Leveraging Procedural Narrative and Gameplay to Address Controversial Topics

Ben Samuel[*], Jacob Garbe[*], Adam Summerville[*], Jill Denner[†], Sarah Harmon[*], Gina Lepore[†], Chris Martens[‡], Michael Mateas[*] and Noah Wardrip-Fruin[*]

[*]University of California, Santa Cruz
[†]Education, Training and Research
[‡]North Carolina State University
[*]{bsamuel, jgarbe, asummerv, smharmon, michaelm, nwf}@ucsc.edu
[†]{jilld, ginal}@etr.org
[‡]{martens}@csc.ncsu.edu

Abstract

Social justice issues are often controversial in nature, and require an appeal to emotion and empathy—rather than lists of facts—to solve. Serious games can be effective pedagogical tools, but often focus on short minigames (providing fleeting "aha" moments) that eschew the empathetic power of narrative, or vice versa. This paper presents a framework that dynamically generates sequences of short narrative and gameplay pairings, in the style of Molleindustria's *Unmanned*. A playtest of an initial prototype of the system in the domain of climate change speaks to the framework's potential of being an effective means of nurturing players' empathy and curiosity for controversial topics.

Introduction

Social justice is a broad term; what is considered a cause of social justice might vary significantly from culture to culture, or even from individual to individual. However, one unifying quality that many concepts in the domain of social justice share is that they are controversial. Ironically, what constitutes a controversial topic evades an agreed-upon definition as well (Abu-Hamdan and Khader 2014; Tekin 2011). However, frequently used definitions (Wellington 1986; Fraser 1963) situate controversial topics as being of great importance to a great number of people, "involve value judgments, so that the issue cannot be settled by facts, evidence or experiment alone," and have yet to yield a solution that satisfies the majority of those people; once a solution is found, the topic is no longer considered controversial. As both concepts share similar definitions, such as they are, we link the notions of social justice and controversial topics.

Social justice may pertain to racial themes such as racism and immigration, sexual themes such as sexism, sexual orientation, and sexual assault, or matters of life and death, such as the death penalty and abortion. Many controversial topics, such as evolution, genetics, and climate change, require a fundamental understanding of scientific concepts to meaningfully appreciate them. Lacking this foundation can make these topics difficult to discuss and explore, and could have negative repercussions for future research of these domains (Alters, Nelson, and Mitton 2002; Lawson and Weser 1990). However, as controversial social justice issues may not be able to be "settled by facts, evidence or experiment alone" (Wellington 1986), making these topics more accessible requires more than better education fundamentals.

There are many recent examples of utilizing technology to educate and explore controversial topics, often taking the form of *serious games*. Serious games have been shown to be effective pedagogical tools (Connolly et al. 2012; Wouters et al. 2013), though are by no means a cure-all (Young et al. 2012). Serious games typically employ one of three strategies to communicate, or be about, a real-world topic area: narrative, theming of minigames, and simulation. Narratively-driven games employ narrative tropes to engage the player and express the topic domain as a well-formed narrative arc. While successfully tapping into narrative psychology influences creating emotional engagement, identification, and potentially behavior change, such games don't make use of the fundamental affordances of rule-based emergent gameplay to engage systems thinking about their domain (Frasca 2003). A second communication strategy for serious games is theming minigames. This approach starts with a rule system for relatively abstract, typically 2D games (such as platform or shooter arcade games) with a focus on movement and collision between graphical entities, and "themes" the graphics. This is a common strategy for the class of serious games known as *newsgames* (Treanor and Mateas 2009; Sicart 2008), games that provide editorial opinion about news events, and are the game equivalent of editorial cartoons. While these games provide simple rule-based gameplay, they lack complex progression structures and so do not support deep engagement. They typically provide a single "aha" moment where the player understands how the game is providing commentary about the target domain through its rule system, after which there is nothing more for the player to learn about the domain through playing the game.

The final communication strategy is simulation-based gameplay. Simulation games create a simulation of the underlying domain, typically with multiple interlocking rule systems, often employing economic and resource management simulations. Simulation games support emergent gameplay and systems thinking about their domain, but unlike themed minigames are more difficult for players to learn and engage, and unlike story games lack the emotional identification and sense of closure of narrative. Further, simulation games are difficult to design, as authors must iteratively tune their interlocking rule systems to achieve desired emergent properties. Given the relative strengths and weaknesses of these three dominant meaning strategies for serious games, how can we employ generative methods to leverage the strengths and move beyond the weaknesses?

We propose a way out of this impasse through the generation and dynamic sequencing of narratively-framed minigames. A manually-authored example of such a game can be found in Molleindustria's *Unmanned* (Pedercini 2012). This game explores issues around drone strikes by presenting a sequence of narratively-framed minigames depicting a day-in-the-life of the player character, a drone pilot. Each of the vignettes, consisting of a minigame on one side of the screen and a dialog tree on the other, portrays different aspects in the day of the life of the main character. Any one minigame is simple for a player to engage and makes its point cleanly and quickly like a newsgame. Since each minigame is paired with narrative elements in the form of a dialog tree, and because vignettes are presented in a sequence with a clear protagonist shared across all the vignettes, it moves beyond the limitations of minigames to provide the identification and closure of narrative, and to explore its domain (in this case the politics of drone strikes) with much more depth and nuance than the simple "make a single point" approach of newsgames. Unlike purely narratively-driven games, the use of minigames affords the use of game rules to communicate via procedural rhetoric (Bogost 2007) without requiring a single, complex and monolithic simulation as is typical of simulation games. *Unmanned*'s weakness is its support for systems thinking. After two or three playthroughs the player exhausts the possibility space of the game. What we propose is to build on the strengths of *Unmanned*'s approach, while providing deeper support for systems thinking by dynamically generating and sequencing vignettes, each composed of a minigame and narrative-frame.

Our proposed approach provides the emotional engagement of narrative, the accessibility and simplicity of minigames, and the intertwined considerations and consequentiality of simulation games. Any one playthrough features a main character whose story is told against the background of the domain, with each vignette delivering a specific emotional moment that both communicates something about the main character and about some issue or theme of the domain. Since vignettes are dynamically generated, future vignettes can be deeply responsive to earlier player outcomes. This allows for player actions to have systemic consequences, and thus encourage systems thinking about the domain.

Broadly speaking, our system is an experiment in interactive storytelling, and has applications in any domain where narrative can be bolstered with systems-level thinking. The system itself is capable of representing a wide array of value systems, therefore enabling more nuanced political arguments. In this respect, the onus is on authors to decide which politics they bring to bear, and how they choose to represent the material concepts of the simulation, and at what resolution. By that same token, the possibility of this system being used to further dangerous rhetoric exists. A content creator could theoretically use this system to build an argument against social justice issues, just as one could author a manifesto or propaganda film. Thus, as with any media production and consumption, it is the author's responsibility to ethically craft stories, and the player's responsibility to recognize that the games and narrative can contain the author's biases.

After discussing related work, we present the two primary parts of the system: the narrative sequencer StoryAssembler, and the minigame generator, illustrating their use with a sample scenario. Finally, we present responses from a preliminary play test of a prototype of our framework in the domain of climate change. Climate change is a controversial topic steeped in social and environmental justice issues (Mohai, Pellow, and Roberts 2009), but the play test responses indicate that our design choices are successfully fostering curiosity, knowledge, and empathy towards the domain.

Related Work

Many examples of prior work exist in the computational creativity community pertaining to the individual aspects of our system. Previous systems have addressed the generation and evaluation of narrative (Tearse et al. 2011; Zhu 2012; Montfort et al. 2013; Mateas, Mawhorter, and Wardrip-Fruin 2015). Some such systems have specifically applied themselves to social justice causes (Harrell et al. 2012).

Other computationally creative systems have pertained to the generation and evaluation of games and their themes. These include (Liapis, Yannakakis, and Togelius 2014; Cook and Colton 2014; Guzdial and Riedl 2016). Moreover, procedural content generation techniques have broadly been applied to many aspects of the game design process, with ample non-game applications as well (Cook 2015).

However, the authors believe that this is the first time a single work is leveraging procedural generation of both narrative and games simultaneously in this fashion, and for those two sides to have the means to affect one another; the gestalt forming a novel system of its own.

One of the primary goals of this project is to engender the player's empathy for controversial, complex, or otherwise difficult themes of social justice. We are certainly not the first to pursue this goal; games and other new technologies provide users with the means to experience and learn about events that they might not otherwise encounter (Rankin and Thomas 2017). Narrative in general has the power to be an empathy engine, as "an important role of literature is its capacity to enable readers to imagine what it is like to be another." (Walton 2012). Besides building empathy, narrative—and specifically narrative that invites participation on the part of the "reader"—can be an effective tool for presenting and exploring difficult topics that might not be as readily explored through other mediums (Young et al. 2011). Moreover, the reconfiguration of the presentation of text has been used to reveal different insights and perspectives on the nature of a narrative and the characters within it (Jackett 2007); the design of our system allows for textual fragments to be reconfigured dynamically.

Existing serious games that attempt to address themes of social justice are, perhaps, the closest to the present work. As outlined in the introduction, many existing serious games either focus on having a narrative with moderate-to-minimal affordances for player intervention to affect its content, or focus on systems and simulations that fail to leverage the empathetic power of storytelling. Though games such as *Cart Life* (Hofmeier 2011), *Papers Please* (Pope 2013), and *1979 Revolution: Black Friday* (O'Connor 2015) still tend to fall on either side of the narrative/system line, they remain powerful pieces to draw inspiration from. Crucially, the systems and narratives in these games—where applicable—are not generative, but were designed by humans. Discussing one such game in particular, *Unmanned*, will help illustrate the narrative/system divide our system hopes to bridge, and reveal the importance of doing so procedurally.

Unmanned is an experience which asks players to engage with narrative and gameplay simultaneously. As described in the introduction, *Unmanned* depicts the day in the life of a drone pilot, juxtaposing mundane daily rituals (e.g., shaving and driving to work) against the horrors of remotely dispatching enemy targets (an act which itself takes on a feeling of the everyday due to the player character's distance from the violence).

The game is divided into a sequence of scenes. For every scene, the screen is split into a left and right half. The left half consists of the player selecting dialog choices, while the right consists of a minigame representing the action of the scene (e.g., shaving, driving to work, etc.). The dialog choices give the player the option to paint the player character in a variety of ways, ranging from a stalwart military man trying his best to be a good father, to a callous soldier, numb to his work and dismissive of his family. Though mechanically speaking the games are simple (such as requiring a single well-timed click) they still require the player's constant attention, lest they end in failure, prematurely ending the scene. Together, they provide a compelling window into the nature of modern warfare and those that fight it.

However, the interplay of the narrative and game-systems in *Unmanned* is limited. Save for rare occurrences of narrative gating, the only means for the player's gameplay performance to influence the narrative are the aforementioned fail states. This level of influence is local to the scene it occurred in; for example, if the player drives off the road on their way to work the "driving to work" scene will end, but the next scene will begin at work all the same. The only persistent effects of the player's gameplay actions appear to be the nicks on the player character's face accrued while shaving (which remain with him through the duration of the game) and the end-of-scene "medals" that the player earns. These medals bear no impact on the narrative, and only appear during the ending sequence as a reminder of personal achievement. Similarly, the dialog choices the player selects do not affect the content of its accompanying minigame.

The disjointed, low-agency nature of *Unmanned* is likely an intentional artistic choice of its designer to accentuate the themes of the piece. Nevertheless, we hypothesize that a framework that imbues *Unmanned*'s combined narrative and gameplay with increased agency could be a powerful mechanism for telling stories about—and engendering empathy for—many social justice causes.

System and Game Description

Our system is powering a game meant to increase interest, understanding, and empathy for the cause of climate change, and those affected by it. It follows the life of a young woman, Emma. Through player choice and performance, Emma can positively impact the effects of climate change by taking action at both the local and global level, as well as influence the feelings on climate change of those around her. We'll use this game to illustrate examples of the system's components throughout their description. Our system is primarily comprised of three parts: a narrative engine (StoryAssembler), a game generator, and a compiler.

StoryAssembler is responsible for presenting narrative content to the player that is consistent with both their previous narrative choices and game performance while adhering to authorial goals. The game generator takes as input rhetorical goals, and produces an abstract logical representation of a game that fits the rhetorical constraints. The compiler uses the Rensa encoding (Harmon 2017) to translate the game's logical representation into JavaScript code that runs in a browser using the Phaser game engine (Faas 2016). A fourth component, the sequencer, serves as a blackboard keeping track of narrative choice and gameplay performance to determine which scenario the player should be presented with next (if there are multiple options), resulting in further increased variation in playthroughs.

Given the capacity for individual scenarios to still exhibit dynamically configured text content and gameplay based on player performance in previous scenarios, we focus our discussion here on the StoryAssembler and game generator.

StoryAssembler

StoryAssembler is an engine built to create dynamic choice-based narratives, similar in output to traditional hypertext systems like StorySpace (Bolter and Joyce 1987) or Twine (Klimas 2009). However, unlike these systems, StoryAssembler has the capability to dynamically re-route paths between lexias, and to also assemble compound lexias from sections of others.

Organizationally, StoryAssembler is driven by a list of narrative scene goals represented as desired states, which the system attempts to greedily satisfy each time the reader makes a choice. These "wishlist items" are roughly ordered through possession of the optional tags "first" or "last," but in general the system treats it as an unordered list.

A wishlist item can evaluate bool, string, or int values. These are mapped to any qualities the author wishes to track, enabling functionality from reader path tracking (`establishCharProfession eq true`) to changing text for how characters speak when angry (`roomTension gte 5`).

Scenes have a library (or libraries) of "fragments," which are used to construct the choice-based narrative. Fragments correspond to hypertext lexia at the simplest level, containing a main section of displayed text, and a list of

```
{
    "id": "sampleFragment",
    "content": "The main text of the lexia, which can contain
    replacement grammars like {name|protagonist}",
    "choices" : [
        {"gotoId": "classSize"},
        {"condition": "furtherExplanation eq true"}
    ],
    "effects" : [
        "set sampleFragmentVisited true",
        "addWishlist { 'condition' : 'explanation gte 4' }"
    ],
    "preconditions" : [
        "startExample eq true"
    ]
},
```

Figure 1: A sample fragment. The first choice links explicitly to another fragment by ID, the second to any fragment that satisfies the condition. The second effect triggered adds a new item to the wishlist.

choices. Each fragment can additionally contain fields for pre-conditions and effects, which is how they're bound to wishlist items, and causal ordering is enforced. An example of an authored fragment can be seen in Figure 1.

Parameterized text can also be used to change the presentation of both fragment content and choice labels, which the underlying scene state can affect.

In terms of linking fragments to each other, one can directly link by fragment ID, the same as with traditional hypertext. However, links can be made more dynamic by setting to state conditions, such as `roomTension incr 1`, and the system will procedurally link to a fragment that fires the intended effect. Identical state conditions can be used for multiple choices, and the system will choose different paths to satisfy them.

For example, one could write a lexia with three choices, two of which increase the tension in the room, and one that alleviates it. StoryAssembler will search the fragment library for unique choice paths that lead to those states, and link them in. This paves the way for surprising juxtapositions of paths, and emergent readings that are driven by the underlying state changes and tracked stats.

When no further choices are available for the assembled path of fragments, the system bridges to a new starting point by creating a "Continue" link, and then proceeds to a new fragment that satisfies one of the remaining wishlist items when the reader clicks.

StoryAssembler could be summarized as a simpler, slightly more flexible version of a traditional planner, applied to the domain of choice-based narrative. This predisposes it to make more procedural choice structures, driven by sets of dramatic concerns and qualities selected for state tracking in each scene.

To illustrate StoryAssembler's use, we describe the first scenario of our protoype: the night before a stressful trial for Emma. There are several potential settings for this, but let us say that she is eating dinner with two friends prior to her PhD defense. The StoryAssembler wishlist has several items on it. These items include establishing the setting (e.g., where the scene takes place and who is currently present), as well as establishing some amount of drama: one of Emma's friends is a fellow academic; while the other believes real change can only occur outside of the classroom. The wishlist insists that both characters make their cases, that the tension in the room passes a certain threshold (via fragments that increment a `roomTension` variable), and that Emma discusses her own career aspirations. A library of fragments have been authored that can achieve these wishlist items in a variety of configurations.

Authoring content for this system is difficult to verify by hand, due to emergent effects caused by the unordered nature of wishlists, and the greedy nature of the search. Content the author may intend to show up at a certain point may appear much earlier or later, due to unintentionally satisfying desired state conditions.

Additionally, the knee-jerk reaction to prescriptively restrict lexias with stringent pre-conditions undermines the core goal of the system: if there is only one possible point the content can appear, then it might as well be statically linked. Ideally, all content in these narratives should be capable of appearing in at least one other narrative position.

Without a tool, the only way to double-check content authoring is through laborious traversal of the choices, and given that they are also dynamically assembled, essentially the entire structure must be re-verified with each added lexia or choice, to ensure it isn't showing up in an undesired spot due to unforeseen state conditions.

The visualization solution created for this problem needed to show the assembled choice structure, when wishlist items were being fulfilled, and how content was being re-used. Given that the code underlying StoryAssembler was still undergoing changes, we chose to collect data by aggregating playthroughs using the same procedures called in-program, so that any updates to how stories were formed would be reflected in the visualization. The resulting data was displayed as a directed graph. However, additional strategies were used to expose some of the underlying structure.

We created a subset of the narrative's state variables to establish whether a node in the structure could be considered structurally identical under different contexts. A good example is a short test segment where Emma is sitting in an airplane reading the newspaper. After an introduction (which fulfills an introductory wishlist item) she has a choice to read any of four articles, incrementing a state variable "articlesRead." When four articles are read, the last wishlist item is fulfilled and the segment ends.

If we set the visualization to not consider articlesRead as a differentiating state value, we get a flower-like structure with the central node as the recurring lexia (Figure 2a). If we set articlesRead as a differentiating state value, however, we get a slightly different structure (Figure 2b) where the recurring node, although identical in content, appears as a separate entry. However, they are still grouped together in a box, due to their shared content ID.

Game Generator

To generate a companion game for the narrative, the generator needs to be able to target specific affective responses and rhetorics. These might take the form of

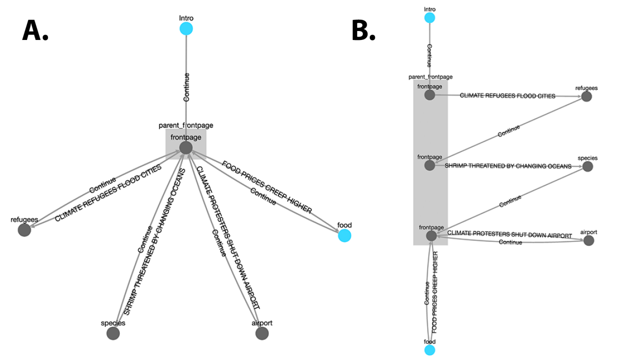

Figure 2: Screenshot from the narrative visualization, showing different displays for differentiated state variable of articlesRead.

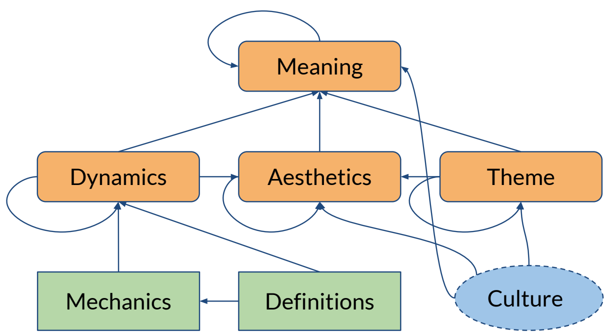

Figure 3: A graphical depiction of the structure of a proceduralist reading. Green rectangles represent the base facts of the game, the Definitions (i.e., what entities, resources, etc. are present) or the Mechanics (e.g., when entity A collides with entity B resource C is increased). Orange rounded rectangles represent the derived proceduralist readings. The blue oval represents the cultural background that an individual brings, which can change the reading (e.g., European cultures see red as angry or dangerous, while Chinese culture sees red as representing happiness and luck).

- *Game-O-Matic* (Treanor et al. 2012a; 2012b) style micro-rhetorics specific to entities found in the game (e.g., dog chases cat, cat eats mouse).
- Player modeling such as "The player will attempt to achieve outcome *X*."
- Procedural readings such as "This game feels hopeless because difficulty increases monotonically."

Towards this end, we build on previous work by Martens et al. (Martens et al. 2016). Martens et al. used Answer Set Programming (ASP) to perform proceduralist readings (Treanor et al. 2011). Proceduralist readings are a proof-like structure wherein the different meanings found in a game are constructed from lower order facts about the game. A graphical depiction of the types of readings and facts can be seen in Figure 3. The work of Martens et al. used fixed sets of mechanics and definitions to generate sets of Dynamics, Aesthetics, and Meaning, and we now turn that process around, choosing fixed sets of Meaning, Aesthetics, and Dynamics and generating Mechanics and Definitions that produce those readings. ASP is well suited for this reversing of directions, as the same rules can be used for both directions of the process; however, the process of generating a game requires additional rules.

ASP broadly has three classes of rules:

- Facts - Ground facts that are given as truth (e.g., `animal(dog)`, i.e., "dogs are animals").
- Rules - Either constraints on what facts are or are not allowed to be present or ways to derive new facts from existing ones (e.g., `organism(O) :- animal(O)`, i.e., "All animals are organisms").
- Choice Rules - Rules that allow for choices to be made (e.g. `{hungry(O) : animal(O)}`, i.e., "An animal, O, may or may not be hungry").

In our code, as in the code of Martens et al., the rules governing meaning derivations are regular rules. Where our code differs is that they treat game definitions and mechanics as facts, but we treat them as choice rules, allowing the system to choose a set of mechanics and definitions that satisfy the constraints on the derived readings (which they place no constraints on). To adequately define the definitions and mechanics such that a playable game can be defined from them, we use a modified version of the language used by Martens et al. that we will refer to as *Cygnus* from now on.

Games in *Cygnus* are organized in a manner consistent with the proceduralist readings, i.e., they are composed of *Definitions* and *Mechanics*. *Definitions* are simply the sets of things found in the game and their properties. e.g.,

```
entity(dog).
resource(money).
timer(release_more_dogs).
```

Here, entities are the graphical entities that may or may not be present on the screen, resources are scalar values, and timers represent events that occur after a duration, perhaps periodically.

Mechanics build on these definitions and are defined as grouped sets of preconditions and results. e.g.,

```
precondition(le(lives,0),lose).
result(lose,mode_change(game_loss)).
```

...which can be read as "If lives ≤ 0, then the player loses the game." Theoretically, a mechanic can have any number of preconditions linked to any number of results, but in practice there are typically at most three preconditions and three results per mechanic.

To generate games, we pull from a pool of possible game atoms (both definitions and mechanics) with choice rules.

```
{precondition(overlaps(E1,E2,true),O) :
entity(E1),entity(E2)}
  :- outcome(O).
```

i.e., "It might be the case that a precondition for mechanic, O, is whether two entities, E1 and E2, are overlapping." However, we must add additional constraints, not just those related to the targeted derived meaning, to produce sensible, playable games. Some are required for a game to be playable in any way, such as precluding games that are instantly lost:

```
:- initialize(set_value(R,V1)),
  precondition(le(R,V2),O),
  V1 <= V2,
  result(O,mode_change(game_loss)).
```

i.e., “A resource, R, should not be set to a value, V1, if that would result in the game being lost because it is less than V2.” Other constraints are not strictly required, i.e., if they were violated the game would technically be playable, but their addition results in more aesthetic and sensible games. Like the aforementioned limiting of the number of preconditions/results that a mechanic can be composed of, they are typically limits on the number of things that can take place or what types of preconditions/results can be found together. For instance, the following mechanic would be precluded from our generated games.

```
precondition(overlaps(e1,e2,true),o).
precondition(overlaps(e1,e3,false),o).
precondition(control_event(click(e4)),o).
precondition(ge(r1,5),o).
result(o,add(e1,e2)).
result(o,decrease(r1,2).
```

i.e., “If e1 and e2 overlap and e1 and e3 don’t overlap while the player clicks on e4 and r1 $\geq$ 5 then add another e1 at the location of e2 and decrease r1 by 2” which is an overly complicated mechanic with no easily interpretable meaning.

Given the machinery to generate games, the generator takes in a set of desired readings and produces a game designed to have that reading. The set of possible readings are:

- Is the game strategic?
- Does the game require dexterity?
- Is sharing represented?
- Does the game require organizing?
- Is the game meditative?
- Is grinding present in the game?
- Is the game hopeless or hopeful?
- Does the game have increasing/decreasing stress?
- Is defeat inevitable?
- Do the players actions have risk/reward?
- Are there any tradeoffs?
- Is there urgency?
- Is there scarcity/abundance?
- Is the game slow/fast paced?
- What is the difficulty of the game?
- What are the stakes of the game?
- Does the game require maintenance of a resource?

While certainly not an exhaustive list of all of the affective properties a game could produce, to our knowledge no previous game generation system has allowed for generation to target as large a set of readings intentionally.

Returning to the aforementioned dinner scene, the rhetoric specified for the game generator is intended to create a slow-paced, easy game in which there is no scarcity and the idea of sharing is represented. These qualities are meant to be evocative of the tenor of the evening—though

Figure 4: A screenshot of the preliminary study prototype. Players search for crabs (upper right) while debating the utility/futility of the action with a fellow activist using a dialog tree (left half). Feedback is offered through the depiction of the characters (lower right).

Emma is anxious the meal remains celebratory in nature—as well as the action. By specifying the presence of sharing, the game should elicit a feeling of making sure all entities present in the game are well-fed.

Though many such games could be generated, a simple example might be one with the goal to produce satiation. One form of this game could involve three blue circles (representing Emma and her friends) and a steady supply of red circles (representing food). The food is continuously generated (due to the request for the absence of scarcity), and if the food is dragged to a person, then satiation is produced.

StoryAssembler and Game Generator Interplay

In the dinner minigame, if the player neglects to keep all parties equally fed, the tension in the room rises, resulting in StoryAssembler presenting different narrative fragments to the player. Conversely, if the player is doing a good job of maintaining peace in the narrative, the minigame representations of those characters may be less demanding.

By the end of the dinner scenario, the player’s choices will have both short and long term ramifications for Emma. Emma may choose to remain in academia or focus on making a difference in her local community based on how she sided with her friends. Her friends may or may not be selected to appear in subsequent scenarios based on Emma’s final standing with them. Additionally, the content of this game (a slow-paced sharing game meant to connote “dinner”) is remembered, and can be played upon in future scenarios as a rhetorical device. For example, a later scenario, taking place twenty years later, might involve a game with the same specified readings, except now “scarcity” is present. The familiar rule-set of the game should still read to the player as a “dinner” game, though now there is less “food” then there was before, to convey the difficulty of sufficiently feeding friends and family in a hypothetical future heavily suffering from the effects of climate change.

Preliminary Results

Although the first full game using this framework is still under development, we have conducted a small player study to gather data on the principles motivating it. This study was conducted on January 15, 2016, prior to completing StoryAssembler or the game generator. We gave ten participants a "prototype" version of the experience, consisting of a three scenario sequence (out of a pool of four scenarios).

Scenario one involves Emma eating dinner with friends. In it, players answer questions about Emma's upcoming defense while serving food to the room. Scenario two is Emma's first lecture as an assistant professor. It asks players to maintain Emma's composure through a simple rhythm game, which affects the quality of her lecture. Scenario three depends on the player's performance in scenario two. If Emma successfully delivers her lecture she becomes a successful academic and players plan conference trips across the world, balancing Emma's growing fame, expenditures, and carbon footprint. If she fails the lecture, Emma leaves academia, and volunteers at a local beach, where she must inspire a pessimistic co-volunteer while relocating a crab population (see Figure 4).

The ages of the participants ranged from seventeen to twenty-five; all ten were students from a variety of majors (including Anthropology, Computer Science, Global Economics, Marine Biology, and others). After playing the game, the participants were asked a variety of questions, including "what are your general reactions to this game," "what choices did you notice you had in the game," and "how serious of a problem do you think climate change is," and were asked to fill out a brief demographic survey.

Several respondents expressed that they found the game "educational, interesting" and that they were "curious to play more." Their "choices were intentional" and had several positive feelings regarding the combination of narrative and gameplay. In the dinner scene, many participants commented on how it "mimicked having to stay alert to carry conversation while eating," and in the lecture scene "the game mechanics [were] less distracting but add [an] element of stress or time pressure to the game" though another participant reported that "the information in the lecture was hard to absorb because I was distracted by the game." In the prototype version, narrative choices influencing game mechanics were not yet implemented, but one participant suggested that "game play could be more challenging at times and less at others to... mimic Emma's stress."

The "travel" scene had intentionally vague goals; Emma's fame, expenditures, and carbon footprint were all tracked, but no explicit goal was presented to the player. Although this caused confusion for some of the participants, others reported making choices that felt right to them such as one participant that "played with the objective of minimizing carbon footprint and saving money, not for fame" and another that visited "places that just seemed fun and interesting." The game was also designed to adhere to different readings, which participants were able to pick up on through responses such as "this game [is] less challenging and stressful but requires more strategy and planning."

Many participants responded negatively to the pessimistic volunteer at the "beach" scene. Many reported the character as "kind of annoying" due to an obstinate negativity in the face of positive change, as well as recognizing that the character "really made apparent the negative impact of pessimists." Participants "wondered if [their] responses were going to change [the volunteer's] mind" but were generally unable to notice a difference, which was frustrating for them. This suggested that in a high agency system it is important for players to have some sway over the hearts and minds of such people.

Participants learned specific facts pertaining to climate change (such as "C02 in ocean affects exoskeltons of crustaceans"), but also made "new connections between previously understood concepts" such as the "interconnectedness of food sustainability and humans." Some participants also expressed empathy, (e.g., "I am concerned about poorer countries since they will suffer more, island nations") and felt spurred to action in their own lives (e.g., "I know I can only do so much, but my choices matter. I could do more" and "the game game made me want to put a little more effort into making even small changes instead of just talking.").

Although additional player studies will need to be carried out once the game is finished, these preliminary results make us hopeful that our system is effective at galvanizing players to learn about—and care about—social justice issues.

Conclusion

Serious games can be effective pedagogical tools for discussing controversial issues related to social justice, but their ability to persuade and educate can be increased through the combined use of narrative and sequences of rule systems. This paper outlined two of the primary components of a system meant to dynamically generate such game and narrative pairings. Though the first fully fledged game using this framework is still in development, an initial prototype was playtested. The results of this playtest were generally positive, with many participants reporting increased understanding and empathy for the target domain of climate change, as well as recognizing different rhetorical readings from minigame to minigame. Future analysis with a completed experience will better inform how well this work generalizes for other causes of social justice.

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