Proposal for Analyzing Player Emotions In An Interactive Narrative Using Story Intention Graphs

John Murray, Michael Mateas, Noah Wardrip-Fruin
{lucid,michaelm,nwf}@soe.ucsc.edu
Expressive Intelligence Studio
University of California, Santa Cruz

ABSTRACT

Many contemporary interactive digital narratives consist of cinematic content that combines performance, sound and dialogue with conventional patterns of player interactions that dictate the story path. The non-linear nature of the content makes applying methods of annotation and analysis currently used in text and film challenging, as any particular experience may differ in significant ways and a player's response may occur at different times in the experience while still applying to a particular event. As a result, most studies approach analyzing player experience using either qualitative methods or quantitative methods alone, and often these studies focus on experimental systems. We developed a coding scheme that captures opportunities and decisions and provides hooks for annotating story content and player affective response. We plan to annotate recorded player traversals of *The Wolf Among Us*, a choice-based adventure game, incorporating a non-verbal report method, the *Sensual Evaluation Instrument* [6], guided by a text-based intermediate format that models the game logic. We use David Elson's *Story Intention Graph* to annotate the story content [2]. The proposed study will be evaluated by whether the responses capture salient story content between different traversals effectively. We describe a proposed baseline method of manually identifying shared story segments and tagging emotional content of scenes.

CCS CONCEPTS

• **Applied computing → Computer games**;

KEYWORDS

computational narratology, story intention graph, interactive digital narratives

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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 are expressed in a variety of immersion levels: text-based for interactive fiction and first-person mimetic representation for the interactive drama *Facade* [10]. A subgenre of adventure games uses cinematic aesthetics along with simple choices and is suitable to adapting techniques from analyzing linear narratives. The research program described in this paper examines a subgenre of interactive digital narratives using a computational model of narrative to analyze player emotional responses. *The Wolf Among Us* by Telltale Games was chosen for its consistent story structure along with its evocative emotionally charged themes and critical acclaim. We believe that the work's complex network of character goals and their evolving relationships with the player would provide a good test for assessing the efficacy of modeling for understanding player emotional experience in a narrative context of opportunities and decisions. This paper describes our initial work on developing an annotation schema and a proposed methodology for developing a corpus-based approach to analyzing a subgenre of interactive digital narratives (IDN).

1.1 Motivation

Interactive narratives are challenging to study with the methods used to study linear narratives. The variations in content prevents simple annotation techniques based on timecode or character position from being compared, and the player response is often affected by previous choices and the associated content. The proposed methodology builds on efforts within the computational narratology community focused on corpora and formal models. These approaches owe a debt to the original corpus study of Russian folk tales by Vladimir Propp [13]. More recently, Finlayson has led the charge in standardizing annotation approaches in narrative modeling, although his focus and that of his annotation environment was primarily on linear narratives. Finlayson concluded text 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 [11]. The program outlined in this paper takes a similar approach to linear narratives, with the addition of provisions for the interactive opportunities and variable content as well as the inclusion of player emotional reports.

Many studies conducted on IDNs have opted for a more case by case approach based on the work, with many looking at shorter (in duration) experiences such as Facade [15], whose story varies heavily and so is not as suited to corpus based approaches. Computational analysis of contemporary *interactive* digital narratives is still in its infancy, as no agreed methods or corpora are available.

Current approaches to understanding player experience in IDN include focusing on quantitative aspects [9], developing objective measures[17], using phenomenology [15], reading and interpreting the processes themselves ([20], hermeneutics [1] and identifying design patterns [14]. None of these approaches incorporate the underlying narrative content and its influence on other aspects of the player experience and none relate experiences to a consistent model of narrative. A consistent model would identify shared content and interaction opportunities between traversals and map player subjective interpretation separately from more objective measures. Such a representation, like those enabling annotated datasets in linguistics, could be used to identify patterns and new relationships not apparent otherwise.

Tanenbaum argues that we should focus on interactive narratives to understand their *readerly pleasure* through their *bounded agency* [18] rather than the more popular notion of agency that involves a player taking actions and seeing the results. This position also suggests that techniques currently being used to study linear narrative could be adapted to study non-linear narrative. That goal, of extending and adapting a model of linear narrative to non-linear narrative, supports the objective of better understanding the nature of player's experience while interacting with story content in an interactive narrative.

What is the nature of the content that is salient to the player's experience in these works? Wardrip-Fruin describes computational media in terms of three components: data, process, and surface [21]. The primary characteristic of content in this genre of computational media is the density of meaning shown on the surface but entirely interpreted by players. Works such as those created by Telltale Games rely heavily on hand-authored narrative dialogue and human performances (data) 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 (process). Additionally, the procedural complexity is limited to simple state tracking and varying the content shown after a particular decision point.

The model of story that describes the underlying content is critical to associating player experience with the relevant aspects of the work itself. Elson created the *Story Intention Graph* (or SIG) to be a descriptive model of that meaning, representing the mental simulation that naturally takes place in the minds of readers of how agents interact: their values, the goals they pursue and the network of causally linked events that make up actions taken in those pursuits. For the purposes of the present work, Elson's data structure provides a suitable structure for information about events, agents and affective goals using a graph representation, though others may yet emerge that can fill that role. This information is hypothesized to enable prediction, given previous player choices and responses, future moments where a player might experience emotion. **Emotions** are, for our purposes, feelings directly tied to witnessing information, making inferences or making decisions and are often mapped on two axes: valence (positive/negative) and arousal (high/low). They may or may not be associated with outward expressions.

The remainder of this paper is organized as follows: We first define the specific subgenre of IDN, cinematic choice-based adventure games, and its suitability for this study and how we captured the salient information in a schema. Next, we propose a sequence of studies and efforts that address the goal of annotating existing interactive narrative playthroughs with emotional and story content, identify possible patterns or relationships 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 describe the initial results of the first effort 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.

1.2 Cinematic choice-based adventure (CCBA) games

Telltale Game's *The Wolf Among Us* (TWAU) was released in 2013 for multiple platforms [19]. The game received numerous positive critical reviews and is a mature work in the subgenre. Its story is conveyed through spoken dialogue, animated performance and cinematography. The game's story has even been translated into a comic book, the original media of the Fables series on which the game is based [16]. This section locates the work in a subgenre of adventure game and identifies and justifies an annotation schema created for it. The game plot consists of a protagonist (Bigby Wolf) investigating a crime in a community of fairy tale inspired characters where magic is present and can disguise identity.

The subgenre of CCAG has several primary features: the story content can be represented as a graph whose elements often have key order relationships and is for entirely bespoke. The label "cinematic choice-based adventure game" was because highlights the salient characteristics and has a specificity above existing terms such as interactive cinema or hypermedia. CCAG could be considered a hybrid of the point-and-click adventure game and interactive cinema. CCAG's primary mechanics involves making decisions either in exploring content, responding as a player-character and through time-bounded actions a.k.a. quick-time events (QTE). As an adventure game, it emphasizes a player-character and story over combat and twitch skills.

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 behaviors. The player's choices vary the way in which that performance is carried out as well as whether certain key facts are true or omitted which color and vary the reception of a plot. Most decisions and actions only have an impact on the pacing or variation of the performance rather than major changes in the plot, though apparent major decisions affecting other characters do occur less frequently.

TWAU is an episodic game: 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[1], are closely related in their mechanics and are suitable candidates for using the annotation methods detailed here. Episodic games tend to conserve content and maximizing narrative payoffs, and are ideally suited to annotation using a variation of SIG, as the player's goals and intentions are rewarded for small perturbations while the story remains mostly 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 and theory of mind. 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 mapped to spans of text in the text layer. 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. The textual layer in our study is initially mapped onto transcripts of the gameplay, but in a future version this may be replaced by video spans.

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 annotator agreement in meaning that we are interested in, as well as the enforcement of the schema for actions to be associated with characters and end values. By encoding the values pursued by characters, we hypothesize that certain relationships will emerge that will predict potential points where players may respond emotionally.

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. This section describes the sequence of completed and proposed steps that enables the work to be annotated and analyzed. The first stage is to select and adapt a narrative model and coding schema that can represent relationships between events and decisions and the gameplay itself. The second step is to use it to annotate a set of "natural" traversals of players along with emotional events. The third step is to analyze the data (SIG + Emotional Content) with respect to choices and player decisions. The fourth step is to train an algorithm that identifies content & decisions associated with moments of player emotion and predict possible future moments that could occur. This is followed by another study that validates the algorithm on different content to assess the success of the tool.

3.1 Using a Model to Annotate Narrative Structure

For linear media, traditional annotation approaches use spans locations or timecodes to associate metadata. This won't necessarily be useful when content can appear or not appear based on player input, and where timing can vary significantly.

[1]Quantic Dream, 2010

First, the narrative structure needs to be available for annotation. This means that content 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 SIG schemata was selected due to its ability to map elements to text spans and its separation of interpretation and objective propositions. The following requirements for an intermediate format for SIG annotation emerged:

(1) It must be in a text format, at least initially, given availability of SIG annotation software
(2) Be capable of representing additional traversal content, allowing comparison between traversals.

We began with the scope of the first episode, focusing on what we are calling a "natural traversal," which is a a first encounter of a player to the game and story where the events and outcomes are not known. In order to assess the annotation method before collecting data from study participants, we decided to test the transcription and narrative annotation using an existing streamed video posted online of a game traversal. A video by creator-performer Felix Arvid Ulf Kjellberg, aka "PewDiePie", was selected [7] based on its completeness as well as the presence of additional think-aloud by the performer. The present study will focus on individual players encountering a work alone. To understand the content better and to save time, we translated the gameplay content from the video using a rational reconstruction approach of the underlying model. This enabled us to document player input and to think about how to represent it in a coding schema.

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. One of the disadvantages of the popular authoring tools is a lack of a formal model of the underlying structures - with the idioms and convenience of syntax and relieving authoring burdens the primary goal. Of the possible options we selected *Inkl* and *Ink*, an open source language. Ink represents variables and choice structures with plain text. The method of transcribing is translation and reconstruction: certain opportunities are recurrent (and so do not dissapear once visited) while others may trigger transitions to new content or flip state flags. A single transcription won't capture all of the salient variables such as state flags that aren't shown, and only through multiple choicepaths can a more accuruate model that produces all of the traversals be reconstructed. Only the inter-playthrough differences are necessary for this work, however.

Ink has several advantages as an intermediate format: It represents state variables, it is simple to annotating lines and it can concisely represent diverging and converging traversal threads and player choices. This first pilot involved translating the work into ink and then annotating the output using Scheherazade [2], with the SIG mapped onto the transcript of the ink file produced using a javascript application that executes player decisions. The next step

[2]the reconstructed ink file from the video playthrough is here: [http://lucidbard.com/ink/TWAU_001.ink], the first episode's SIG encoding: [http://lucidbard.com/ink/TWAU_001.vgl]. *Scheherazade* can be downloaded at [http://www.cs.columbia.edu/~delson/software.shtml].

would be to map SIG directly onto the ink file to enable multiple traversals to use the same ink file.

3.2 User Study

We are planning to conduct a user study by having between 6 and 8 players play through episode one of TWAU . We will record the player's report of their emotional experience using the Sensual Evaluation Instrument (SEI) [8] as well as more traditional surveys and a structured interview. The SEI uses several tactilely differentiated objects to enable players to indicate emotional states and are calibrated prior to the playthrough for valence and arousal. These sessions and the gameplay will be recorded for transcribing the traversals using the method described above.

We hypothesize that the study will show consistent reactions during moments where the tension is high, when the information revealed is surprising and when the player's character is emotionally involved. This translates to propositions in the model when a character goal is either actualized or not. The emotions themselves will vary based on a player's values as expressed through their decisions. For instance, the player may decide to give Faith money in one of the earlier scenes, indicating that the player is performing a softer, more generous Bigby, and is thus more likely to feel bad for ripping off the arm of another character later (or not ripping it off at all). The value at stake in both cases is justice, though a justice that is more broadly interpreted.

3.3 Iterations on SIG

Based on an initial encoding of the YouTube playthrough video, we predict that certain patterns between previous decisions will be significant in identifying a player's response. These connections will be rely on capturing the player's responses to the decision logic of the genre and may require additions to the SIG schema. If SIG schema can be extended to incorporate video, choices and state tracking, then the intermediate format will not be needed. The additions will require a means of locating a state within a traversal, using an approach similar to that of Playspecs [12].

In addition to extending the text layer of SIG to incorporate choice paths and video content, we anticipate the need for a tool to facilitate the annotation process that associates the video footage of gameplay traversals with story elements from the SIG in addition to the player's emotional expressions. This will also enable players to annotate their own gameplay, ideally.

A second user study, this time focusing on the second episode of TWAU, will be run using the same procedure as the first, namely having subjects play through the game while using the SEI. The extensions to SIG and the original method will be applied to these traversals, and the resulting predictions will be evaluated for whether they identify potential points where players may experience emotion.

4 TOWARD COMPUTATIONAL ANALYSIS OF INTERACTIVE DIGITAL NARRATIVES

The primary goal of analyzing narratives with a rich modeled dataset 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 role of story content on emotional experience motivates the work ahead in curating the corpora that will enable us to refine both the methods of evaluating and representing models of narrative as well as leveraging as unknown new methods to understand the player experience.

We presented a description of the initial coding schema developed to annotate a corpus of interactive digital narrative playthroughs, and provided a "pre-registration" of a program of proposed efforts that measure emotional experiences from players of a released CCBA and plan to extend an existing computational model of narrative to 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 support eliciting particular emotions through a combination of story architecture, interactive decision selection and game design.

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