

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

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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 drawing for the interactive drama *Facade* [10]. A subgenre of adventure games uses simple choices and cinematic aesthetics and is amenable to approaches from traditional narratives. The research program described in this paper examines a simpler form of interactive narrative 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 a nuanced narrative and critical acclaim, as well as a thriving fanbase. We believe that the work's complex network of character goals and their relationships with the player would provide a good test for assessing the efficacy of understanding ways that a specific work's combination of opportunities and decisions combined to create a player's emotional experience. 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 analytic methods usually applied to linear narratives. Their variations prevent simple annotation techniques based on time or position from being compared, and the player response is often determined by choices and the order or selection of content. The proposed methodology of annotating story traversals 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. Finlayson conducted a study of the use of corpora that concluded that 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, proposing to record and

Many studies conducted on IDNs have opted for a different approach, focusing on short, experimental works such as *Facade* [15], whose story differs drastically each playthrough and is not suited to corpus based approaches. Computational analysis of contemporary interactive 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 shared content between traversals to be identified enable subjective interpretation to be incorporated separately from objective measures. Such a representation, like those enabling annotated datasets in linguistics, could be used to identify patterns and new relationships that are not obvious 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? Noah Wardrip-Fruin describes computational media in terms of three components: data, process, and surface [21]. The primary characteristic of content in this genre is that the density of meaning shown on the surface but otherwise 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 story content is critical to associating player experience with the work itself. David Elson created the Story Intention Graph to be a descriptive model, 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 structure for information about events, agents and affective goals using a graph representation. This information is hypothesized to be sufficient to predict, given previous samples of player choices, future moments of potential player emotion. **Emotions** are a challenging phenomena to quantify, but for the purpose of this paper they are defined as moments of internal sensations associated with receiving information and are often mapped on two axes: valence (positive/negative) and arousal (high/low). They may or may not be associated with facial expressions or other physiological indicators such as heart rate or skin conductivity, though these may be useful in detecting potential states.

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 describe a sequence of proposed 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 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 chosen not because it is the popular name. CCAG could be considered a hybrid of the point-and-click adventure game and a descendent of what was called interactive cinema. CCAG was chosen for how the label highlights the primary mechanics (making choices) and the primary representational mode (cinematic) as well as including the historical genre of adventure games which is characterized by distinct authored player-character(s) and an emphasis on story over combat.

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 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 changes in the plot, such as the timing for choosing menu options or choosing two options that have the same content play afterward but which have apparent different descriptive text.

TWAU 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*¹, are closely related in their operational logics and

¹Quantic Dream, 2010

are suitable candidates for using the annotation 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 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.

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 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 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 and player decisions, taking into account self-reported information such as motivation and documenting decisions. The fourth step develops an algorithm to associate content with player emotion and locate possible situations giving rise to it. 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 text spans or video 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.

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 directly onto text spans and its ability to separate the information layers of events inferred and events represented. In order to annotate a game with SIG, the following requirements for an intermediate format emerged:

- (1) It must be in a text format, at least initially, given availability of SIG annotation software
- (2) Be capable of adding additional traversal content without redoing, deleting or altering previous traversal content. This would allow comparison of content amongst traversals, or indicate content that was revisited in a loop.

We began with the scope of the first episode, focusing on what we are calling a "natural traversal," which is 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, better known as "PewDiePie", was selected [7] based on its completeness as well as the presence of additional think-aloud by the performer. The actual results of using a streamer are interesting and left to a future study, while the present study focuses on individual players encountering a work outside of a streaming context. To understand the nature of the content, we reconstructed the gameplay content from the video using a rational reconstruction approach of the underlying model. This enabled us to document where player input was provided 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, Inkl was released an open source version of their narrative scripting language, Ink. Ink is capable of representing all of the story-related structures present in the game, including representing variables, as well as being a pure text format.

Ink provided the following advantages as an intermediate 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 first pilot involved recording both ink and scheharazade annotations ².

²the reconstructed ink file from the video playthrough is here: [http://lucidbard.com/ink/TWAW_001.ink], the first episode's SIG encoding: [http://lucidbard.com/ink/TWAW_001.vgl]. *Scheharazade* 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 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. 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 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

The intermediate format of INK was adopted for two reasons. First, transcribed player traversals did not capture the underlying structure, and instead presented a simple linearization. This shifted the burden of associating identical content in different traversals to that of the annotator, and is not supported in the current annotation tool (Scheherazade) or the text layer in the SIG schemata. Based on an initial encoding of the YouTube playthrough video 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 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 choice structures and state tracking, then the intermediate format may no longer be needed. The additions will require a means of uniquely 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 non-textual 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.

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 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 that will enable us to refine both the methods of evaluating and representing models of narrative as well as leveraging them to understand the player experience.

This paper provided a description of the initial coding schema developed to annotate a corpus of interactive digital narrative playthroughs, and functions as a "pre-registration" of a program of proposed studies that measure 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 support eliciting particular emotions through a combination of story architecture, interactive decision selection and game design.

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