

A Corpus-based Approach to Analyzing Player Experience in Interactive Digital Narratives

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Abstract

Contemporary interactive digital narratives combine interactivity, cinematic tropes and rich thematic writing. The content in such works is usually hand-authored, and the mechanics and instancial content designed to elicit particular player emotions and responses. Current computationally based analytical tools are focused on textual interactive narratives that are often created by the researchers themselves, and many investigate novel interactive storytelling mechanics and systems rather than pre-existing works. We argue that a corpus-based approach which is agnostic to a particular research goal would, as it has in linguistics, facilitate the quality of research into effects of interactive narratives. We have compiled an initial corpus using this approach by annotating gameplay and observational videos of players ($n=7$) experiencing the first episode of Telltale Games *The Wolf Among Us*. The player study uses multiple simultaneous measures to record a wide variety of input that isn't immediately apparent from a log of the player choices alone, including the use of an instrument to facilitate player non-verbal report of emotions, the Sensual Evaluation Instrument (Isbister et al. 2006). We have annotated the synchronized videos with choice identity, player-made decisions, and the players usage of the instrument. Our hypothesis was that multiple participants would converge on usage of the instrument at similar times in the narrative. Initial results, however, indicate that the work has elicited a much greater diversity of experiences than we could account for with the given measures.

Toward a Corpora of Cinematic Interactive Narrative Player Experiences

Narratives are a fundamental mode of discourse, and a topic of intense interest in the AI community since the beginning. The form represents a sophisticated communication of not only information about a particular series of events, but various perspectives on them that are encoded in the telling. Storytellers rely on these methods to achieve various effects, and often psychology and social sciences rely on narrative context to conduct experiments due to the strength that a narrative understanding exerts over emotional response and perception of new events.

This paper describes an exploratory, corpus-based approach to conducting interactive narrative research in order

to address several issues with current approaches. First, current work is often, due to cost and practical reasons, conducted on works created by researchers for the purpose of research. While many of these serve as a viable testbed for isolating particular narrative effects, they do not represent the current state of interactive narrative in the entertainment industry. Many story-based games that are popular today are backed by large budgets and include mimetic storytelling over text-based storytelling. As a result, these experiences closer resemble cinema than literature, and the production quality of the final work is simply out of the reach of research labs budgets. Second, there are no current accepted methods or approaches to comparing competing models of narrative on equal footing. A major contributor to this is the lack of availability of datasets which allow for comparing models. Third, the tools that we have for discerning and measuring effects of narrative are improving, but they require additional work to assemble a study to validate. This suggests that a shared resource of data, content and raw results which is not designed for a particular study would be of general use, as has been the case in the computational linguistics community.

To this end, we propose a corpus-based approach to studying interactive narrative that focuses on long-form, released episodic games and which leverages as much data collection as possible for the testing and refuting of models and theories. We have begun this work by recording a set of player experiences of the contemporary interactive fiction piece *The Wolf Among Us* by Telltale Games, and have analyzed the initial set of annotations with the goal of finding patterns in emotional reports by players.

This paper is organized as follows: First, we motivate the current work by arguing for the study of long-form episodic interactive narratives and further characterize the sub-genre of choice-based cinematic adventure games (CCAG) as a primary avenue for focus. Second, we review the existing methodologies and research approaches that have used computational means to study both static and interactive narrative, and pay particular attention to those that include measurement and characterization of the player experience and emotions. We then describe the study design and initial annotations applied to the dataset. Finally, we describe the results of comparing the usage of the instrument with the annotated choices of the participants and observe that the hy-

pothesized clustering of usage around significant decisions or events was not present. We close with a discussion of future research to be done based on availability of a corpus of interactive fiction playthroughs.

Motivation

Narrative media accumulates meaning over time; a given event can color future events while a given detail properly foreshadowed can complete a final plot flourish. A work's effect results from the totality of material, resulting in an impression of a world and its inhabitants. Many of the effects of a particular representation of media are also additive: the linguistic meaning of a particular dialogue exchange may be undercut by the treatment in the language of cinematography.

The holistic nature of many modern commercial interactive narratives raises many research questions about interactions between story and interaction choices, presentation modes (Springel 1998), or game mechanics (Larsen and Schoenau-Fog 2016). The proposed approach of using a corpus of real player traversals is not an exhaustive analysis of the potential experiences present in the artifact itself, as such would require investigating every possible combination of choices. Instead, by using a set of player experiences of the interactive narrative we can understand the range and types of reactions to the artifact as well as the specific affordances in the genre that may have given rise to them. Consequently, the schema proposed in this is specific to the genre of games that Telltale has popularized, and would need to be extended as each game in the series often introduces novel interactions that heighten or deepen the narrative engagement.

Related Works

This project crosses many boundaries of traditional efforts, charting both a non-textual interactive narrative as well as one that is previously published. The following sections describe the current efforts in both modeling narratives as well as understanding player experiences.

Modeling Narratives

Following in the original models of meaning in artificial intelligence research started by Shank with conceptual dependencies, a number of approaches have been developed by the community over the years to capture aspects of narrative in a computable model, with either the goal of understanding the model as a human would need, or in using these models to create a story. There are a number of efforts underway to model narratives, including NarrativeML (Computational Narrative) (Mani 2012), the drama-focused ontology Drammar (Albert et al. 2016; Larsen and Schoenau-Fog 2016; Rapp 2001). David Elson has also taken a computational linguistics approach to charting narrative discourse using a semantic graph based approach. Much of his work with Story Intention Graphs (Elson 2012b) and in particular focusing on descriptive methods has been an inspiration to the present work. He has made publicly available corpus of stories, the DramaBank (Elson 2012a). Sarah Harmon has begun revis-

iting the goals of SIG with a human-readable textual management system.

Annotating interactive media

Interactive media presents novel challenges compared to the linear media that is the focus of the descriptive models in section 2.1. There have been many efforts to operationalize these models of narrative to create novel storytelling systems, but relatively few efforts to document and analyze existing interactive narratives of which source code is unavailable. One of the first roles of the Hypermedia model was to provide a specification of what that name and product could look like with a focus on static content and linear media connected via annotations (Hardman, Bulterman, and van Rossum 1994). In a more descriptive vein, the OntoMedia project (Jewell et al. 2005) seeks to identify parallel content in and amongst heterogeneous media. One type of result that came from the model was the evaluation of prominence of a character in a work in a written version versus a film adaptation..

Choice-Based Interactive Narratives

One of the primary features of the choice-based cinematic adventure game is the emphasis placed on the moment-to-moment timed choices of the player over puzzle solving, combat or other interactions. While combat and other tense events are often represented by quick-time events, the majority of the content is delivered by dialogue among a set of characters acting out essentially an interactive script. The gameplay is evocative of cinematic works, showing a changing perspective between characters and also incorporating shot types often seen in film and television and not often present in the middle of a typical roleplaying game. Fendt et al investigate the role of actual agency versus perceived agency in text-based games. Their study compared actual branching storylines with those that are similar to the structure of Telltale games, which includes primarily short-term feedback of the responses to a particular choice (Fendt et al. 2012)

Peter Mawhorter has made contributions to understanding choice poetics, synthesizing a range of research into a foundation for a theory of choice aesthetics (Mawhorter 2016). In it, Peter not only devises a set of narrative dimensions to map his work across, but also assesses the measures he developed through an online gam. The main shortcoming of his approach, analyzing choices based on player goals, is the diverging set of player goals and identities vital to the work itself. Cardona-Rivera et al take a different approach with their analysis of choices, using a situation model to decide whether choices were in fact meaningful or not based on whether a choice would result in a change in the situation is some way (Cardona-Rivera et al. 2014). Both studies have focused on textual choose-your-own-adventure style games and thus miss out on the opportunity to see choices influenced by non-textual factors such as tonality, dramatic presentation, cinematographic or even visual appearances. Many subtle influences are exerted in *The Wolf Among Us* either by the characters themselves or by the creators to influence a particular interpretation of events or characters,

and the choices often feature and reinforce that interpretation heavily.

Player and Player Experience Modeling

Many works have started charting the specific reactions of players to interactive narratives. The exact nature of how reader response is shaped is theorized by Mani (Mani 2010), whose focus is on the evaluation of characters by the reader, whereas along a similar vein but Battaglini and Damiano focus on the character appraisal of each other (Battaglini and Damiano 2014). Part of the tendency is to model these effects with a goal of optimization, or finding an ideal model to represent the readers response or the characters affect. In contrast to this, Roque engages directly with the hermeneutics of literary complexity in text (Roque 2012), a reminder that the sheer amount of meaning embedded in a communicative media may not be amenable to reductive approaches, again with a focus on uncovering the meaning of existing works rather than generating them themselves.

Some of the more successful approaches to using planning and knowledge of the storyworld to create or understand specific effects include suspense (Cheong 2007), surprise (Bae and Young 2008), tension (Szilas and Richle), interestingness and specific emotional responses (Roberts, Narayanan, and Isbell 2009; Hernandez, Bulitko, and Hilaire 2014). Part of the desire to understand the interactions and the totality of a longer, fully produced work is what motivates the current approach.

Another strain of work has focused on the communicated experience of expressive characters within drama, in particular their emotions. Annotating Character Emotions in Drama (Damiano et al.)

Katherine Isbister et al developed the Sensory Evaluation Instrument (Isbister et al. 2006; Laaksolahti, Isbister, and Höök 2009). While we are not using every aspect of the SEI in the present study, its use is tabulated to evaluate basic affective response and the video is saved along with the annotations for future use.

Goals and Requirements

Given the current efforts in studying narratives and in particular experiences of players and interactive narratives, we assembled a set of requirements for a player experience corpus that would application of existing methods and models as well as facilitate experimentation with new methods and approaches. Because we wanted to establish methods that could both be used for different purposes and for future approaches to compare against current approaches, we tended to err toward a more holistic documentation of the experience from as many measurable and nonmeasurable records as possible. Nevertheless, the following requirements stood out:

Synchronizing annotations of player observation and gameplay footage. This enables training of machine learning algorithms to eventually automate any of the tagging that may take place or be used. Annotating specific events in the playthrough. This includes any event that can be identified through a videofeed of the gameplay itself or by the players interaction with it. Connecting events across shared content.

An audience watching a movie all witnesses the same story. In the case of interactive stories, the prior events or even the selected response of the player-character may vary significantly, and these lead to potential problems when comparing a players response to the same content. The method should allow for tracking both current content choices as well as prior choices that led up to it. Enable future elements derived from the gameplay footage, e.g. gaze, expression, posture to be visible and able to be connected to the other annotated features

Telltale Games *The Wolf Among Us*

With these goals and requirements in mind, we selected Telltale Games *The Wolf Among Us* as it had an acceptable amount of complexity and narrative variation while taking advantage of many of the emotional-targeting authoring techniques often used for modern televisions). In this section we'll review the overall game, including plot for the first episode, as well as the types of dramatic scenarios present.

Telltale Games has similar goals to television series creators, that of emotional storytelling. As a result of its original has defined this genre with

By working with a popular game genre, we can apply computational methods to the communities of discourse surrounding it. Many players discuss their choices and their experiences either through self-published videos of their own playthroughs, or through discussion forums.

First, the plot focuses on an investigation by the player-character protagonist, Bigby Wolf, of a murder in the community of Fabletown, where creatures and characters from bedtime stories have been forced to flee their homelands and take up residence in New York City. The game is based on a comic series by Bill Willingham, and has been since adapted into a canon issue ahead of time.

An important thematic and core draw for the story is the portrayal of a poignant class divide within the currently causing friction between the non-human Fables, such as the first character introduced, Mr. Toad, and the human fables. Not only are the non-human Fables unable to live in the desirable luxury apartment complex, where the mayors office and sheriff are, but they are mandated to wear a special enchanted item called a Glamour that gives them any appearance possible.

The game is divided into 6 chapters, with the 4th chapter being essentially a choice of ordering of two scenes within the 5th chapter (having Snow and Bigby visit either Toads apartment or Prince Lawrences apartment first). The game primarily employs choices in the form of timed sets of buttons to respond to a particular situation as the player-character. Often the player-character will also deliver lines and actions without prompting to either set up the scene or deliver a necessary kernel for each story. While analyzing the game for the pilot study, a number of types of mechanics were identified by their functionality. The three primary ones are dramatic choices, exploratory choices, and game choices. The focus of the present study is on dramatic choices, which are characterized by values and relationships over material gain or access.

Study Design

We conducted a preliminary study with 7 participants. Each participant was instructed to play through the first episode of *The Wolf Among Us*, using All the Feels (ATF) (Robinson, Isbister, and Rubin 2016), Sensual Evaluation Instruments (SEI) (Laakso, Isbister, and Höök 2009; Isbister et al. 2006), and think-aloud techniques. Post game, the participant did a retrospective think aloud and filled out the Immersive Experience Questionnaire (IEQ). We wanted to know the benefits of this emotion evaluation suite at various points of play. As a prerequisite to participate in the study, we required that the participant had never played the game before so their reactions would be unadulterated. We chose this particular game because of its easy controls to pick up for a non-gamer, as well as its range of narrative mechanics and emotional palette. The work represents a subgenre of adventure game that focuses on moment-to-moment player choices relating to dramatic beat (Murray, Mateas, and Wardrip-Fruin 2017) As why we chose



it] At the beginning of the session, we started by having players take a pre-game questionnaire, asking them a variety of questions relating to familiarity with the Fables comics lore the game is based off of or any other telltale games which may bias their feelings. We then calibrated the SEI, which consists of showing the users a set of 10 photos of different images and having them indicate with the SEI which association came to their mind for that particular instrument. We then instructed participants to play the game, think aloud, as well as use the SEI as much as possible. They were also equipped with the Empatica E4 wristband (ATF) to track their HR and GSR data. The facial recognition, Affdex, from ATF was running as well (Robinson, Isbister, and Rubin 2016) At the end of the session, we conducted a retrospective think-aloud with the player about how they felt at certain peak moments of the game, how they felt about various characters, and why they used specific SEI during play. We then instructed them to take the IEQ as an additional method for comparison. We then analyzed the data and correlated the moment-to-moment choices with use of the SEI, biometrics, and think-aloud.

We needed to annotate the actions taken during the playthrough, the presented choices, and any player reports of emotions. Cinematic choice-based adventure games employ a variety of interaction mechanics. These include inventory (keeping track of items that affect choice availability), navigation (moving through a 3D environment which displays hotspots indicating possible interactions. These can also af-

fect the state of items in the environment, such as whether a fan is on or off, and include triggering satellite content such as the player-character commenting on a particular item in their apartment (see (Chatman 1980)). We understand that modeling the full diverse range of mechanics does not need to be done all at once, and so we focused on the aspects of the game most apparently tied to emotional states of players.

We focused on a subset of features were the simplest to identify by visual inspection without resorting to inter-annotator agreement validation. These included the time-code and set of alternatives of each choice presented to the player and the ultimate player decision (including not making a choice in time). The timing and the content are used to further analyze the players emotional context after such choices by comparing the timecodes of the instruments to that of the choices. We began the annotation process by making use of a research tool designed for multi-modal annotation of videos, Anvil (Bunt, Kipp, and Petukhova), an openly available video annotation tool for annotating playthrough data. Anvil represents annotations on tracks which allows for a set of annotations that have attributes with various types associated with them. We eventually completed the annotation using the marker feature of Adobe Premier Pro due to the sheer amount of footage, totaling at over 13 hours. The main advantage of Premier Pro over Anvil was the ease with which speed could be controlled, although specifying ranges for annotations was not as easily done. We exported the annotations into a CSV format for further work, which consisted of identifying the choice point and transcribing the choices text.

We decided to start exploring the dataset by charting the extent and variance of this new dataset, and so proceeded with mostly objective and easily annotated features without the need for inter-annotator agreement to validate the annotations. The next section presents and discusses the initial metrics of the playthroughs.

Initial Results

While we aimed to collect as comprehensive a set of measurements on the actual player performance and expressions during the traversals as possible, we report our early analysis on the metrics that were easily annotated.

Player	Duration	SEI Uses	Doubleball	Ball	Spiky	Bubbly
1	1:51:55	8	2	1	2	2
2	1:42:05	14	3	1	3	0
3	2:01:46	30	2	0	4	3
4	1:55:39	70	12	3	8	11
5	1:44:25	49	2	1	2	12
6	1:53:30	82	12	3	7	19
7	1:54:07	14	3	1	4	1

In order to correlate the decisions among players, a coding schema was devised that incremented a scene number whenever a change in character occurred, and which incremented a choice set number each time an interface was presented. This enabled some amount of flexibility in identifiers to agree when certain choice paths led to additional choices, as was the case several times. There were two game

segments that included non-dramatic gameplay mechanics. The first was the office, where the player gradually learned that the identity of the prostitute was a Fable named Faith. While this segment was vital for backstory, the mechanics are largely that of hypertext. The second divergence was during a scene with Mr. Toad where Bigby is questioning him about suspicious circumstances. In this scene the exploratory mechanic supports a game of pointing out inconsistencies and forcing Mr. Toad to admit why he was concealing a break in. Interestingly, the dramatic tension in this scene is in part built up by earlier exchanges with Mr. Toad which may provoke the player to side against the character. One of these is an aside given by Mr. Toad when Bigby has passed away, cursing the Sheriff for telling him how to spend his money. Such a scene plays the dual role of establishing the class theme as well as providing the player a ready-made set of relationships to base their interpretation of the character on.

Because of the focus of this initial study on emotions and choices, we focused exclusively on dramatically staged choices. We also recorded variants of choices based on state variables. We decided on 25 distinct scene units, some of which occurred in different orders. Some scenes are single choice sets, such as the final decision as to whether to arrest Dee or the Woodsman.

We found that there were 6 choices which received unanimous agreement in the decision from all of the participants. Three of these choice sets were strongly influenced by the presentation of the choices within the game. One of the choices was a final dilemma of who of the two available suspects to arrest. Interestingly, all of the participants chose to arrest Dee, most likely because of the revealing scene that caused the Woodsman to confess another crime during the final scene of the game. Another 10 questions were agreed by 6 out of the 7 participants, including not disclosing a character's presence, Beauty, to her husband, Beast by lying. The vulnerability of Beauty's request and its primacy may play a role in its preference, much as the first sequence is designed to elicit players' attachment and sympathy for Faith.

These findings suggest that narrative modeling will be necessary to understand the reported diversity of player experiences.

Szilas proposed a number of measures for choice analytics (Szilas and Ilea 2014) which we quickly realized would not apply well to CCBA as the diversity of choices was extremely limited, with 74 choices identically presented to all 7 participants.

Table 1: Annotator agreement of use of SEI on sections

ID	Participants	Description
12-1	3	Snow gets Bigby and brings him to see Faith's decapitated head.
15-1	2	Exploring the office in the Woodlands and interacting with the mirror finding Faith's identity
6-1	2	Visiting Prince Laurence's House and discovering he'd been shot (or shot himself)

One of the more surprising results was that only three segments had multiple annotators express emotions during them. This was determined by selecting SEI events by their timecode using the timecode of a decision point and the fol-

lowing, or the end of the work if it was the last. By this measure, two choice sets stood out as they were surrounded by large spans of time. See Table 3.

Future Work

With an increase in the density of the data, visualization will become ever more important. While we subjected the dataset to basic mathematical analysis, more advanced questions relating causes from narrative origins to potential effects will require an interactive visual interface. Further analyze emotional data based on calibrations and compare to other measures of emotion (for both characters and for the player).

We would like to attempt to automate many of the more mechanical feature detection tasks and focus annotation efforts on semantic challenges such as meaning and story structure. To this end, we'd like to use multiple story models on the same corpus for comparison (SIG + Drammar, for instance).

Analyze choice paths based on the values expressed by the player both about morals and about particular characters and visualize how they change over time. This is well supported by this dataset.

Conclusion

In this paper we presented a methodology for collecting the videos of both player behavior and gameplay captures as well as emotional and physiological signals. We argued for the focus on longer form commercially available works as subjects of experiments and presented the initial results of an analysis of a study of 7 participants playing Telltale Games *The Wolf Among Us*. We evaluated the effectiveness of our corpus by comparing the usage of emotional instruments to the choice points across a variety of traversals, finding that the diversity in expression was not easily uncovered. We believe there are a number of opportunities for developing holistic models that capture narrative, emotion and context in order to understanding player experiences in interactive narratives. :

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