

Study Design for Predicting Player Emotions In An Interactive Narrative Using Story Intention Graphs

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ABSTRACT

This paper describes a planned study to use a model of the narrative meaning to analyze a contemporary interactive digital narrative. The primary research question is whether a model of the underlying story can predict player emotional responses to key events within an interactive narrative when provided with a player's earlier choices. The game *The Wolf Among Us* by Telltale Games was selected due to both its critically acclaimed status and the fact that it has both a strong, stable narrative and rich emotional content tied directly to the story itself. The combination of sophisticated narrative and high production values provides an opportunity to understand how choices and branching stories operate within contemporary digital narratives. The game uses choice menus with natural language labels with simplistic accounting of inventory and environments. The game uses bespoke hand authorship of complex well-rounded characters and on dramatic voice and animated performances, representing highly layered meanings and attracting fervent fan communities. We selected an existing computational model of narrative for its ability to represent affective relationship between story-values and the character goal networks that pursue them (David Elson's Story Intention Graph and its text-focused annotation tool, */Scheherazade/* [2]) and plan to use annotated adaptations of traversals to compare player experiences. This paper describes the proposed efforts to pursue the aforementioned research question: first, developing a repeatable methodology for annotating a cinematic choice-based adventure using the selected narrative model (SIG) and in particular associating events with story values and characters. Second, recording a set of player's emotional experiences while playing the game, and using the method developed in the first effort to associate these responses with configurations of the story content. Third, developing an algorithm whose input is the player's traversal and whose output are potential places for emotional response. Fourth, a second study validating the algorithm which is conducted using episode 2 of *The Wolf Among Us*.

CCS CONCEPTS

• **Applied computing** → **Computer games**;

KEYWORDS

computational narratology, story intention graph, interactive digital narratives

ACM Reference format:

Omitted for blind peer review. 2017. Study Design for Predicting Player Emotions In An Interactive Narrative Using Story Intention Graphs. In *Proceedings of ACM Conference, Washington, DC, USA, July 2017 (Conference'17)*, 4 pages.
DOI: 10.1145/nnnnnnnn.nnnnnnnn

1 INTRODUCTION

Interactive storytelling uses the capabilities of computational media to dynamically assemble stories based on player input and/or on an underlying simulation of a world. These narratives can be in any of a variety of immersion levels: text-based were popularized as the genre of interactive fiction, whereas the interactive drama *Facade* [10] uses conventions from theater and simulates a mimetic illusion of a world where characters act and react as agents with audible natural language in continuous time and space. Regardless of immersion level, narrative is an important vehicle for communicating experiences. The present study uses computational models of narrative to encode a particular storygame, *The Wolf Among Us* by Telltale games. It was selected due to its nuanced narrative and critical acclaim, as well as the thriving fanbase. We hypothesized that the work's intertwining character goals and complicated relationships with each other and the player would provide an ideal testing ground for assessing the value of the techniques on understanding the specific ways in which a specific work negotiated interactivity and choice within a fictional universe and with a defined cast. The goal of this paper is to begin the work of applying formal models to nontrivial works and to embrace the ambiguity, complexity and nuance in the surface and in the attention to the narrative simulation taking place.

This paper is organized as follows: First, we motivate the research question and situated its goals within game studies and the computational narratology. We then define the specific subgenre of interactive narrative chosen for the study, cinematic choice-based adventure games, and describe the traits that make it suitable for the study. Next, we describe a proposed sequence of efforts to address the research questions: modify an existing model of story for interactivity and non-textual sources, annotate corresponding events with coded experiences of player emotion, identify possible models for how the story structure and recorded emotions relate and use it to predict player emotional experiences in a new episode of the series. We then describe the initial results of the first effort

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Conference'17, Washington, DC, USA

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DOI: 10.1145/nnnnnnnn.nnnnnnnn

of transcribing and annotating a non-textual traversal of an interactive narrative for encoding with emotional events. Finally, we discuss direction for future work and conclusions.

1.1 Motivation

Interactive narratives are challenging to study: they present a constantly moving target for analysis, as each traversal (a term introduced by to describe a specific playthrough) still in their infancy. Most approaches to understanding the player experience (PX) in narrative games involve some combination of quantitative measures [8], close play and the idea of the reading the processes ([19], hermeneutics Arjoranta [1], design patterns [15] and user studies [17]. None of these approaches can comment on the underlying narrative structure without a model of narrative. Such a scaffold would comparison of the content between traversals to be compared automatically and would enable subjective elements of an interpretation to be made explicit. Such a representation, like other annotated datasets in linguistics, could further be used to identify patterns and new structures that are not obvious. They also study IDN (interactive digital narratives) broadly, rather than segmenting the genre of interactive narratives into those that are simulation-based and those that are story-based. Tanenbaum argues that the focus on such works should be to understand their *readerly* pleasure through their *bounded agency* rather than the more popular notion of agency that involves a player taking actions and seeing the results. This position also suggests that techniques that are currently being used to study linear narrative could, with some modification, be used to study non-linear narrative. That goal, of extending and adapting a model of linear narrative to non-linear narrative, supports the objective of understanding how humans interact with the substance of a narrative in the context of an interactive narrative.

This work builds on the ongoing efforts within the computational narratology community, especially those focused on corpora and formal models. Modern structural approaches such as those taken by many narrative generators owe a debt to the original corpus study of Russian folk tales by Vladimir Propp [14]. Noah Wardrip-Fruin describes computational media in terms of three components: data, process, and surface [20]. Works such as those created by Telltale Games rely heavily on hand-authored narrative dialogue and human performances rather than generated or simulated content found in Emily Short and Richard Evan's *Versu* [3] or the model of social games at the core of Joshua McCoy et al's *Prom Week* [11].

Narrative can be understood as phenomenon that arises from the coordination of inherent mental abilities, including the ability to understand the interaction of agents, their goals, and beliefs and the sequence of causally related events they are involved in [16]. There is a long history of its study in the field of narratology.

In the field of Computational Narratology, Mark Finlaysen conducted a study of the use of corpora that observes that text¹, is prioritized given the availability of tools [5], although the only game logs that he cited were those of Orkin in the game EAT & RUN [12].

The literature does not, however, provide an example of a corpus of a modern interactive narrative game in a format suitable for annotation, nor does it detail an effort to map an existing model of computational narratives onto a pre-existing long-form interactive digital narrative work.

David Elson intended the *Story Intention Graph* to be a descriptive model of meaning, representing the mental simulation that naturally takes place of agents, their pursuit of goals and resulting causally linked events that make up those pursuits. For the purposes of this work, the data structure contains information about events, agents and affective goals through simple graph traversals. This information is hypothesized to be sufficient to predict, given previous samples of player choices, future moments of potential player emotion.

In the next section, we'll briefly define the subset of narratives that fall in Tanenbaum's *readerly* pleasure. These ideas will be particularly useful as we attempt to identify why it is that players feel differently and how the context of the choices within the narrative influences those experiences.

1.2 Cinematic choice-based adventure (CCBA) games

Telltale Game's *The Wolf Among Us* was released in 2013 for multiple platforms. The game received numerous positive critical reviews and represents a mature example of this subgenre. Its story content is conveyed through a combination of dialogue, performance of the characters and cinematography. The game has even been translated into a comic book, the original media that of the *Fables* series on which the game is based [18]. This document locates the work in a subgenre of adventure game, and further places it on two axes.

It is useful to locate the specific space that the subgenre of cinematic choice-based adventure games occupies: where story content is coded to be presented to the player in a very specific order and under very specific conditions and where virtually no unexpected sequence of content occurs.² The label "cinematic choice-based adventure game" was chosen not because it is the popular name used for this subgenre of adventure games, which could be considered a hybrid of the point-and-click adventure game and interactive movie, but rather for how it highlights the primary mechanics (making choices) and the primary representational mode (cinematic) as well as including the historical genre of adventure games which is distinguished by distinct authored player-character(s) and an emphasis on story.

The adventure game genre is often put in opposition to genres which promote more player freedom, such as in Massively Multiplayer Role Playing Games (MMORPGs) or Open World RPGs which allow players to create and develop their own character. Clara Fernandez-Vara describes in her dissertation how adventure games shape "the means by which the player restores the behavior that is expected by playing the game" [4]. In other words, in adventure games, the player takes actions that are authored by the game's creator rather than have those actions emerge from the system's

¹That is, stories which consist of characters and not the broader sense sometimes used which could incorporate movies or comics

²This is influenced by Michael Mateas' concept of "content selection architectures" as a useful way to describe how various types of content and the configuration of the systems that organize them can be compared. [9]

behaviors. The player's choices vary the way in which that performance is carried out as well as certain key facts that make up the plot. Most decisions and actions only have an impact on the pacing or variation of the performance rather than ontological changes in the plot, such as the timing for choosing menu options or choosing two options that have the same outcome but which have apparent different descriptive text.

The Wolf Among Us is episodic: future episodes must account for selected previous player decisions, although these are usually limited to decisions that have an ontological effect on the world (including the memories of the characters). Other non-episodic games, such as *Heavy Rain*³ and *Life is Strange*⁴ are closely related in their operational logics and their suitability for discovering content relationships using the methods detailed here.

Games in this subgenre conserve content and maximizing narrative payoffs among all possible traversals, this subgenre is ideally suited to annotation using SIG, as the player's goals and intentions are rewarded for small perturbations while the story remains relatively consistent.

2 STORY INTENTION GRAPHS

The Story Intention Graph (SIG) schemata were developed by David Elson as a set of discourse relations to represent key relationships among concepts such as goals, values and agents present in textual narratives using concepts from narrative theory. It consists of three layers: a **textual layer**, which contains relevant (but not exhaustive) spans of text from the source textual story. These are connected to a set of propositions and states in a layer that captures the described happenings as a **timeline layer**. Finally, there is an **interpretive layer**, where propositions are linked to agent goals, plans, and values.

Elson found that the SIG schemata, even without representing individual propositions, was more successful than alternative methods at identifying similarities in the stories. It is this structural resiliency amongst annotators that we are interested in, as well as the particular enforcement of the schema for each action to be related both to a character and to an end value. By encoding the values pursued by characters, we hypothesize that certain relationships will emerge that will predict potential occurrences of emotional responses.

The lack of contemporary narrative games as the source of annotated datasets is further exacerbated by the popularity within the fields of narrative generation and understanding for using simple stories such as Aesop's fables. Elson, for example, used *Aesop's Fables* as a corpus to validate the SIG's usefulness in discovering analogies between stories. Elson adds a single extended work to the corpus, *Beowulf*, that was encoded by a single annotator, but admits the effort of the annotator to do so was significant. As Finlaysen laments, "it is easier to use [an existing] corpus than build another one." [5]

3 METHODOLOGY AND STUDY DESIGN

The proposed study requires the development of new methodology. To the authors' knowledge, there has been no usage of a formal

model of narrative to annotate a pre-existing non-textual interactive digital narrative. There are several steps to addressing the research question. This section describes the sequence of proposed steps that enables the work to be annotated and analyzed. Each adopts the best-available approach and methodology to collect or prepare the data for the following step. The first stage is to select and adapt a narrative model that can represent relationships between events and decisions and the gameplay itself. The second step is to use that model to annotate a set of "natural" traversals of users who are also reporting emotional events. The third step is to analyze the emotional content with respect to the story structure, taking into account self-reported variables such as player motivation and providing prior decisions as input. The fourth step would be to use these results to iterate on the model, the annotation process and to run further studies on different content to assess the success of the tool.

3.1 Using a Model to Annotate Narrative Structure

First, the narrative structure needs to be available for annotation. This means that a set of narrative elements should be identifiable consistently across different traversals. Further, this model should be capable of identifying complex relationships between decisions and outcomes as understood by agents within the story. Given these requirements, the Story Intention Graph formalism edged out others due to its ability to map elements directly onto text spans and its ability to distinguish between representations in the medium and interpretations made by a reader. In order to annotate a game with SIG, the following requirements for an intermediate format emerged:

- (1) It be in a text format, given availability of SIG annotation software
- (2) Be capable of adding additional traversal content without redoing deleting or altering previous traversal positions. This would allow comparison amongst traversals where if one traversal referred to a piece of content it would be at the same position as a separate one.

We began with the scope of the first episode, using as a source what we are calling a "natural traversal." A natural traversal is a first encounter of a player to the game and story, one where the events and outcomes are not known. In order to validate the technique before applying it to study participants, we decided to test the approach using an existing streamed video posted online of a game traversal. A YouTube video was selected [6] based on its completeness as well as the presence of additional thinkaloud by the performer. The creator-performer was Felix Arvid Ulf Kjellberg, better known as "PewDiePie". This video served as the source for a rational reconstruction of the underlying model in textual format, and a reference for the coding methods to be undertaken on the study results.

There are a number of tools now available to author narratives based on a model of lexia and links, including *Ink*, *Twine*, *Ren'Py* and *ChoiceScript*. These tools enable authors to create textual or visual narratives with various mechanisms to direct the player along particular paths, or traversals. Of the possible options, *Inkl* released an open source version of their narrative scripting language, *Ink*.

³Quantic Dream, 2010

⁴Dontnod Entertainment, 2015

Ink was capable of representing the structures present in the game, including representing variables, as well as being a pure text format.

Ink provided the following advantages as a representational format: It can represent state variables, it has a simple means of annotating lines with metadata such as character, it can concisely show converging traversal threads and player choices and it is in an easy-to-read text format source code.

This segment has been mostly complete, and the resulting *ink* file transcription from the first episode traversal can be found here: http://lucidbard.com/ink/TWAU_001.ink, while the first episode's SIG encoding can be found here: http://lucidbard.com/ink/TWAU_001.vgl. David Elson's *Scheherazade* v0.33 can be downloaded at <http://www.cs.columbia.edu/~delson/software.shtml>.

3.2 User Study

We are planning to conduct a user study by having between 6 and 10 players play through the first episode of *The Wolf Among Us*. We will assess their emotional experience using the Sensory Evaluation Instrument [7] as well as more traditional surveys and a structured interview. These sessions will be recorded with gameplay footage to allow for transcribing the traversals using the method described above.

We hypothesize that the study will show that players feel the most during moments where the tension is high, when the information revealed is surprising and when the player's character is emotionally involved. The emotions will center around certain choices that affect the outcome of other characters and consist of feeling of satisfaction at having restored behavior (or countered it).

3.3 Iterations on SIG

Based on the user study and an initial encoding using the baseline method, we hypothesize that certain patterns and connections between previous decisions will be significant in identifying a player's response. These connections will be directly related to the decision logic of the genre and which may require additions to the SIG schema. We hypothesize that additions will include a means of uniquely locating a state within a traversal, using something similar to Playspecs [13]

Additionally, we anticipate creating a tool to facilitate the annotation process of the gameplay that incorporates the video footage in addition to the textual representation so as to retain the emotional and performance aspects of the source material in addition to the player's emotional expressions.

3.4 Second User Study

A second user study, this time focusing on *The Wolf Among Us: Episode 2: Smoke and Mirrors*, will be run using the exact same procedure as the first. The extensions to SIG and the original method will be applied to these traversals, and the resulting predictions will be evaluated for whether they worked on the new content.

4 CONCLUSION

The primary goal of analyzing narratives with a rich dataset enabled by a computational models of narrative is to discover insights that might lie hidden beneath the surface experience or which may be invisible without the full set of decisions represented by

multiple players. This potential to understand the multifaceted role of interactive narratives motivates the work ahead in creating the datasets to refine both the models of narrative as well as use them in improving the experience of authoring complex, interactive narratives.

This paper provides a "pre-registration" of a proposed study that will collect emotional experiences from players of a released interactive narrative and extend an existing computational model of narrative for predicting them. We believe that the availability of open datasets that can be annotated and studied will provide researchers in the field with a valuable resource for conducting further studies on the player behavior as well as test future models of narrative, ultimately facilitating future authoring tools designed to support creation of interactive digital narratives to inspire particular emotions through a combination of story design and game design.

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