, I was skeptical of their requirement that the player must control “a minor character inhabiting the periphery of the action,” one who is “unimportant, unheroic”; the question of why a player would want to control such a character was not satisfactorily answer for me. Their goal in this was to allow for the forward momentum to be provided by an author/system-controlled protagonist, who would ensure the tragic decisions, ironic timing, or witty repartee needed to produce a compelling

¹⁵And in fact, since it is marketed as an ongoing, subscriber-based casual game, its creators have little incentive to solve this particular problem.

story. Perhaps *Bazaar*'s failure to produce compelling long-term narratives can be blamed on making its player characters decidedly heroic and thus able to act in dramatically unsatisfying ways. However, I suspect the lack of affordances given to the player to affect their long-term fate is a larger problem. A player cannot alter the ongoing story except by succeeding or failing at pre-authored challenges; their decisions are limited to which aspects of the narrative to engage with, not what direction to take it.

More significantly, I think neither the theoretical nor the implemented systems make the conceptual leap asked for by Andrew Stern in his response to Bernstein's essay: "[while] it seems likely that certain types of stories such as traditional tragedy may not work as an interactive story ... instead authors will need to tell the kinds of stories that do work interactively" (ibid., 173). *Card Shark* imposes a traditional narrative by denying the player any significant actions; *Echo Bazaar* avoids it by creating only the "fires in the desert" but not the lines to connect them into a developed story. Meaningfully interactive story systems will need procedures to handle both the dots and the lines, and player characters interesting enough to traverse this web in an engaging way.

3.3 *Façade* and interactive drama

Stern and his collaborator Michael Mateas released a story system designed to test some of these hypotheses in 2005, *Façade* (Fig. 3), one of the most influential interactive stories of the previous decade. *Façade* casts the player as an old friend arriving at the apartment of a couple on the verge of marital collapse. As the couple bicker, the player can communicate with them in natural language and real time, take actions such as answering a phone or requesting a drink, and attempt to sway the course of the argument, during a multi-form story experience lasting about twenty minutes.



Figure 3: *Façade* in action.

Façade attempts to provide the player both local and global agency, by use of a number of overlapping systems of “multiple, mixable hierarchical levels, sequenced by procedures written in multiple, mixable authoring languages ... we divide the narrative into *multiple fronts of progression*, often causally independent, only occasionally interdependent” (Mateas and Stern, 2007). Multiple systems work in parallel at both the moment-to-moment and scene-to-scene levels to attempt to provide both player agency and narrative progression to the experience. This use of both a high-level drama manager and low-level systems like global mix-ins, which allow the player to temporarily change the subject then ease back into the former flow of conversation, attempts to manage the “trade-off between coherency and the combinatorial explosion.” This high degree of narrative procedurality makes *Façade* one of the most complex story systems yet built.

But *Façade* approaches the edge case of what we might define as reasonably authorable: its creators estimate three person-years of authoring were required to produce a twenty minute experience (ibid., 205). Perhaps some of this time can be

attributed to the high bar set by aspiring to professional production values, including the use of recorded voice acting. The authors also note the difficulties of recognizing natural language utterances and clearly communicating the system state to the player through natural performance. Mateas has made a case that language is necessary to communicate complex plot, and that the player must be able to respond with the same language used by the characters to balance the material and formal constraints (2004, 28). However, this requirement creates enormous challenges for system builders, potentially touching on two massive and unsolved computer science problems, natural language generation and natural language understanding. We will next look at another system that attempts to balance this affordance by simplifying the language.

3.4 *Balance of Power: 21st Century* and process fetishism

Built with a 2009 version of Chris Crawford's StoryTron engine, *Balance of Power: 21st Century* (Fig. 4) is perhaps the most purely procedural story system created to date. *Power* invites the player to act as the president of the United States in a post-9/11 world. The player can choose from a large number of international policy goals to pursue, and has a wide array of strategic options to choose from in attempting to implement them. As in real international politics, direct action is often impossible; instead, players must attempt to sway countries to support US policy through indirect means or through organizations such as the United Nations.

StoryTron (formerly Erasmatron) is an engine and a language for creating story systems. Its major structural elements include actors (who can have an unbounded set of author-defined traits, mostly numeric along an axis), stages (discrete, unconnected locations), and props, which can be positioned in relation to stages and actors. The system's main divergence from other narrative systems is that it tracks several abstracted layers of awareness of these traits: both each actor's perceived

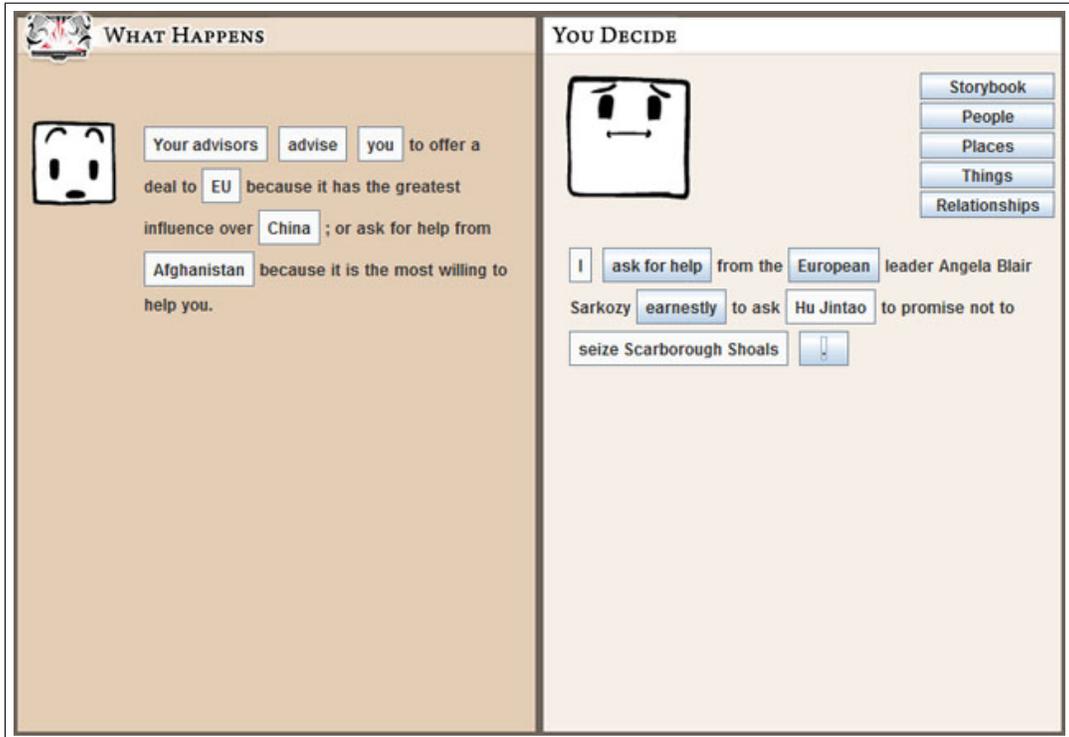


Figure 4: *Balance of Power: 21st Century* in action.

traits of all other actors, and, when necessary, actors' perception of other actors' perceptions. Combined with a verb-based language called Deikto, this allows for actors to express quite complicated concepts (such as "USA proposes deal with Japan that if Japan asks Israel to abandon settlements in the Gaza Strip then USA will move for sanctions against Iran") with actors taking into account complicated relationships (such as Japan's perception of Israel's perception of Iran). The system also has the virtue that the player can communicate in the same language as the system's agents: using drop-down menus, the player forms Deitko sentences expressing intents, which the non-player characters (here representing other countries) can respond to in the same fashion ("Japan refuse deal.")

Power certainly produces a complex, narratively rich system to interact with and explore. But there are two major problems with this system. First, the wide-open affordances implied by the premise, and even the drop-down menus in certain situations, are not always made available to the player. For instance, you can threaten a

country with a promise that you will take a certain action unless they take another action; but the two lists of actions are not the same, nor are they the same as list of actions you can pursue yourself at any given moment. Why are these lists different? It's unclear to the player.

More seriously, the system does not seem to encourage dramatically satisfying traversals in any clear way. If we consider the output of a session with *Power* as a story, it often falls short. One reviewer of *Power* made his point bluntly:

“The elephant in the room, though, is: does Storytron represent a new way to tell a story? Because that’s how it’s billed. I would argue that Balance of Power 21st Century is barely a story at all. There are the elements of story—character, plot, setting—but there is no emotional content there at all, and little for the reader’s imagination to grasp hold of. . . . More fundamentally, I also believe the most interesting character moments in stories defy the kind of modeling techniques that Storytron employs” (Klimas, 2009).

In a comment posted to this review, Crawford suggests that perhaps the subject matter of this particular story colors the reviewer’s perception of the underlying system; with a “smaller and more emotionally-centered” story, he offers, these complaints might be addressed. He also repeats a claim made elsewhere (Crawford, 2007) that “Storytron will never equal the very best hand-crafted storytelling. That’s because its strength lies in its interactivity, not the polish of the resulting story.”

The question of whether *Power*’s failure to create an emotionally engaging experience is entirely by design—contained within the content and presentation layers, rather than a deeper flaw in the underlying narrative procedures—is difficult to answer without more StoryTron-driven experiences to try. Despite an attempt to entice others to participate, two years after the system’s public availability, *Power* remains the only released story created with it (Crawford, 2011). I agree with Crawford that a compelling story system driven by StoryTron would produce narratives

much different than traditional stories, and I would be curious to create a story system in his framework that attempted to work within the affordances it offers, rather than fight against them. *Power* is at the least an interesting experiment charting the boundaries of how procedural a story can become before we no longer identify it as a story. Whether that failure of identification is a function only of our lack of preexisting models for processing such radically different experiences, or represents a genuine boundary between one type of experience and another, awaits the construction of a new generation of radically procedural story systems.

3.5 *Blue Lacuna* and procedural ownership

I would like to close this review of existing story systems with a brief overview of my own contribution, the 2009 textual interactive fiction *Blue Lacuna*. I have written more extensively elsewhere about my goals with this piece (Reed, 2010; Reed and Malloy, 2011), but I'd like to reexamine this project in light of the story system mode. Most relevant of my goals in producing this work was a wish to allow the player to take a meaningful role in defining a relationship with the central non-player character, Progue. The player shepherds a relationship with this character from first meeting to the conclusion of his character arc. As the player interacts with Progue in a series of scenes, Progue's feelings about the player change on three axes; the combination of these three values defines which of twelve possible archetypes (such as "Bitter Father") best describe this relationship. The availability of lines of dialogue, scenes, and character arc resolutions are affected by the dominant archetype.

Lacuna offers less choice in plot than in character relations, mostly sticking to a main quest; however, several sequences allow for significant narrative divergences which either end in alternate complete traversals, or merge back with the main quest with the possibility of that outcome being referenced later. For example, early in the

story the player may choose to delay an important decision, which causes twenty years of time to pass for the player character. Though the story ultimately continues the same way regardless of which choice is made, the decision both colors the player's perspective on the subsequent events, and has minor but significant consequences at various points later in the narrative. *Lacuna* becomes more procedurally narrative during its final chapter, offering nine different resolutions to and a larger number of variations on a climactic scene with Progue, as well as one of three different playable epilogues dependent on which of three characters the system believes is most important to the player. During its middle, *Lacuna* shares some qualities with open worlds, presenting a large area for exploration where many different actions can be taken in variable order.

As a story system, I believe *Lacuna* is most effective in combining agency over a significant personal relationship with an open world and multi-form story. The use of multiple systems, on both small and large scales, to help the player feel ownership of her particular traversal of the story seemed effective at producing a compelling experience. Its biggest failings, I feel, are the large authorial burden brought on by the hand-crafted rather than truly procedural narrative structures it encodes. Nearly all of the narrative variation *Lacuna* offers is a result of careful hand-authoring of possible branches, which does not play to the computational strengths of a story system. In addition, the more complex system simulating the relationship between the player character and Progue was often frustratingly opaque. In an attempt to keep the player immersed in the story world, I described his state using adjectives or short phrases, which often did not stand out enough from the surrounding text or did not clearly delineate the possible states enough for players to get a handle on the system.

Despite these flaws, I remain proud of what I was able to achieve with *Lacuna*. While it fails to introduce meaningful narrative procedures to a story system, it

does incorporate meaningful *character* procedures. As we saw with the concept of phantasmal fictions discussed above (sec. 2.4.2), it may be useful to keep in mind that plot is not the only component of narrative which can be simulated.

4 Thesis Project: “*what if im the bad guy and other stories*”

My MFA work is a collection of four experimental interactive stories, informed by various existing aesthetics including interactive fiction, augmented reality, and hypermedia narratives. I have been inspired in this approach in part by the work of Ken Perlin, who spoke at UC Santa Cruz about the importance of experimentation for artists (2010). His website¹⁶, littered with hundreds of minor experiments he has developed in pursuing his own goal of procedurally interesting character animation, is an inspiration for anyone afraid of starting a project without knowing how to finish.

As I pursued these projects, I began to slowly define the types of interactive stories I was interested in telling. The concept of the story system arose out of this process of experimentation. I will examine these projects both in light of the existing traditions they are informed by, and in terms of whether they can be effectively understood from within the story system mode.

4.1 *18 Cadence*

This experiment imagines a fictional house at the address 18 Cadence Street, and allows the player to explore it in both space and time (Fig. 5). The lives and stories of the people who have lived there are told in single-sentence chunks anchored in

¹⁶<http://cs.nyu.edu/~perlin/> as of 2011

time and space.¹⁷ Along with a map of the house, a list of items visible at this place and time is visible to players exploring the house:

Corner Bedroom, 1972

Marianna (age 19) joins in with a half dozen other would-be dancers, laughing and relaxing over cheap champagne.

a ballerina music box
some folded work aprons
some dance shoes

In addition to controls to navigate the house, both physically and temporally, the user also has controls with which they can capture sentences of text (descriptions of either descriptions of an actor performing an action, or an individual item situated within the room). These sentences are added to a blank canvas below the main text, which has room to fit five such sentences. Additional controls let the player select which of the five slots they wish their next captured sentence to be placed into. These controls were implemented as a trackball (to control forward and backwards movement through time) and a gamepad (movement and “camera” controls).

18 Cadence offers little instruction to the player as to how to shape their high-level experience. Participants can explore the house without constraints, treating it like a fourth-dimensional wax museum of vignettes they cannot affect, only observe. They might notice connections between certain events and become curious in unravelling a particular mystery, such as the why the empty-nester parents occupying the house during the 1970s seem estranged from one of their two sons. By exploring temporally, the player can attempt to discover enough about the house’s history to answer these questions. Finally, the participant can make use of the snapshotting functionality to attempt to assemble a story of their own. On this level, the piece functions something like a filmmaker’s editing booth: presented with the vast raw material of the house’s entire history, the player is implicitly challenged to select five moments that can assemble into a narrative. As with cinema, these

¹⁷Originally intended to cover a century of history, from 1900 to 2000, as implemented in the MFA show the scenario covered only the years 1960 through 1979.



Figure 5: *18 Cadence* on display at the 2011 DANM MFA show.

moments need not be chronological, or even coherent when juxtaposed; they may attempt to tell the story of one of the house's occupants, or they may not, instead choosing to focus on seemingly trivial details of furniture or possessions, or focus on minor moments in the lives of the occupants instead of those which seem most charged with narrative potential.

Technically, *Cadence* was written in Inform 7 using several custom extensions.¹⁸ The map of the house was implemented using standard rooms. All of the furniture of the house was created in a dynamic table which specified the beginning and end years that item appears in, as well as its location and how to describe it.¹⁹ A sep-

¹⁸Prose Room Descriptions by Aaron Reed, Flexible Windows by Jon Ingold, and Glulx Input Loops by Erik Temple, most notably.

¹⁹Each item can be given a verb clause relating it to a possibly shared supporter, such as “hangs on” and an object representing a room's wall, as well as a pair of adjectives that can be used during the first or last third of its temporal existence, such as “new” and “fading,” and a numerical importance value for each item. An extension called “Prose Room Descriptions” was developed that can generate descriptive sentences grouping objects by supporters and inflecting verb phrases accordingly, resulting in output like “Hanging from the bedroom wall are a fading KISS poster and an autographed t-shirt.” Objects with higher importance values are more likely to be mentioned earlier, in their own sentence, or with supplemental adjectives. This functionality was ultimately not used

Section – Corner bedroom, Mark and Daniel (1960 – 1969)

Mark is a man with birthday 1951. Daniel is a man with birthday 1949. Leonard is a man with birthday 1922. Phyllis is a woman with birthday 1926.

Table of Corner Bedroom Stuff (continued)

thing	incept	expiration	new-adj	old-adj	action phrase	platform
an Erector set	1960	1962	--	--	"lies in pieces on"	MD floor
a crystal radio set	1963	1969	"new"	--	"sits on"	wooden chest
some comics	1960	1964	"well-worn"	"forgotten"	"hide in a corner of"	MD closet

Table of Character Tableaus (continued)

person	room	year	action phrase
Leonard	Corner Bedroom	1960	"says it's up to [Daniel] who gets the top bunk, since he's older, and [Mark] sulks for days"
Mark	Corner Bedroom	1960	"sulks for days when [Leonard] says it's up to [Daniel] who gets the top bunk"
Daniel	Corner Bedroom	1960	"can't believe [Mark] sulks for days when [Leonard] says the older brother gets the top bunk"
Daniel	Corner Bedroom	1961	"reads a story from Astounding out loud to [Mark], who listens rapt as his brother does voices and sound effects for the Venusian invaders"
Mark	Corner Bedroom	1961	"listens Rapt as [Daniel] reads a story from Astounding out loud, doing voices and sound effects for the Venusian invaders"

Figure 6: Authoring for *18 Cadence* (using the Inform 7)

arate table tracks actors and descriptions of significant actions they take in certain locations and years. As the player operates the installation to navigate through the space, the furniture is moved into place and visible actions are played back, along with supplemental information such as how old each actor is in the given year. The photography functionality was implemented by creating a series of template sentences that could be filled in at the time the photograph was taken, such as “[current year]. [prose name of location], [it-they of star] [action of star].” Unlike the sentences visible during main navigation, these are processed into plain text and stored in one of the five available slots.²⁰

Authoring for *18 Cadence* is relatively straightforward (Fig. 6). Objects and in the exhibited form of the piece, which simply listed scenery items on the right of the screen (a response to frequent criticism that the objects seemed to be more important than the people).

²⁰A more elaborate earlier prototype where the player could select an arbitrary number of elements (actors, objects, years, ages) and have a sentence generated incorporating everything selected, was shelved as too complex for both the participant and the system, although early work was done implementing a hierarchy of tables. This system could, for instance, have begun by eliminating those templates which don't include a year slot, then eliminate those that don't offer a slot to include a list of objects, and so on until a match was found; otherwise, it would try generating two sentences incorporating all the requested elements, and so on.

character moments are defined in tables within the Inform 7 IDE, which features smart resizing of columns allowing for a more fluid experience than working directly in a spreadsheet application, as well as syntax highlighting and other useful features. Since a recorded sentence might be from the perspective of any character participating in a tableau, these must be rewritten from the perspective of each of them. Writing the life story of people as a series of disconnected significant moments, and being further limited only to those events that take place within the walls of their home, was an interesting but not particularly difficult challenge. Working a whole story point into a single sentence was the larger difficulty, which often required splitting a story into multiple rooms with an implied chronology between the two moments, or over multiple years (such as showing the beginnings of one action and suggesting the results of it later). The story logic here was well-isolated from the authoring environment, meaning I was able to focus on the writing.

Cadence is informed by the tradition of textual interactive fiction (Montfort, 2003), although it differs significantly from several canonical features of the form: it lacks text-based input and does not simulate a traditional model world where the player can affect a change in the simulation. It is perhaps closer to hypertext fiction with its exploratory focus and lack of an overall narrative structure. As an experiment in allowing players to construct or explore their narratives from narratively charged raw material, I felt it was an interesting success, somewhere between the “magic trick” of *Life in the Garden* and an open world like *1893*. The concept of the *temporal open world* that allows for free exploration in both time and space has only rarely been implemented, and gives the player a unique and exciting variety of agency.

Expanding this project into a story system might involve encoding notions of narrative significance into the representations of objects and events. One might attach metaphorical meanings to various objects, and create procedures to connect

different metaphors together.²¹ Giving more explicit goals to players could also structure a meta-narrative of their process of exploration and discovery.

4.2 what if im the bad guy

*what if im the bad guy*²² (Fig. 7) represents the most ambitious and time-consuming project presented in my MFA show. Inspired by a fall 2010 news article about a platoon of US soldiers accused of systematically murdering innocent Afghan civilians²³, the project used augmented reality (AR) to create an immersive exploration of the events leading up to the killings, in an effort to understand the perspective of the accused soldiers and the events that might have led them to take such horrific actions. Something that struck me was the level of access the public had to the private lives of the soldiers involved, because of the increasing pervasiveness of social networking sites. When the story was first breaking, I easily found profiles for several of the accused soldiers on MySpace, Facebook, Classmates.com, and other similar sites. These were rapidly filling up with invective comments either vilifying the soldiers or condemning their accusers. In contrast, the victims, all from poor areas of a war-torn third-world country, had no online presence and almost nothing was known about them except their names and dates of death. The victims, in contrast to the soldiers, remained almost completely anonymous. This led me to thoughts

²¹Such a system might make use of the highly authorable arbitrary relations between objects that can be created in a language like Inform 7. I've previously implemented a bare-bones system that finds a path between any two objects in a story world through the metaphorical concepts they're associated with (<http://aaronareed.net/if/ex1/>); for instance, if trying to connect to the concept of being lost, examining a jacket might remind you of coldness, then wilderness, then being lost.

²²The title comes from a tattoo on whistleblower soldier Justin Stoner's back, reading "what if im not the hero // what if im the bad guy". This turns out to be a quote from the hugely popular *Twilight* series of books and films that repurpose vampire mythology into a pop-culture product, replacing blood with sparkles, which only strengthens for me its appropriateness as a title.

²³I believe the article that inspired the project was "Stryker soldiers allegedly plotted to kill Afghan civilians," appearing in the August 24th *Seattle Times*. In the months that followed I did a great deal of research on these events and background history; some of my primary sources are listed in Appendix B.

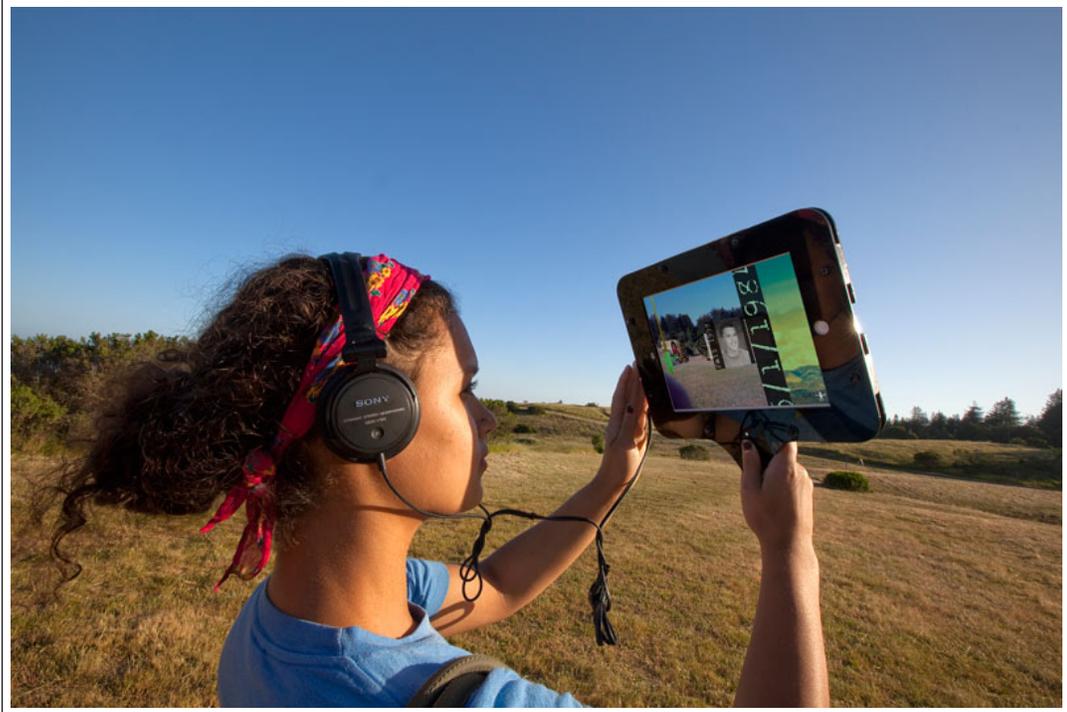


Figure 7: *what if im the bad guy* running on an iPad 2 in a custom case designed by Phoenix Toews.

about whether augmented reality's affordances for physically instantiating virtual objects could make it a useful framework for exploring the vast distances on many levels that separate US observers from the realities on the ground in Afghanistan.

The project was developed for Palimpsest, an AR framework and Lua scripting language for iOS devices created by Phoenix Toews (2011). Through a series of conversations, Phoenix and I developed many ideas that would conceptually shape the project.²⁴ AR has to date been primarily developed as a vehicle for advertising; Phoenix and I were interested in reclaiming this space for artistic and meaning-making pursuits. Perspective also became a watchword for our early thinking. Language is filled with metaphors linking the way we understand other people's

²⁴Though we initially discussed a direct collaboration, Phoenix ended up producing his own Palimpsest piece for the MFA show, entitled *forget me (not)* The final form of *bad guy* is my own work, although it would not have been possible without Phoenix's tools and many generous hours of technical help.

opinions to movements in physical space: I might say I can see your point of view, get where you're coming from, or where you're going with something; I can talk past you, or appreciate your perspective, or meet you halfway. The concept of "finding the point of view from which the story makes sense" became crucial to the project's development. Conversations with D. Fox Harrell also helped me focus on the uniquely proprioceptive quality that positioning narratives within real-world spaces can have, and led me to think about how the technology could give participants a physical/spatial connection to the people in the story and the environment where the events took place.

I also was personally inspired by the weariness I've felt as part of a generation that has come of age in a time of unending war. The toll these wars have taken on the national psyche is summarized well in this quote from journalist Gary Younge:

After ten years of war, we've really lost all interest in Afghanistan. Less than 3 percent of American identify the wars as a major problem facing the country. Yet there are still thousands of troops there, fighting for a goal that seems unattainable, sweltering in the desert heat, growing more and more jaded. And that has consequences. (2010)

The concept of presenting narrative as a series of fragments which must actively be reassembled into a coherent whole has many precedents; even in strictly linear media like film, projects like Michael Haneke's *71 Fragments of a Chronology of Chance* have explored this aesthetic. On computer-based media more capable of non-linearity, projects like Norman Kline's *Bleeding Through: Layers of Los Angeles*, a CD-ROM project presenting fragments of narrative about a fictional character embedded in a real historical context, adopt a similar approach. Jessica Faith Hayden and Christopher Molla's *Seemingly External Things* extruded these fragments into physical space by furnishing a Silver Streak trailer with period objects that conspired with hidden technology to tell a story about 1950s atomic testing through video, audio, and of course the objects themselves (2010); here the fragments can-

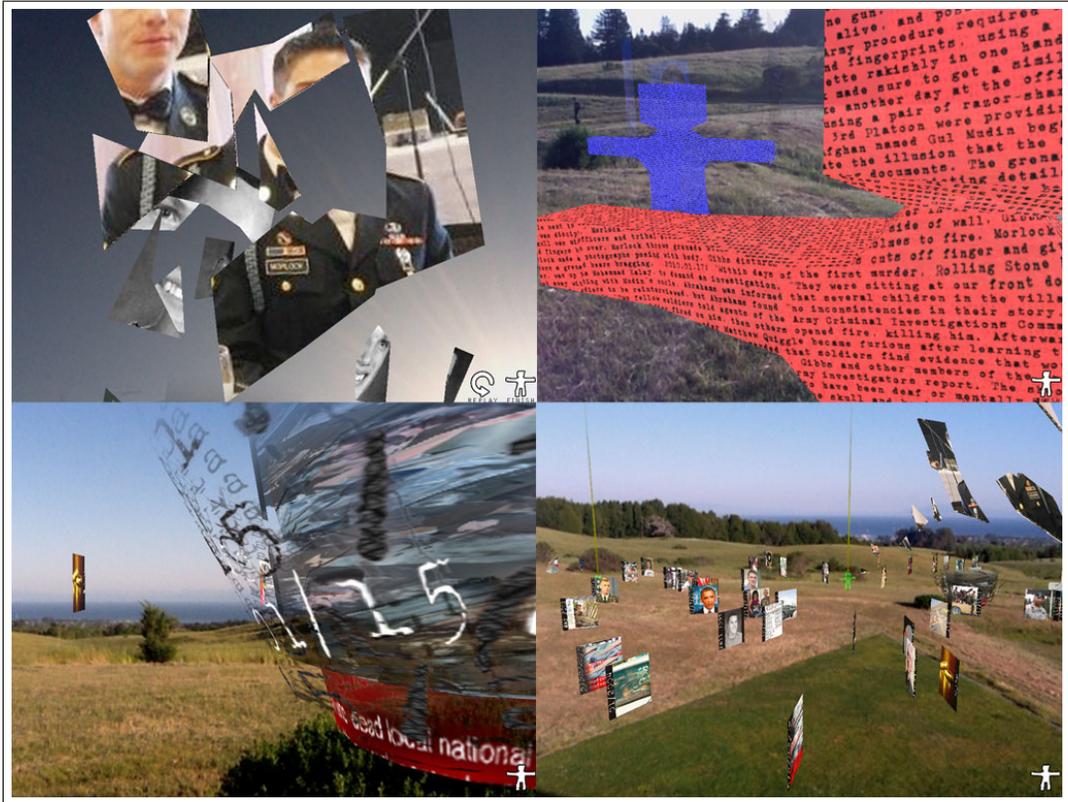


Figure 8: Four views of *what if im the bad guy*, showing (clockwise from upper left) sky fragments of portraits of soldiers Jeremy Morlock and Calvin Gibbs; a view of a soldier and a victim during a vignette; the view looking down on the rotating events on the playing field; part of a memorial exterior.

not be physically rearranged, but reveal their narrative significance through physical interaction.

Using virtual spaces to explore real-world events or take on fictional characters' perspectives also has precedent. Tamiko Thiel's *Beyond Manzanar* recreates a Japanese internment camp in virtual reality. The project's creators harbored similar goals to my own in their attempts to bring a real-world event to life: "Beyond Manzanar uses the unique spacial (sic) characteristics of navigable 3D virtual reality to kinesthetically locate you inside the Manzanar Internment Camp. As you explore the camp your kinesthetic sense is engaged to underscore the emotional impact of confinement" (Thiel, 2002). (However, Thiel's work is presented "projected onto

a large, wall-sized screen,” and movement is done using a “joystick mounted on a pedestal in the middle of the room,” limiting the participant’s engagement with an actual physicality of motion and direction.) In Blair MacIntyre’s project “Three Angry Men” (2002), the participant could move between chairs to witness a fictional drama from the perspective of any of its three characters. As with *bad guy*, perspective here has the dual meaning of both actual visual perspective and ideological perspective: in *Men*, sitting in a character’s chair not only presents the augmented reality world through that character’s eyes but lets the player hear that character’s thoughts.

Structurally, *bad guy* consists of four major components (Fig. 8). The primary element is a collection of forty-seven events²⁵ actualized as 2-meter square photographs slowly revolving around the playing field. Each event represents one moment of the story of three of the accused soldiers and their victims.²⁶ Each event is tagged with a date, description, up to five keywords, an optional direct quote from an involved party, and an image. Events are stored in a spreadsheet, and a script converts this data into code to instantiate Palimpsest objects (Fig. 10). When a player stands close to an event and touches it, the image and ancillary text fill the screen, and the keywords are shown as buttons (Fig. 9). Tapping one of these keywords causes all events associated with that keyword to realign themselves spatially into a line along the axis the player is facing, ordered chronologically. The sounds and animation of this realignment, along with the initial slow revolution of events around the playing field, is meant to invoke a medieval orrery, an earlier century’s attempt to make sense of the universe through making obscure relationships physical.

²⁵This was the number of events during the original MFA exhibition, but the project was designed to make it easy to add new events as further information came to light. For instance, during the run of the show I considered adding an event for the death of Osama bin Laden on May 2nd.

²⁶The three soldiers chosen were Calvin Gibbs, Jeremy Morlock, and Adam Winfield; the three victims were Gul Mudin of La Mohammad Kalay, Marach Agha of Khari Kleyl, and Mullah Alahdad of Qala Gai.

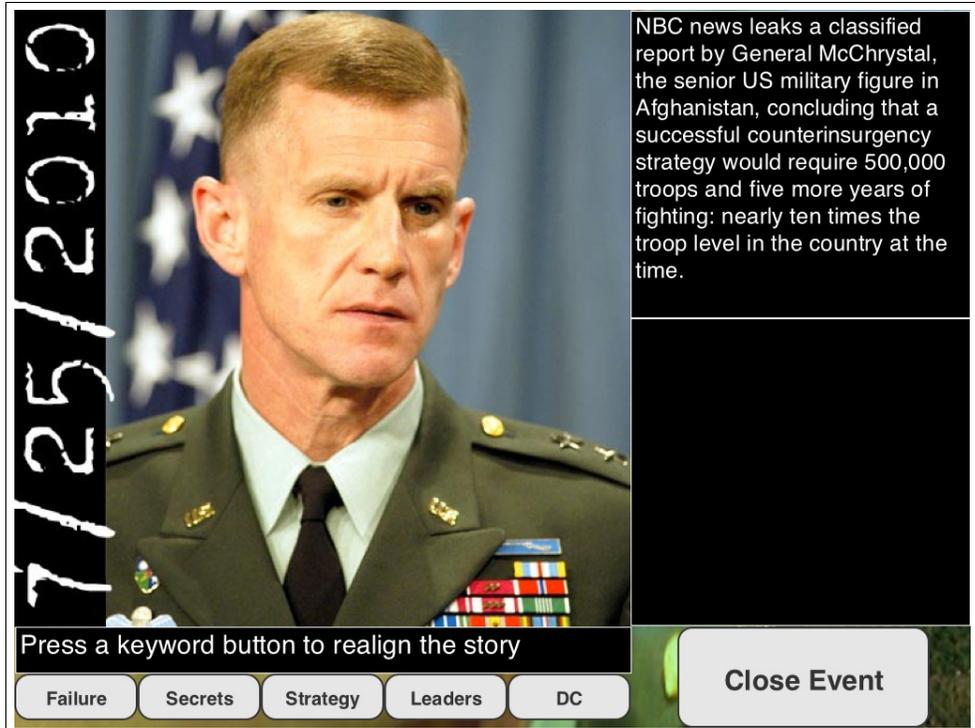


Figure 9: A touched event in *bad guy*, showing the possible keywords for realignment along the bottom; the area on the lower right shows the direct quotations for events that supply them.

Also present are a series of portraits of the three soldiers, broken up into nine fragments each that are positioned in the sky. Each image has a corresponding point on the playing field from which all the fragments align to recreate the portrait. Custom code calculates how to size and position each fragment so as to line up from the appropriate spot, given the desired additional parameters such as horizontal/vertical angles and a distance for the spread.

When the explorer stands at one of the positions where a portrait aligns, they trigger one of three vignettes retelling a murder from the point of view of the soldier whose portrait they have aligned. The other elements freeze and become transparent while a voiceover describes the scene from that soldier's point of view. Blocky stick figures textured with words are positioned in a tableau recreating the spatial relationships between the soldier (standing at the player's position) and other nearby

actors in the scene. The vignettes last between 45 and 90 seconds long, during which the stick figures change position: when a victim is shot, his figure changes from being upright to face down on the ground. When the vignette concludes, the stick figures disappear and the other elements resume their former motion. Returning to the same spot again causes a “replay” button to appear, which allows the player to optionally see the vignette again. The stick figures are also used to help guide the explorer to the playing field at the start of the experience, and provide a closing moment when the user chooses to end their time with the piece: tapping a Finish button on the interface turns on a stick figure standing at the saved location and orientation of all previous participants at the time they pressed the button. The player returns to the device checkout table walking through a field of “ghosts” representing all the previous visitors who have taken the journey.

The final element is three memorials to the Afghan victims. These are located at the spots in the vignettes where each soldier first saw the victim.²⁷ From the outside, each memorial is represented by an angry series of overlapping, slowly spinning funnel shapes suggestive of a frozen explosion. The visual representation of these shapes are based on distorted images of the accused soldiers and text denoting the date and place of death of the victims. An audio montage of warfare, war protesters, mourners, and news coverage of the killings originates from each memorial; this can be heard across the playing field but becomes louder as one steps closer. Stepping inside a memorial causes all sound and other imagery to immediately vanish, replaced by a wraparound panorama of a beautiful, tranquil landscape, and floating text marking the name, occupation, and date of death of the victim.

Phoenix and I jointly exhibited our two AR projects using a shared pool of

²⁷Originally, the memorials were placed at the spots where the victims died relative to the shooters; but this placed them much too close to the vignette trigger points, creating technical difficulties given the accuracy of the GPS in determining which point the participant was standing at.

Day	Month	Year	Description	Quote	K1	K2	K3	K4	Image
3	5	2010	Stoner fed up with fellow soldiers smoking hash in his room reports the problem to a senior sergeant. Despite assurances of confidentiality word quickly gets out in the platoon about Stoner's report.	Stoner: ^They baked the room many times until it stank constantly. ...I was worried for my own job.^	Afghanistan	Stoner	Drugs	Secrets	eStonerReports.jpg
17	2	2009	In his first major military move as president Barack Obama orders an additional 17 000 troops deployed to Afghanistan.	Obama: ^There is no more solemn duty as president than the decision to deploy our armed forces into harm's way. I do it today mindful that the situation in Afghanistan and Pakistan demands urgent attention and swift action.^	Leaders	Strategy	DC		eObamaTroopBuildup.jpg
		10	2009	The 5th Brigade encounters numerous bombs and is frequently attacked. Morlock survives at least four separate concussive events serious enough to require medical care.	Afghanistan	Morlock	Injury		eMorlockConcussive.jpg

Figure 10: Authoring Excerpt for *what if im the bad guy* (Microsoft Excel), showing four of the five available slots for keywords. Special characters had to be substituted for comma and quotation marks in the text fields to prevent problems with exporting and importing through multiple programs. The day and month fields can be left blank, in which case the events are ordered chronologically as if they took place at the beginning of the month or year.

ten iPad 2 devices.²⁸ We put removable matte screen coverings on the iPads to reduce glare and allow the scene to be visible even in broad daylight, although the brightness was significantly less than would be ideal. Phoenix designed cases to make the devices easier to hold and to provide protection in case of accidental dropping; we used an industrial laser cutter to build these devices.

Visitors to the exhibition would check out a device and spend between fifteen and forty minutes exploring the project. After an initial generic voice-over narration explaining how to use the device and interact with the AR components, a more specific monologue followed setting up the experience and instructing participants to follow the red stick figures across a street and down a courtyard to a balcony. The portrait fragments were visible in the distance as they did so. As the user approached the balcony, the events appeared (as if now visible over the edge). The

²⁸The iPad 2 was necessary for its rear-facing camera and faster graphics processing, and only just became available in time for the initial exhibition; initially, we had planned to use much smaller and less immersive iPhone 4 devices.

user was instructed to walk down a flight of stairs and begin their experience. From here they were left to their own devices to explore the playing field at will.

Since Palimpsest was still in active development during the time I was constructing this narrative for it, it proved to be an extremely difficult environment to develop for. A lack of documentation, untested code, and other features typical of alpha-level software meant it often took days or weeks to do something that would have taken minutes with a less cutting-edge system. In addition to these technical challenges, the piece was also incredibly draining on an emotional level (due to the disturbing, heartbreaking subject matter) and an intellectual level (as I struggled with how to tell a documentary story in a new way using a unique toolkit). As a result, *bad guy* ended up much less narratively sophisticated than I had originally hoped it would be. It makes no attempt to structure the pieces of the narrative itself, only provide the player with the tools to do so. I functioned more as an architect than an author: the interesting aspects of the piece are mostly in the non-fictional content, and its arrangement and presentation, attempting to enact a rhetorical stance through the piece's ergodic structure. The vignettes are hand-authored but linear, and contain the only writing with much creative license; the texts describing the events attempt to be as short and factual as possible. *bad guy* created a compelling experience that for some participants was moving or informative, and taught me a lot about telling stories without words. I hope the project can continue to evolve into a fully realized story system, incorporating narrative procedures at both low and high levels to make for more compelling traversals.

4.3 maybe make some change

maybe make some change is an interactive fiction incorporating video, audio, and animated text to explore a frozen battlefield moment from six violently conflicting perspectives. Inspired by and created initially to explore some of the same events



Figure 11: Player interacting with an early version of *maybe make some change* at the 2011 IF Demo Fair in Boston, Massachusetts (where it was exhibited under the name *what if im the bad guy?*).

and themes as *what if im the bad guy*, this project spun off to become its own distinct piece.

The user sits at a table covered with news articles about the FOB Ramrod killings and a monitor showing the title screen, and puts on a pair of headphones. As instructed, they type “begin” and press enter on the keyboard to begin the experience. A series of short messages appears one by one on the screen, accompanied by instant messenger sound effects to suggest these are part of a chat. The instructions set up the mood of the piece and then give the player a list of six “things he doesn’t know,” such as “You don’t know how to win the hearts and minds.” It ends with the lines “Don’t worry. We’ll tell you.”

The experience proper then begins. The piece is centered around a textual interactive fiction limited to a single room (the desert) as a single character (the soldier) with an unchanging group of visible items (the sun, an Afghan, your platoon, and

your gun). These nouns are highlighted to draw attention to them. The text describes a situation where the Afghan is coming towards you; he may or may not be holding something in his hand. This scenario is described differently based on which one of six narrators is currently active. Some of the narrators are describing the scenario as a hypothetical future event the player character might face; others are inventing an alternate explanation or attempting to spin a past event. The player is presented with a command prompt, but unlike in traditional IF, only a small set of formally introduced commands are understood. These verbs are displayed on the left half of the screen. At the beginning of the experience, the only recognized verb is SHOOT. Also onscreen, filling the background but only faintly visible, is one of several video clips from first-person shooters portraying real-world wars.²⁹ The video's background audio is sometimes audible, along with an audio montage of Afghanistan air raid sirens, war protestors, and media coverage of the "kill team" events; audio excerpts from a field recording of soldiers returning to a village where a murder took place a few days afterwards are also played after every player action.

After each player action, the narrator comments on what the player tried to do, either rejecting misunderstood commands with instructions specifying that the player should type only onscreen verbs and nouns, or interpreting the player's action as either a complicit or contrarian act. The vignette is then repeated from the perspective of the next narrator in the sequence, eventually looping back to the first narrator again. Complicit actions are those a specific narrator expects the player character to take; so for the racist uncle telling you what it's going to be like "over there," the expected, complicit action when confronted by a "hajji" running towards you is to shoot him; the player will be praised if he takes this action. Some actions are labelled contrarian, meaning the narrator rejects the act as cowardly, inappropriate, or incorrect—in other words, out of character. Shooting the "native civvie"

²⁹The games used include *Battlefield: Vietnam*, *Call of Duty II: Modern Warfare*, *Medal of Honor: Operation Anaconda*, *Counterstrike: Source*, and *Tom Clancy's Rainbow Six*.

when the narrator is an Army instructor is contrarian: this figure expects the player character to be trying to win hearts and minds.³⁰ These judgements are sometimes surprising: the liberal blogger labels attacking the Afghan a complicit action, since he wants the player character to be part of a story about the failures of the US war in Afghanistan.

Sometimes, verb words in narrator responses flash yellow and are added to the list on the left and made available for use; the player thus slowly learns a vocabulary of actions. There are six verbs that can be found in addition to ATTACK: HUG, THREATEN, MISS, WARN, HEAR, and CALM. Each of these actions can be tried on any of the story world's objects, and will be interpreted as best as possible by the narrator: so HUG THE DESERT might be taken as diving for cover, or ATTACK SUN as firing into the air.

As the player performs contrarian actions, a second layer of text behind the primary layer becomes more and more visible. This second text describes not the story world, but the narrator telling this interpretation of the story world. With each contrarian action this text flares up and becomes more visible, eventually overshadowing the original text. Effectively this makes visible the distinction between the plot level and the discourse level of the narrative, the *fabula* and *sjuzet* (Chatman, 1975). As with the nouns in the story-level text, the nouns in the discourse-level text are also highlighted. Eventually the player realizes they can use the verbs they've collected to interact with discourse-level nouns (the narrators). Each narrator is matched to one of the verbs: you can threaten your bullying staff sergeant, or miss your uncle. As the player uncovers these combinations, the verb and narrator annihilate each other: the verb disappears from the list and may no longer be used, and that narrator and his version of the story are removed from the cycling sequence.

³⁰In addition, narrators will only allow you to use their own vocabulary; the instructor won't allow you to call the Afghan a hajji, and the uncle won't let you call the same character anything but one of the several racial slurs he uses in his dialogue.

When the player has eliminated every narrator and is back to only their original verb, SHOOT, the screen goes black and a final version of the event appears, this one in a neutral present tense. The player may input one last command, after which another instant message chat log appears, a condensed version of a real-life Facebook chat held between soldier Adam Winfield and his father. In this chat from February 2010, Winfield tells his father that other men in his platoon have been murdering innocent people, and he is afraid he will be killed if he tells anyone. Winfield was later accused in May of the same year of the murder of Gul Mudin, along with his sergeant and other members of the platoon. The chat log has been a key element used by journalists to characterize Winfield, either as a hero or a coward, and will likely be a crucial piece of evidence in his eventual trial.

The piece was written in Inform 7 and displayed using the Quixe Javascript interpreter running in a web browser. Custom hacks allowed code executing within the Glulx virtual machine to send text strings representing function calls to the browser's Javascript layer, which could then be executed with an eval() function.³¹ The story world simulation and narration was done by the I7 component, with a modified version of the extension Custom Library Messages by Ron Newcomb used to inflect verbs properly based on the temporal point of view of each narrator. As the IF story file passed narrative state changes (such as a change in narrator) to Javascript, these could then affect the jQuery-driven display layer by, for instance, flashing verb words or changing the color and visibility of the various text layers. This framework should allow for eventual distribution of this project on the web, although the complex interconnections of systems and media files means this will take some effort to make cross-browser compatible.

Authoring for *change* (Fig. 12) comprised of defining how the six narrators

³¹Many thanks to Dannii on the intfiction.org forum for making this work, which seemed like impossible magic at the time; since then, many promising frameworks such as Juhana Leinonen's "Vorple" (<http://nitku.net/blog/2011/03/introducing-vorple/>) are coming into existence to make cross talk between browser-based IF and the rest of the web much easier.

Table of Vignette Details					
map sequence	vignette	narrator	tense	person	
modality	soldier-word	soldier-article	platoon-word	Afghan-word	
Afghan-action		Afghan-holding		do-you-mean	
correction	talk-sense	narrator-description			
"0"	Uncle-Fear	Uncle	present tense	second person	would
	"you"	"your"	"buddies"	"[article for Afghan] hajji"	
	"running at you shouting [one of]crazy talk[or]somethin in Arab				
[stopping]"	"Gonna fuckin kill you if you don't take care of him"		"You mean"	"Don't	
talk like a faggot, say what you mean"	"Then what the hell are you talking about?"				
	"Kitchen Table Your 				
	>uncle sits lecturing."				
"1"	Diversity-Training	Trainer	continuous past tense	second person plural	could
	"any one of you"	"your"	"platoon-mates"	"[article for Afghan] native	
civvie"	"coming towards you, maybe irate, maybe yelling"		"He's got something that		
could be a weapon"	"You're refering to"		"I'd prefer you use the right		
terminology in this class."	"Sorry, say again?"		"Fort Sill Classroom Up front some diversity trainer		
	lectures at you all."				


```

Instead of shooting the Afghan:
  if current vignette is Diversity-Training:
    now could-would-should is would;
    now story tense is past tense;
  say "[We] [aux][shoot*] him.[paragraph break]";
  say "[Afghan-word] [aux]di[e-s].[paragraph break]";
  if current vignette is:
    -- Uncle-Fear:
      say "One less Al Kayda motherfucker in the world.";
      mark complicit;
    -- Diversity-Training:
      say "His wife and child would run out of their house, screaming and crying. You just
        killed dad.[paragraph break]Way to lose the hearts and minds, soldier.";
      mark contrarian;
    -- Planning-Revenge:

```

Figure 12: Two authoring excerpts for *maybe make some change* (using the Inform 7 IDE). Inform 7 tables wrap awkwardly when they are too wide to fit on the screen, leading to difficulties effectively authoring content.

described the story world, and thinking up appropriate responses for every likely combination of action and narrator, as well as labeling which were complicit or contrarian from the perspective of each narrator. These responses are the way the player learns about the agenda of each narrator, which helps them understand the increasingly visible *sjuzet* layer and also to determine which verbs to use to eliminate each narrator, so it was important for them to help characterize the narrators as efficiently as possible. As many responses as possible also had to work in one of the six verbs, to minimize the time spent by the player as they try to collect them all, which proved to be an interesting constraint: trying to repeatedly work the word “hug” into a bullying sergeant’s jeers, for instance, took some effort. About 70% of responses ultimately incorporated one of the six verb words.

I had several opportunities to exhibit and refine *maybe make some change* before the MFA show, which pushed the piece towards being more transparent as to the underlying mechanisms and allowed modes of interaction. Many participants have been unwilling to engage with the piece by typing the first required command, shooting the Afghan (described by the first narrator using a racial slur). This is a reaction to the piece that I find completely acceptable, and has provoked a number of fascinating discussions as to why so many gamers are willing to engage in much more graphically realistic depictions of firing on foreign combatants (as in the first-person shooters playing in the background), but will not participate in the system presented here. I feel *maybe make some change* qualifies as a story system (although its narrative is not coherent to all participants), and uses the procedures of how the narrators relate to both the player character and the event they’re retelling to tell a meta-story about a soldier replaying an imagined or regretted incident over and over again in his mind. I am particularly proud of the way *change* demonstrates both how interactive fiction can be used as a platform for reflecting on current events, and a significant departure in both affordances and presentation from what most people

think of as IF.

4.4 Perfect

In this smaller experiment, two differently-colored squares can be moved by the player within a playing area on a screen, alongside a group of five sentences narrating a memory of a perfect day (Fig. 13). By moving the squares, the player alters certain aspects of these sentences in ways that change their meaning in a discrete or linear way. For instance, the second sentence describes the setting of the narrated event. For each sentence, the player has four axes (x and y for both squares) along which they can affect a sentence. The meaning of the four axes is hand-authored for each sentence. For example, moving the yellow square left or right changes the weather from, at one extreme, “clear blue skies,” to, at the other, “wind and rain lashing the trees,” with increments in between: moving the square slightly left changes the latter reference to “a dismal rainstorm.” Moving this square up or down changes the temperature; moving the blue square left or right changes the narrator’s perception of the event along a scale from “achingly beautiful” to “hideous”; and moving this square up or down changes how the narrator perceives these details; for instance, “not even noticing” them. Additional controls can change the person of the narrator (from He, She, I, You, We, to They) in all onscreen sentences. Some sentences dynamically affect each other: for instance, changing the event in the first sentence from “kissed a boy” to “tasted a peach” also changes a reference in the third sentence from “his lips” to “the juice.”

In combination, these controls give the player the ability to significantly change the individual sentences and the overall content of the story, in ways sometimes surprising to both the author and the player. Here are a few possible variations on the second sentence:

A magnificent rainstorm was raging, but the air was burning hot.

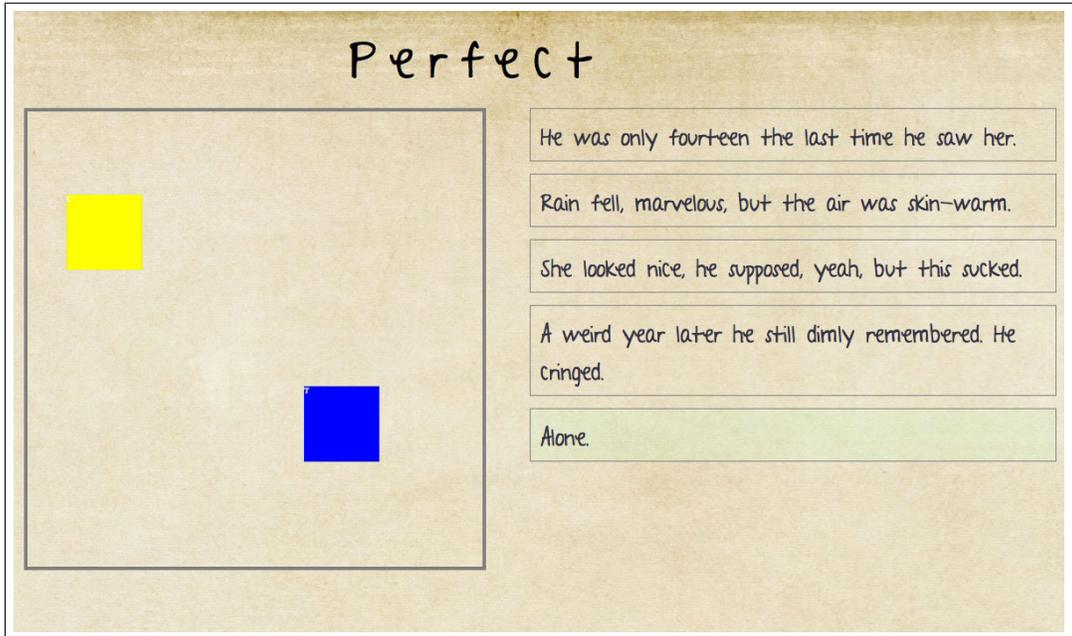


Figure 13: Screenshot of *Perfect* showing a completed story.

Only a drab wisp of cloud was in the sky, and we imagined the air was cold.

There were clear blue skies, marvelous, and you wished the air were frigid.

The goal is to provide enough affordances for players to feel as if they are sculpting a story, mapping large movements to large changes and small movements to smaller changes, until they find an arrangement of squares that produces a sequence of sentences they find satisfactory. The original prototype for the piece called for the squares to be represented by physical blocks on a table, using a Reactable (Jordà et al., 2005) or something similar to track the positions of the squares. I feel even the simplified version proved to be a useful experiment in exploring the aesthetics of making crafting a fiction feel tactile and sculptural.

Perfect was written in JavaScript using the jQuery framework to create the drag-able squares. As a prototype, I did not come up with a codified system for altering the text on a granular level, instead simply doing things by straightforwardly

```

function genResult() {
  var term = posToneX;
  var effects = posCharacterX;
  var mood = posToneY;
  var decision = posCharacterY;

  function aAdj() { return chooseOneBy(mood, ["long", "", "giddy", "", "tense", "",
"contented", "", "weird", "", "electric"]); }
  function aAdjICap(fLet) { var s=aAdj(); if (s.length!=0) return iCap(s)+" "+fLet; return
iCap(fLet); }
  s="";
  s=s+chooseOneBy(term, [aAdjICap("s")+econds later", aAdjICap("m")+oments later",
aAdjICap("m")+inutes later", "One "+aAdj()+ hour later", aAdjICap("h")+ours later", "Half a
"+aAdj()+ day later", "The next day", "A few "+aAdj()+ days later", "The next week",
aAdjICap("w")+eeks later", "After a "+aAdj()+ month", aAdjICap("m")+onths later", "A
"+aAdj()+ year later", aAdjICap("y")+ears later", iCap(heSheC)+"'d tell "+hisHerC)+"
children"]);
  s=s+" "+heSheC);
  if (term <0.7)
    s=s+chooseOneBy(effects, [" tried to forget", " was moving away", " shook it off", "
couldn't stop replaying", " was becoming obsessed"]);
  else s=s+chooseOneBy(effects, ["'d completely forgotten", "'d almost forgotten", " barely
remembered", " still dimly remembered", " still remembered", " remembered", " had never
forgotten"]);
  s=s+" "+iCap(heSheC)+" ";
  s=s+chooseOneBy(decision, ["screamed", "cringed", "fidgeted", "confessed", "turned away",
"decided", "smiled", "laughed"]);
  s=s+".";
  return s;
}

```

Figure 14: Authoring excerpt for *Perfect* (Javascript in Textmate). This is the code to produce one story sentence, taking into account the four axes of the two blocks.

hacking logic directly into string-generating code snippets (Fig. 14). This made following the flow of the sentences and ensuring they maintained coherence and grammatical correctness in all possible combinations fairly challenging. On the other hand, it's difficult to imagine what a better authoring environment that allows for more than one axis of change in individual sentences would look like. Improving *Perfect* in this regard would likely require delving into natural language generation techniques. As a brief experiment, I feel the project is most effective at creating a smoothly mutable and non-binary surface for interacting with a textual narratively charged environment, and an aesthetic of “constructive fiction” to aim for in future work.

4.5 Prom Week

Though not exhibited as part of my MFA show, I also spent a great deal of time during my second year doing authoring work for *Prom Week* (Fig. 15), a social physics puzzle game set during the week before senior prom in a fictional high school (McCoy et al., 2010b). Based on an AI system for simulating social interactions called *Comme il Faut* (McCoy et al., 2010a), this story system simulates a recognized set of conventions (dumb jocks, awkward break-ups) and challenges players to try to achieve certain outcomes from unlikely-seeming starting states (get the nerd to date the popular girl). As lead author, I was tasked with writing several hundred *instantiations* of social game moves performed by the player, such as “Txt Msg Breakup,” “Insult Friend,” and “Brag.” Using a custom design tool created by the core team (Fig. 16), for each social game I had to envision a wide variety of ways each interaction could play out, based on the dynamic state of the world and characters.

The system offers authors a wide and rich world of encoded knowledge, such as permanent traits and temporary statuses of the characters involved, their past



Figure 15: *Prom Week* in action.

actions in the world, a database of things they like and dislike, and a changing set of networked and numerical values charting how they feel about each other. We might for example define the character Simon in part by saying he is shy and brainy, is friends with Zach but doesn't like him very much, has an unrequited crush on Monica, is into wolf spiders (which are considered gross by his peers), and is currently angry at Buzz because Buzz recently insulted him—all of which is actually encoded into the game system. Authors can then write instantiation variants for particular social games keyed to any of these factors: an “Ask on a date” for a shy initiator (trait) but a popular responder (status), for instance.

Authoring for this system (Fig. 16) proved challenging on many levels. While a given instantiation contains hand-authored dialogue, this dialogue is never written for a specific character, but must be applicable for any character that might take part in a given social game. While the use of template-based mix-ins³² helped give individual characters more personality, care was always required to avoid writing

³²such as *%pejorative%*, which might expand to *jerk*, *dweeb*, or *zombie* based on which character is speaking

dialog that might contradict the complicated world state and recorded history. Dialogue that seems too confrontational, for instance, might seem incongruous if a shy character delivers it. While one solution is to write a separate version of the instantiation for shy characters, this quickly leads to an untenable combinatorial explosion of required content. In addition, despite the system's complexity there are countless qualities and factors it does not simulate: if one line of dialogue claims a character's favorite subject is math, there's nothing to stop that line later being assigned to another character, even one who has previously claimed a different favorite subject or even to detest math. Again, one solution would be to add a simulation of favorite subjects to the system; but this also becomes untenable as it makes the system increasingly bogged down.

Authors must therefore walk a line between instantiations that stay within the bounds of the system but are uninterestingly generic, and those that are pointed and specific but risk contradicting the system's knowledge about the story world. *Prom* therefore proved an excellent testbed to further develop techniques of quantum authoring, offering up frequent challenges like how to write a break-up conversation between two characters when you don't know anything about either of them, including whether they've been dating for five minutes or a year.

This ultimately requires a much different approach to authoring than with traditional fiction. It requires ceding a lot of control to the system, accepting that you don't know anything about the past or future of the characters you're writing about, and focusing just on a single, isolated moment. You have to learn to trust the hooks given you by the system to tie this moment to a larger narrative: the preconditions you can place on a scene (perhaps one is written only for two people who both like the same unpopular band) and the qualitative tag you can give a scene's entry in the historical record (this was a funny moment, or the initiator of this scene was mean to the responder) become the only bridges connecting it to a larger story. *Prom Week*

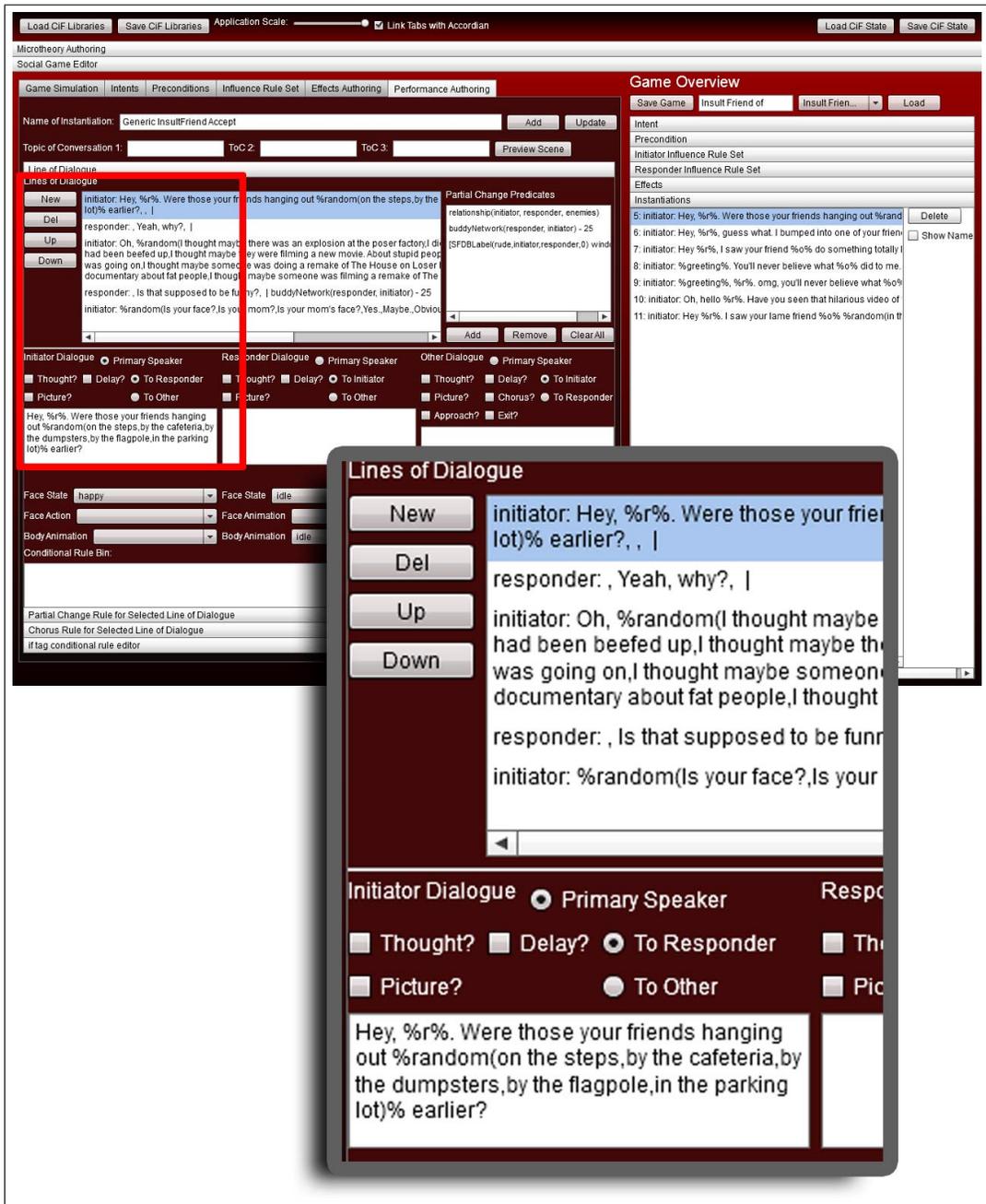


Figure 16: The design tool authoring environment for *Prom Week* and close-up insert.

is not yet finished at the time of this writing, but I remain confident it will produce a compelling experience. Its core mechanic of turning a cast of hand-authored characters and the relationships between them into a Rubix-cube story machine that can be turned, manipulated, and set into pleasing configurations is a quality that meshes well with my concept of an interesting story system.

4.6 Spyfeet/Informant

I also helped design an interactive narrative system called Informant for an EIS project based around developing an experimental mobile phone RPG (Reed et al., 2011). Among other goals, the SpyFeet project proposed to lessen the authorial burden caused by the combinatorial explosions of branching tree structures in interactive stories by a two-pronged approach of introducing a dynamic plot point sequencer and a natural language generator. With both technologies in place, players would have a great deal of agency to explore the fictional world in a style and order of their choosing, and the system could reveal plot points in a non-predetermined order using non-predetermined characters to advance the narrative.

Informant is a prototype narrative sequencing engine and character manager developed for SpyFeet. Written in Inform 7, the system uses standard interactive fiction tools to create a simulated story world, as well as instantiating plot points (or WMEs, for Working Memory Element) and how they relate both to each other and to each character. Characters can have a set of traits, and WMEs have a definition explaining what sort of characters know them. A story is authored by creating a series of WMEs representing plot points, as well as a set of characters with authorially-chosen traits. These characters can be friends with each other and the player, who can gain increasingly higher levels of trust through performing missions for that character. Each WME is then given a set of prerequisite WMEs (what must be known before this point can be revealed) and definition for what type of charac-

ters knows and is willing to reveal it. By talking to various characters, the player can navigate through the connected WMEs to reach the end of the story through a large and fluctuating number of paths based on the changing set of characters they know and have befriended.

While the SpyFeet project is still in progress, Informant has already provoked new modes of authorial thinking. The interconnected structure of the WMEs means that what appears to the player to be a traditional conversation menu is actually non-predetermined: the same question might lead to various answers depending on the details of the player's traversal, and likewise any character utterance might be preceded by a flexible (and perhaps unknown to an individual author) number of questions. While disorienting at first, we have hopes that this authoring framework will make interactive plot structures more flexible and easily altered and amended; authors can add and connect new plot points, story arcs, or even whole new characters without needing to revisit existing content. It's a model closer to adding new Legos to a model than trying to touch the house of cards that characterize authoring for many existing RPG systems.

5 Results

After synthesizing an analysis of previous work in creating interesting story systems, six interactive narrative experiments of my own, and the proposed story system framework, I have gained a number of insights into my own writing process for interactive stories, as well as what tools and approaches might be most useful going forward to continue developing them.

5.1 Multiple systems at multiple levels of granularity

In my survey of successful story systems, I observed that while different in details, most procedurally narrative systems combine multiple overlapping systems at different scales to produce effective stories, rather than relying on discrete and non-overlapping systems. This sloppy-sounding approach to compelling narrative has proved effective in other domains such as natural language recognition (the Watson program which recently bested top Jeopardy champions used something similar) and seems to be required to create the emergent, surprising behavior we expect from a compelling interactive narrative. This high-level design pattern will be useful to keep in mind as I think about designing future story systems.

5.2 Quantum Authoring

Story systems require a new kind of authorial thinking that I've come to think of as *quantum authoring*. One of the fundamental ideas of quantum mechanics is the notion that a unit can be in several superimposed probability states at once, not collapsing to a single state until it is observed. Similarly, authors for story systems must generate content without knowing the exact circumstances it will appear in. The more procedural the system's narration becomes, the more possibility states authors must keep superimposed in their heads. Good quantum authoring means recognizing chances for prose to read differently in different situations, without making it so generic as to lose its flavor. These systems also require authors to write in a much more fragmentary fashion, and to be willing to give up control over how an individual piece might fit into the overall narrative structure—or more accurately, to cede that control to a narrative procedure.

5.3 A need for high-level systems: recognizers and block connectors

The highest level of narrative procedures, those that produce a compelling overall story arc with a beginning, middle, end, and character development in-between, was the weakest link in the story systems surveyed, often not existing at all or not functioning in an ideal way. While drama management has been the most commonly attempted high-level organization framework, other systems for organizing plots on large scales might be considered. Narrative recognizers could be built that would monitor a story system for states corresponding to high-level structures (such as Budding Friendship), with procedures determining how these high-level structures could fit into an overall plot. We might call this drama justification, looking not to predict the player's best action but to explain the actions that have happened so far in the best possible way. Another useful metaphor might be to imagine story systems as construction sets (such as Legos). If we imagine a parent passing pieces to a child, we would ideally like the set to be robust enough that the child can build any number of interesting things that might surprise and delight them both. At the same time, several overlapping systems—the design of the pieces, the instructions that came with the package, the type and order of blocks chosen by the parent—help determine which blocks are presented to the child, and when. This notion of *constructive fiction* raises interesting further questions. What standards for interconnecting blocks might be useful to study—the simple interlocking bricks of Legos, or the more flexible and variable hinges-and-connectors of K'Nex? How much variety does a set need in order to produce interesting constructions? Systems governing story games like *Gloom* and the higher-level logic of story generation tools might also be useful paths to pursue for further research.

5.4 Measures for reducing complexity and making systems authorable

Authoring for a story system is challenging, and there are few good tools to help authors reduce the inherent complexity involved. Chris Crawford says the “trade-offs between artistic power and manageability has been the most vexing problem” with StoryTron (2007, 174); Mateas and Stern say the architecture built up during Facade’s development “makes authoring interactive drama possible, but not necessarily easy” (2007, 206). At the heart of many of these difficulties is the lack of tools for authoring non-linear content. Many story systems include content that can be represented in spreadsheet or database form, but tools for editing spreadsheets are cumbersome for editing text of sentence lengths or longer. A tool with good database visualization features that allowed for multiple views of the underlying data structure controlling the text, that can easily be flipped between based on whichever is useful from moment to moment, and also followed best practices from the text editing and word processing realms (with features like word wrapping, clean display of text in user-selected styles, robust editing features and so on) would go a long way towards making story system content easier to author. Another useful feature would be a procedural version of the word processor WYSIWYG revolution, allowing authors to easily preview how text that includes procedurally-driven inclusions would look within the story system. Determining which components of a complex system provide the most authorial leverage, and designing tools to make that leverage as clearly apparent and easily authorable as possible, is also critical.

More revelations will be forthcoming as authors spend more time actually creating stories with existing systems. For my thesis work, the vast majority of my time went into building the systems, not authoring the content. I hope over the next year or so to create some new stories for the already-existing systems, which should give me a much better feel for what their affordances, strengths, and trade-offs are

from an authoring perspective.

6 Conclusion

In this thesis, I have proposed a new category for understanding interactive narratives, the story system. Compelling story systems tell multi-form ergodic stories for humans but without the assistance of a human adjudicator, are narratively procedural, and encourage complete traversals of a narrative. The most interesting story systems are those that offer a smoothly mutable possibility space for exploration, contain complex and interesting systems and choices, yet are not so technically overwhelming that they become unauthorable, either through extremely complexity or extreme time requirements to create a complete experience.

Through the experiments performed in the past two years, I have made great strides towards understanding how to tell stories with reconfigurable components that are assembled together through a system guided by narrative procedures. Story systems should generate constructive fictions, ergodic stories that feel as fun and flexible to play with as a child with a block of clay or a fresh set of Legos. But unlike these static artifacts, procedurality lets the clay come alive to help the child form interesting shapes, and the blocks contain authorial intent that helps arrange them into meaningful patterns. In the years to come, I hope to design story systems in light of the wisdom gained through this project. I'm looking forward to the road ahead.

A Interactive Stories Cited

1893: A World's Fair Mystery. Peter Nepstad. Illuminated Lantern Publishing. TADS 2 VM. 2002.

Anchorhead. Michael S. Gentry. Z-machine/Inform 6. 1998.

Balance of Power: 21st Century. Chris Crawford. StoryTron/Java. 2009.

Battlefield: Vietnam. Armando Marini. Digital Illusions Canada/Electronic Arts. Microsoft Windows. 2004.

Beyond Manzanar. Tamiko Thiel and Zara Houshmand. Virtual Reality installation. 2000.

BioShock. Paul Hellquist. 2K Boston/2K Games. Microsoft Windows, Xbox 360. 2007.

Bleeding Through: Layers of Los Angeles, 1920-1986. Rosemary Comella, Andreas Kratky and Norman Klein. The Labyrinth Project/Zentrum für Kunst und Medientechnologie. Microsoft Windows DVD-ROM. 2001.

Blue Lacuna. Aaron A. Reed. Inform 7/Glulx VM. 2009.

Call of Duty 4: Modern Warfare. Infinity Ward/Activision. Xbox 360, PlayStation 3, Microsoft Windows. 2007.

Deadline. Marc Blank. Infocom. Z-machine/ZIL. 1982.

The Elder Scrolls IV: Oblivion. Todd Howard and Ken Rolston. Bethesda Game Studios/2K Games. Microsoft Windows, Xbox 360. 2006.

Echo Bazaar. Failbetter Games. Alexis Kennedy and Paul Arendt. Failbetter Games. Browser-based web app. 2009.

Façade. Michael Mateas and Andrew Stern. Procedural Arts. Microsoft Windows, Mac OS X. 2005.

Fallout 3. Emil Pagliarulo, Todd Howard and Istvan Pely. Bethesda Game Studios/Bethesda Softworks. Microsoft Windows, PlayStation 3, Xbox 360. 2008.

The Girl with Skin of Haints and Seraphs. D. Fox Harrell. Unreleased LISP/GRIOT. 2004-7.

Gloom. Keith Baker. Atlas Games. Physical card game. 2004.

Grand Theft Auto III. DMA Design/Rockstar Games. Microsoft Windows, PlayStation 2. 2001.

Heavy Rain. David Cage. Quantic Dream/Sony Computer Entertainment. PlayStation 3. 2010.

Legend of Zelda. Shigeru Miyamoto and Takashi Tezuka. Nintendo EAD/Nintendo. Nintendo Entertainment System. 1986.

Legends of Zork. Jolt Online Gaming. Browser-based web app. 2009.

Life in the Garden: A Deck of Stories. Eric Zimmerman. Razorfish. Physical game with 52 loose cards and cover. 2000.

The Living Liberia Fabric. D. Fox Harrell, Hank Blumenthal and others. FLASH/GRIOT. 2010.

Minecraft. Markus Persson. Mojang Specifications. Java. 2009-11.

Neverwinter Nights. BioWare/Infogrames/Atari. Microsoft Windows. 2002.

Photopia. Adam Cadre. Z/Inform 6. 1998.

Portal 2. Joshua Weier. Valve Corporation. Microsoft Windows, Mac OS X, Xbox 360, PlayStation 3. 2011.

Prom Week. Josh McCoy, Mike Treanor et al. Flash. 2011.

Seemingly External Things. Jessica Faith Hayden and Christopher Molla. Installation with custom software. 2010.

The Seventh Guest. Rob Landeros and Graeme Devine. Trilobyte/Virgin Interactive. MS-DOS/CD-ROM. 1993.

Terminal Time. Steffi Domike, Michael Mateas and Paul Vanouse. Interactive installation. 1999.

World of Warcraft. Rob Pardo, Jeff Kaplan, Tom Chilton. Blizzard Entertainment. Microsoft Windows, Mac OS X. 2004.

B Afghanistan Sources

Below are some of the primary sources I found most useful during the research for *what if im the bad guy*. This information was supplemented by details and opinions from dozens of bloggers, daily news coverage of trials and new revelations, and the photographs and audio recordings released by embedded reporters, soldiers and their families, and many other people connected to the FOB Ramrod killings.

Ashton, Adam. "Stryker soldier expected beating." *Olympian (Washington)* 3 Dec. 2010.

Bennis, Phyllis and John Berger et al. *War With No End*. Verso Books, 2007.

Bernton, Hal. "Stryker soldiers allegedly plotted to kill Afghan civilians." *Seattle Times* 24 Aug. 2010.

Boal, Mark. "The Kill Team: How U.S. Soldiers in Afghanistan Murdered Innocent Civilians." *Rolling Stone* 27 Mar. 2011.

Goetz, John and Marc Hujer. "Adam's War: The Good Boy and the 'Kill Team'." *Spiegel Online International* 31 Mar. 2011.

Herr, Michael. *Dispatches*. New York: Vintage International, 1991.

Joint Base Lewis-McChord. "Additional charges filed in Afghan civilians' deaths." *Seattle Times* 24 Aug. 2010.

Kushner, Tony. *Homebody/Kabul*. London: Nick Hern Books, 2002.

Mogelson, Luke. "A Beast in the Heart of Every Fighting Man." *New York Times Magazine* 27 Apr. 2011.

O'Hanlon, Michael E. and Hassina Sherjan. *Toughing It Out in Afghanistan*. Brookings Institute Press, 2010.

Purcell, Andrew. "Porn, hashish and killing for kicks . . . what fuelled a GI death squad in Afghanistan." *Herald (Glasgow)* 3 Oct. 2010.

Shah, Taimoor and Alissa J. Rubin. "Relatives Tell of Civilians Killed by U.S. Soldiers." *New York Times* 5 Oct. 2010.

Sharrock, Justine. *Tortured: When Good Soldiers Do Bad Things*. Wiley, 2010.

"Thrill Kill Plea." *ABC Brian Ross Investigates*. Prod. Matthew Cole and Megan Chuchmach. ABC. 25 Mar. 2011.

Tibbits, George. "GI lawyer: Lack of evidence in Afghan deaths." *Army Times* 10 Nov. 2010.

Wahab, Shaista and Barry Youngerman. *A Brief History of Afghanistan*. Facts On File, 2007.

Younge, Gary. "Forgetting Afghanistan." *The Nation* 20 Oct. 2010.

Bibliography

- Aarseth, Espen. "Genre Trouble: Narrativism and the Art of Simulation." *First Person: New Media as Story, Performance, and Game*. Ed. Noah Wardrip-Fruin and Pat Harrigan. Cambridge, Mass.: MIT Press, 2004.
- Aarseth, Espen J. *Cybertext : perspectives on ergodic literature*. Baltimore, Md.: Johns Hopkins University Press, 1997.
- Adams, Douglas and Max Whitby. *Hyperland*. 1990, BBC Two.
- Arendt, Paul. Echo Bazaar Narrative Structures. February 27 2010, Betterblog, URL: blog.failbettergames.com/post/Echo-Bazaar-Narrative-Structures-part-one.aspx.
- Bernstein, Mark and Diane Greco. "Card Shark and Thespis: Exotic Tools for Hypertext Narrative." *First Person: New Media as Story, Performance, and Game*. Ed. Noah Wardrip-Fruin and Pat Harrigan. Cambridge, Mass.: MIT Press, 2004.
- Birringer, Johannes. *Installations and the Participant-User*. New York: PAJ Publications, 2008.
- Boal, Augusto. *Theatre of the Oppressed*. London: Pluto Press, 1979.
- Bourriaud, Nicolas. *Relational Aesthetics*. Les Presses du Rel, 1998.
- Chatman, S. "Towards a theory of narrative." *New Literary History* 6 (1975): 295–318.
- Chen, Sherol, Mark J. Nelson, Anne Sullivan, and Michael Mateas. "Evaluating the Authorial Leverage of Drama Management." *Proceedings of AAAI Spring Symposium, Interactive Narrative Technologies*. 2009.
- Crawford, Chris. "Process intensity." *The Journal of Computer Game Development* 1 (1987).
- Crawford, Chris. "Deikto: A Language for Interactive Storytelling.". Cambridge, Massachusetts: The MIT Press, 2007.
- Crawford, Chris. Remarks, 'Authoring Tools' panel. April 15 2011, Inventing the Future of Games, Milpitas, California.
- Douglass, Jeremy. *Command Lines: Aesthetics and Technique in Interactive Fiction and New Media*. PhD thesis, University of California Santa Barbara, 2007.
- Eco, Umberto. *The Open Work*. Cambridge, Mass.: Harvard University Press, 1989.
- Egri, Lajos. *The Art of Dramatic Writing*. Boulder: Westview, 1960.

- Grover, Ronald and Cliff Edwards. "Game Wars." URL: www.businessweek.com/magazine/content/05_09/b3922094.htm. *Bloomberg Businessweek* (February 28 2005).
- Harrell, D. Fox. *GRIOT's Tales of Haints and Seraphs: A Computational Narrative Generation System*. Ed. Pat Harrigan and Noah Wardrip-Fruin. Cambridge: MIT Press, 2007.
- Harrell, D. Fox. "Phantasmal Fictions." *American Book Review* 31 (2010): 4–6.
- Harrell, D. Fox, Hank Blumenthal, Ayoka Chenzira, Christopher Gonzales, Andrew Roberts, Natasha Powell, Deji Fajebe, Jason Lee, Paul O'Neil, Arjun Tomar, et al. "Authoring the Living Liberia Fabric: A Generative and Interactive Narrative for Peace, Truth, and Reconciliation." *Electronic Literature Organization: Archive and Innovate, Providence, RI*. 2010.
- Hayden, Jessica Faith. *Seemingly External Things: Evocative Objects and Imagined Landscapes in the Installation Practice*. Master's thesis, University of California Santa Cruz, 2010.
- Holmes, Brian. "The Revenge of the Concept: Artistic Exchanges, Networked Resistance." *Art and Social Exchange: A Critical Reader*. . London: Tate Publishing, 2007.
- Jordà, Sergi, Martin Kaltenbrunner, Günter Geiger, and Ross Bencina. "The reactable." *Proceedings of the international computer music conference (ICMC 2005), Barcelona, Spain*. 2005, 579–582.
- Juul, Jesper. *Half-Real: Video Games between Real Rules and Fictional Worlds*. Cambridge, Mass.: The MIT Press, 2005.
- Klimas, Chris. *Reaction: Balance of Power 21st Century*. Mar 30 2009, URL: www.gimcrackd.com/dross/archive/balanceofpower.html.
- Krueger, Myron W. "Responsive environments." *Proceedings of the June 13-16, 1977, national computer conference*. 1977, 423–433.
- Kushner, David. *Masters of Doom: How Two Guys Created an Empire and Transformed Pop Culture*. New York: Random House, 2003.
- Lebowitz, M. "Creating characters in a story-telling universe." *Poetics* 13 (1984): 171–194.
- MacIntyre, Blair, Jay Bolter, Jeannie Vaughan, Brendan Hannigan, Emanuel Moreno, Markus Haas, and Maribeth Gandy. "Three angry men: dramatizing point-of-view using augmented reality." *ACM SIGGRAPH 2002 conference abstracts and applications*. 2002, 268–268.

- Mateas, Michael. "A Preliminary Poetics for Interactive Drama and Games." *First Person: New Media as Story, Performance, and Game*. Ed. Noah Wardrip-Fruin and Pat Harrigan. Cambridge, Mass.: MIT Press, 2004.
- Mateas, Michael and Michael Nelson. "Search-based drama management in the interactive fiction Anchorhead." *Proceedings of AIIDE*. 2005.
- Mateas, Michael and Andrew Stern. "Writing Façade: A Case Study in Procedural Authorship." *Second Person: Role-Playing and Story in Games and Playable Media*. Ed. Pat Harrigan and Noah Wardrip-Fruin. Cambridge, Massachusetts: The MIT Press, 2007.
- McCoy, Josh, Mike Treanor, Ben Samuel, Brandon Tearse, Michael Mateas, and Noah Wardrip-Fruin. "Authoring Game-based Interactive Narrative using Social Games and Comme il Faut." *Proceedings of the 4th International Conference & Festival of the Electronic Literature Organization: Archive & Innovate (ELO 2010)*. 2010.
- McCoy, Josh, Mike Treanor, Ben Samuel, Brandon Tearse, Michael Mateas, and Noah Wardrip-Fruin. "The Prom: An Example of Socially-Oriented Gameplay." (2010).
- Montfort, Nick. *Twisty little passages : an approach to interactive fiction*. Cambridge, Mass.: MIT Press, 2003.
- Murray, Janet. *Hamlet on the holodeck: the future of narrative in cyberspace*. New York: Free Press, 1997.
- Pearce, C. "Theory wars: An argument against arguments in the so-called ludology/narratology debate." *Digital Games Research Association Proceedings* (2005).
- Perlin, Ken. Acting for embodied interactive narrative. July 10 2010, Presentation at the Department of Computer Science, UC Santa Cruz.
- Persson, Markus. Minecraft: Statistics. 2011, URL: www.minecraft.net/stats.jsp; accessed 5-24-2011.
- Plotkin, Andrew. "Characterizing, if not Defining, Interactive Fiction." *IF Theory Reader*. Ed. Kevin Jackson-Mead and J. Robinson Wheeler. >TRANSCRIPT ON PRESS, 2011.
- Reed, Aaron and Judy Malloy. Aaron Reed: Blue Lacuna. April 2011, Authoring Software, URL: www.narrabase.net/aaron_reed.html.
- Reed, Aaron A. "Blue Lacuna: Lessons Learned Writing the World's Longest Interactive Fiction." *Electronic Literature Organization: Archive and Innovate, Providence, RI*. 2010.

- Reed, Aaron A., Ben Samuel, Anne Sullivan, Ricky Grant, April Grow, Justin Lazaro, Jennifer Mahal, Sri Kurniawan, Marilyn Walker, and Noah Wardrip-Fruin. "SpyFeet: An Exercise RPG." *Proceedings of the 6th International Conference on the Foundations of Digital Games*. 2011.
- Sherry, John L. "Flow and media enjoyment." *Communication Theory* 14 (2004): 328–347.
- Sullivan, Anne, Sherol Chen, and Michael Mateas. "Integrating drama management into an adventure game." *Proceedings of AIIDE 2008* (2008).
- Sullivan, Anne, Michael Mateas, and Noah Wardrip-Fruin. "Rules of engagement: moving beyond combat-based quests." *Proceedings of the Intelligent Narrative Technologies III Workshop*. New York, NY, USA: ACM, 2010, 11:1–11:8.
- Thiel, Tamiko. Beyond Manzanar: History and project origins. 2002, URL: www.mission-base.com/manzanar/history/origins.html; accessed 2011-05-27.
- Toews, Phoenix. Palimpsest: Augmented Reality Browser. Master's thesis, University of California Santa Cruz, 2011.
- Tompkins, Jane P., editor. *Reader-Response Criticism: From Formalism to Post-Structuralism*. Baltimore: John Hopkins University Press, 1980.
- University of Richmond Writing Center. A List of Important Literary Terms. 2010, Writer's Web, URL: writing2.richmond.edu/writing/wweb/terms.html; accessed 2011-06-08.
- Wardrip-Fruin, Noah. *Expressive Processing: On Process-Intensive Literature and Digital Media*. PhD thesis, Brown University, 2006.
- Wardrip-Fruin, Noah. *Beyond the Complex Surface*. Pre-publication, 2011.
- Wardrip-Fruin, Noah, Michael Mateas, Steven Dow, and Serdar Sali. "Agency reconsidered." *Proceedings of the Digital Games Research Association Conference*. 2009.
- Welbourn, David. 1893: A World's Fair Mystery Solution. 2002, URL: www.plover.net/~davidw/sol/1893.html.
- Weyhrauch, Peter. *Guiding Interactive Drama*. PhD thesis, Carnegie Mellon University, 1997.
- Younge, Gary. "Forgetting Afghanistan." *The Nation* (November 8 2010).
- Zimmerman, Eric. "Creating a Meaning-Machine: The Deck of Stories Called Life in the Garden." *Second Person: Role-Playing and Story in Games and Playable Media*. Ed. Pat Harrigan and Noah Wardrip-Fruin. Cambridge, Massachusetts: The MIT Press, 2007.