Affective Interaction Design and Narrative Presentation

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Abstract

In this paper we describe a prototype for an interactive multimedia story project called *Scarlet Skellern and the Absent Urchins.* In *Scarlet Skellern* we explore how user interaction can modify non-plot-centric presentational elements of a story. We implement a simple user model for gauging interactor affect which drives elements of the narrative environment which we use to establish story mood.

1. Introduction

Scarlet Skellern and the Absent Urchins (SSAU) is an interactive multimedia story that employs a user modeling approach for affective interaction. User modeling has recently emerged as a promising tool in the creation of interactive entertainment. As of this writing, only preliminary investigations have been done into the potential applications of user modeling in interactive narrative, primarily in the realm of character-driven story architectures (El-Nasr 2004) and multiplayer mixed reality games. (Natkin and Yan 2006) As storytellers and artists, our primary goal with *SSAU* is to communicate our own particular narrative and visual aesthetic in an artful way that takes advantage of the multiple narrative modalities afforded by the computer as a storytelling medium. As researchers we are interested in exploring a mode of interaction that is in harmony with these aesthetic goals rather then at odds with them.

Computationally mediated narrative often suffers from what has been characterized as the "tension between user and author control". (Magerko and Laird 2004) (Steiner and Tomkins 2004) A quick survey of the current state-of-the-art research in interactive narrative reveals one of the core reasons for this tension: most systems for interactive storytelling operate on an event or goal based architecture designed to either dynamically assemble a story [18] or adapt an existing series of plot events to a user's interactions. (Riedl and Young 2006) (Steiner and Tomkins 2004) This *plot-centric* approach puts the author and the reader in direct opposition by making the unfolding of the story the subject of a computer mediated conflict between their individual agendas. Solutions to this conflict often come at the expense of the author, who is relegated to a role of storyworld designer (Pearce 2004) (Murray 1997). We propose a lateral solution to this dilemma by implementing an interactive system that changes the story meaning though alterations to the presentation of the narrative, rather than modifications of narrative events.

2. Visual Storytelling and Interaction

2.1 Comics and Presentational Context

In his first book, *Understanding Comics,* writer and artist Scott McCloud identifies and demonstrates the core underlying conventions of visual storytelling. (McCloud 1993) In his latest book, *Making Comics,* he outlines how these conventions can be understood from a design perspective. McCloud posits a continuum between two opposing goals in visual storytelling: Clarity and Intensity. Clarity is described as the set of techniques which make reader comprehension their ultimate goal, and intensity as those visual techniques which add contrast, dynamism, graphic excitement, and a sense of urgency to a panel. (McCloud 2006) He goes on to provide a framework of *design choices* of which a visual storyteller should be aware, in order to better communicate in either of these modes. He identifies five design choices that influence the amount of clarity in visual communication: choice of moment, choice of frame, choice of image, choice of word, and choice of flow. (McCloud 2006) Three of these choices are explicitly about selecting which events in the narrative to portray. Two of them however—choice of frame and choice of flow—are not about *what to show*, but are instead about *how to show it.* This is important to us because it provides a basis for understanding how communication of story meaning can be altered by changing the presentational context of the story events. When we look at his list of elements for increasing intensity in visual communication we find even more support for this idea. These elements include: depth contrast, graphic contrast, diagonals, extreme poses, 4th wall breaks, frame variation, and surface appeal. Of these seven techniques, only one—extreme poses—is connected to the specifics of the narrative event being portrayed. The rest are manipulations of context which give us the ability to affect the meaning of a scene independent of the specific words and images contained therein.

2.2 Modes of Interaction

The experience of *SSAU* is intended to be closer to the experience of reading a comic book than to playing a

game; however the field of game studies provides the most useful model for understanding interaction in a computationally mediated narrative. In their 2004 book *Rules of Play,* Katie Salen and Eric Zimmerman describe a Multivalent Model of Interactivity with four modes of interaction, or levels of engagement, that a person might have with an interactive system. (Zimmerman and Salen 2004) The first mode—*cognitive interactivity*—occurs primarily in the mind of the user. This is the low level dialectical interaction between a person and a system. The second mode—*functional interactivity*—occurs at the mechanical, or utilitarian level. This mode includes such literal interactions as page turning, and button clicking. The third mode—*explicit interactivity*—is described as "participation with designed choices or procedures". The final mode—*"beyond-the-object" interactivity*—is a cultural form of interaction. This is most often seen in fan culture. (Zimmerman and Salen 2004)

Most interaction designers put their efforts into developing modes two and three as the basis for *meaningful interaction.* (Zimmerman and Salen 2004) Mode one interaction, on the other hand, is often regarded as the default level of engagement that every media object affords. This level of interaction may have first been described in literary theory in the writings of Mikhail Bakhtin at the turn of the century. The underpinnings for this type of "dialectic interaction" are also evident in the work of theorists such as Roland Barthes and Umberto Eco. Cognitive interaction could rightly be described as "interpretive interaction" in that the interactivity happens in the shifting point-of-view of the reader. In SSAU we attempt to extend the natural, automatic, experience of interpretive interaction into the realm of more explicit interaction by providing the system with the ability to attempt to interpret the user's actions and choices as they read the story. In this way cognitive interaction takes on meaningful qualities of explicit interaction.

2.3 Core Aesthetic Principles: Murray's Framework.

2.3.1 Principle 1: Agency. In her 1995 book *Hamlet on the Holodeck* Janet Murray identifies three core aesthetics of digital media: Immersion, Agency, and Transformation. Of these three aesthetic realms, traditional game and interactive narrative design has been concerned primarily with the creation of Agency, which Murray defines as the "satisfying power to take meaningful action and see the results of our decisions and choices". (Murray 1997) This has been interpreted functionally to mean giving users the power to meaningfully manipulate narrative events. The extent to which an interactive narrative facilitates user agency is one of the primary criteria for evaluating its success or failure. This has yielded efforts into more and more sophisticated systems for adapting narrative events to user interactions, such as the Drama Management systems of *Façade* (Mateas and Stern 2005) and *Anchorhead* (Nelson et al. 2006) or the system of Narrative Mediation proposed by Riedl and Young. (Riedl and Young 2006) These approaches tackle the difficult task of ordering plot events and conditions in such a way as to support user control—or Agency—without sacrificing narrative coherence. (Riedl and Young 2006) In *SSAU* we leapfrog the challenge of narrative coherence and agency by disconnecting the reader's interactions from the narrative arc of the story. Instead we focus on giving the reader agency over the presentational style of the story by engaging them in an affective dialogue with the piece. This is not strictly agency as Murray would define it, but we believe that this dialogue between reader and story yields a pleasurable and meaningful experience, nonetheless.

2.3.2 Principle 2: Immersion. The remaining two aesthetic properties of digital media are more elusive in both a theoretical and a computational sense. Immersion has been described by Jim Bizzocchi as the "holy grail" of mediated experience. He identifies two common forms of immersion: the "suspension of disbelief and willing surrender to the pleasure of story" of Coleridge, and the immersion of flow advocated by Csikszentmihalyi. (Bizzocchi 2006) The immersion advocated by Murray is of the former type, although she augments it, arguing that immersion is not simply a suspension of a creative faculty, but the exercising of the active faculty of belief creation. Because immersion is tied so closely to the act of cognitive interaction, it is a tricky aesthetic to attempt to explicitly encode into an interactive system, unlike agency which can be tied to explicit and functional interaction. In emphasizing the cognitive aspects of interaction in our design of *SSAU* we hope to facilitate a greater degree of this type of immersion in the story.

2.3.3 Principle 3: Transformation. Transformation is perhaps the least understood of Murray's aesthetic principles, and the one which she herself is most unclear about. Mateas identifies three distinct meanings of transformation in Murray's writing. These are: Transformation as Masquerade, Transformation as Variety, and Personal Transformation. Of these three meanings, Mateas indicates that the first two could be seen as simply the means to achieve the third. (Mateas 2004) This locates transformation primarily in the realm of the user, who assumes a mask, explores a multifaceted world, or transforms their identity. We argue that another component of transformation present in Murray, but not encompassed by these three meanings is the metamorphosis of digital environments in response to the user. By conceiving of digital systems as being both

capable of facilitating the personal transformation of their users, and of transforming to meet their user's desires, we find an aesthetic sensibility which can directly inform the design of interactive stories. Our intent with *SSAU* is to actively design the possibility for transformation into the mode of interaction by structuring the interactivity around a computational model of the user over the course of their reading. As the reader encounters the story, so too does the story encounter the reader. In the next section we look at the technology of user modeling and explore how it may be applied to these aesthetics.

3. User Modeling

3.1 Overview

User Modeling is a young discipline and there is no out-of-the-box technique for designing a user model. Gerhard Fischer provides a general overview of the development of User Modeling for HCI. He defines user models as "the models that systems have of users that reside inside a computational environment". (Fischer 2001) Fischer describes what he calls an *implicit communication channel* "which supports communication processes that require the computer be provided with a considerable body of knowledge [about the domain in which the interaction occurs]". HCI struggles with how to achieve this type of communication in a way which will provide the system with meaningful data about the user's interactions. Building a computational model of the user is one proposed solution to this problem. Fischer describes several techniques for finding out what the "user really knows and does" including soliciting direct feedback from the user (in the form of questionnaires, preference settings or configuration modifications), inferring meaning from user actions, and providing the system with additional information about the external context in which it is embedded. (Fischer 2001)

3.2 Meaningful Abstractions

Of these three techniques, the second is both the most problematic and the most promising for interactive narrative applications. An interactive storytelling engine that is able to infer from a user's interaction what their knowledge of the subject is, what they like and dislike, and what mood they are in, has the potential to deliver a story that either compliments or challenges their experience of the media in a profound way. In the final chapter of *Plans and Situated Action,* Suchman discusses issues of human-machine communication and provides insight into how to better understand this process of interpretation. She frames human to human communication as a highly contingent process rooted in an interactive exchange of action and interpretation. The significance of any action lies only partly in the action itself. "Every action assumes not only the intent of the actor, but also the interpretive work of the other in determining its significance" (Suchman 2007) The process of interpreting actions is often invisible in human interaction, however, in designing interactions for humans and computers this process cannot be taken for granted. Suchman argues that for a machine system to make meaningful interpretations of human action, it must have an understanding of the context in which the action is taken. She presents two alternative perspectives on face-to-face interaction. In the first, the success of the interaction relies on each participant being able to anticipate the actions of the other based on a preconceived model of their possible responses. In the second, interactional success is rooted in being able to appropriately respond to the unanticipated actions of the other interactor. These perspectives can be applied to human-machine interaction. The first requires designers to anticipate possible user action at design time, while the second requires systems to adapt to user behavior at run time.

By considering these two approaches it becomes possible to see how we might infer meaning from user interactions. We consider the process of constructing a user model to be a hybrid approach to the two perspectives presented by Suchman. Suchman's first approach describes what amounts to a user model, but it is a user model that solicits no information about actual user intent at run time. The second perspective proposes an "on the fly" approach in which the interpretive power lives entirely in the algorithm which is dealing with any given user action, however it lacks any notion of a predictive model. With a user modeling approach, the first mode is arrived at via the second; algorithmic interpretation of user actions is used to create a predictive model of user intentions. The design challenge then lies in creating a model of user behaviour that allows the system to generate a *meaningful abstraction* of the intent potentially underlying the user's actions.

3.3 User Models in *SSAU*

In the case of *SSAU*, we opted for a very simple user model comprised of two sets of storage variables controlled by reader interactions. These variables then serve as control parameters for a number of feedback systems in the story setting, which we describe below. Reader interaction takes the form of a series of choices embedded within the world of the story. Rather then being pivots on which the plot turns, these choices represent potential moods in which the story could be cast. Opportunities for interaction are separated into two types: Major (or weighted) choices and Minor (or counting) choices. Minor choices are infinitely repeatable, whereas Major choices can only be made once per reading.

3.3.1 Major Choices. Major choices present themselves as events within the story, and require reader action in

order to move the story along. For example, at the beginning of the story, the reader is asked "What music am I in the mood for?" She is presented with three possible soundtracks, each corresponding with one of the three possible story moods. Upon selecting which song to play, the story continues, and the soundtrack begins in the background. The choice increments its associated mood parameter in the weighted model by a pre-specified value, determined at design time. At the same time the choice increments the same mood parameter on the counting model by one. There are five major choices over the course of *SSAU*. These include a choice of which music to listen to, and which food to eat in the first scene, where to search for evidence and who to ask for assistance in the second scene, and a choice of dialogue possibilities in the third scene.

3.3.2 Minor Choices. Minor choices, on the other hand, are embedded within the environment of the story, and are optional. The user is invited to explore the page for these minor choices. When acted upon, they incrementally affect the state of the model. When a user encounters a minor choice, they are rewarded with a small bit of meta-information about the setting of the story, in the form of a small animation, a bit of text, or a sound effect. Each minor choice increments its associated mood parameter on the counting model by one, and the mood parameter of the weighted model by one plus the current value of the parameter in the counting model. There are currently twenty possible minor choices within the first two scenes which prevents us from listing them all here. To give an example of one of them; in Scene Two much of the action takes place within Scarlet's home, which is decorated with a number of objects. On the windowsill is wilted dead flower, in a pot which yields the following text when selected. "Sometimes my happy flowers don't survive the hostile conditions brought about by my experiments. I really should throw this one away."

3.3.3 Model Inertia. The weighted model is the primary system for calculating feedback. The counting model simply serves to determine how much of a value should be placed on any given minor choice. The advantage of this operation is that the model is self correcting. If a reader finds and interacts with every minor choice available in the story, the overall relative state of the model remains unchanged. Each choice, in this case is valued equally. However, if a reader returns to some choices again and again, or if she consistently elects to interact only with choices assigned to a specific mood parameter, the accumulated value of those minor choices will increment the weighted model to a greater degree. This gives the model a certain degree of "stickiness" or "inertia" and prevents random or greedy interactions from being treated as meaningful. The effect of this technique is to serve as noise filter for user interactions. Should the reader choose to regularly interact with happy objects, each minor interaction with a happy object will increase in overall value. If the reader instead interacts in a less directed manner, the value of each minor interaction remains relatively the same. In this way, patterns of interaction distinguish themselves from random or meandering explorations. Minor Choices accumulate inertia the more times they are made. Figure 1 illustrates diagrammatically how this system is structured.

Up until this point we have been intentionally general in our description of the user modeling and feedback systems. In the next two sections we discuss in more detail what it is that *SSAU* proposes to measure, and the specific feedback channels currently implemented.

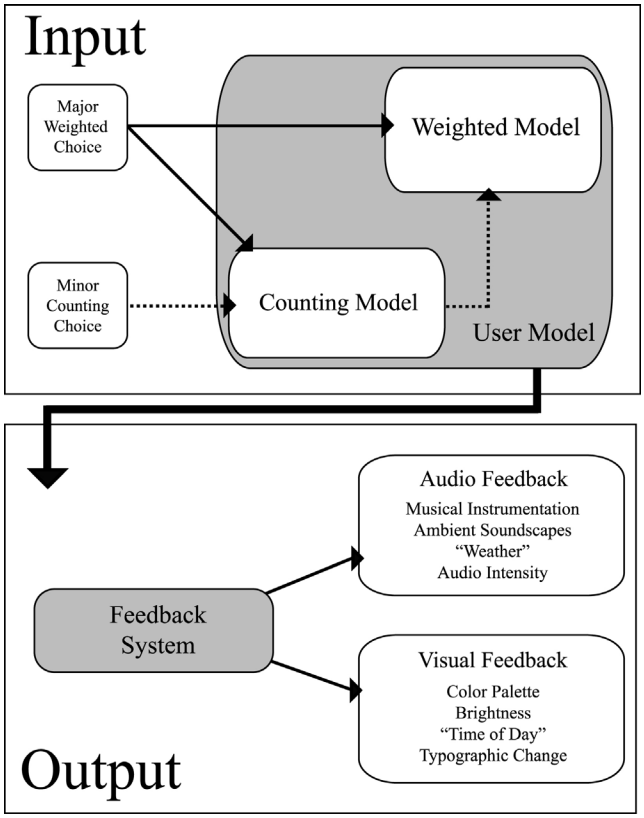

Figure 1. Flowchart of User Model and Feedback system in *Scarlet Skellern.*

4. Affect and Emotion

In her 1997 book, *Affective Computing*, Rosalind Picard defined the emerging field as "computing that relates to, arises from, or deliberately influences emotions." This was a significant step in the study and development of computing in that it stipulated that emotions be implemented within the system rather than merely identified and explained within the context of the system

(Picard 1997). While the affective computer systems described by Picard take their cues from physical manifestations of emotion such as facial expression, gesture and vocal tone, the user model employed in the development of SSAU instead maps specific emotional states to specific choices made by the user throughout the story. This creates a relationship not entirely dissimilar to that which Picard describes however, rather than measuring passive, physical manifestations of their mood our system grants the user active agency. The user is aware of the choices they make within the storyworld, but not necessarily immediately of the outcome of those choices. This was intended to give the user a greater sense of flow and immersion within the system. Picard goes on to posit that "Emotions not only contribute to a richer quality of interaction, but they directly impact a person's ability to interact in an intelligent way. Emotional skills, especially the ability to recognize and express emotions, are essential for natural communication with humans". (Picard 1997).

The difficulty that arises when mapping specific interactions to equally specific moods stems from the subjectivity of mood and emotion due to the differing life experiences of the individual users.

> Two people might feel exactly the same way physically and yet name the same feeling with two different names, depending on the cognitive events surrounding the state. Or, two people who say they are cognitively "very happy" might vary tremendously in terms of how they feel. How often these discrepancies may occur is not known; relatively few studies have simultaneously measured both physical and cognitive responses. (Picard 1997)

Our definitions of the terms "mood" and "emotion" as used throughout this paper are also taken from Picard's work. She defines emotion as being fleeting, lasting only a moment, while mood is the sustained state of a particular emotion brought about by repeated instances of that emotion over a period of time. (Picard 1997) This is a useful distinction in reference to SSAU as it is the longer lasting mood of the user that we are trying to map and reflect within our user model. We also use the term "emotional state" interchangeably with "mood" with no significant difference intended.

5. Presentation and Feedback

5.1 *SSAU* Project Description

We have implemented a first prototype of *SSAU* in Adobe Flash Studio 8. It is viewable via any standard web browser. Reading the story involves simply navigating forward from panel to panel. Occasionally, the reader will arrive at a panel where she is required to make a choice before the story will move forward. These are the major choices. By investigating any given panel, readers have the possibility of uncovering the additional minor choices embedded in the environment.

The default mood of *SSAU* is one of slight melancholy. Characters are line art paper cutouts, arranged on collaged paper backgrounds. The aesthetic draws heavily on Victorian illustration and children's literature, but seen through a macabre lens. Most of the characters are deformed or broken in some way. Scarlet Skellern herself is a sardonic skeletal girl of indeterminate age, and her sidekick and best friend—Errol—has no arms and towers on two stilt-like striped legs. They are accompanied by Petri, a guinea pig that is kept muzzled and straight jacketed for the protection of his companions and their belongings. Should the reader express no clear affective preference during their reading, the story retains this state of quirky dilapidation. However, if the reader is affectively engaged with the piece, then the tone changes dramatically, altering how these characters and settings might be interpreted by the reader in the process.

To either side of the default state we locate an emotional extreme: on one side we have the darker, scarier story, and on the other we have the lighter, happier story. For simplicity's sake we will refer to these emotional states as "happy", "scary", and "melancholy" over the course of this paper, with the understanding that these are shorthand for more nuanced moods. Comic book and film convention provide us with a wide palette of techniques for conveying these moods. For our initial prototype we focused on two channels of feedback. The first is audio feedback in the form of soundtrack selection, instrumentation, and ambient sound. The second is visual feedback in the form of color and brightness.

5.2 Audio Feedback

The role of music in creating and sustaining mood is widely acknowledged. Livingston and Brown write: "The ability of a film score to bring about a change in the user's emotional state is profound." (Livingstone and Brown 2005) The functional role of music in multimedia is the subject of much ongoing research. (Dipaola and Arya 2006) (Eladhari, Nieuwdorp and Fridenfalk 2006) (Livingstone and Brown 2005) While surveying this is outside the scope of this paper, DiPaola and Arya have coined a particularly useful term for understanding how music and art impact emotions. This term is Affective Communication, which has been described as the aspect of a piece of art or music which causes or expresses different emotional states. (Dipaola and Arya 2006) We regard the auditory aspects of the project, not simply as aesthetic window dressing, but instead as a means by which we

express various emotions to the reader, via the mechanism of Affective Communication.

Audio feedback in *SSAU* occurs at two levels: the soundtrack and the ambient environmental noise. The soundtrack elements can further be separated into two primary types of audio feedback, as described by Livingston and Brown. These are event based audio, and dynamic (or adaptive) audio. (Livingstone and Brown 2005) In the case of *SSAU,* event based musical changes happen at the level of song selection. When the reader reaches a specific moment in the story, she triggers a change in the piece of music that is playing. The current state of the weighted model is used as a basis for determining which new piece of music is selected.

Adaptive musical changes, on the other hand, happen in real time at the inter-song level. Each piece of music is written in a modular fashion, so as to support the addition or subtraction of its constituent melodic and harmonic components depending on the state of the user model. In order to keep these elements simple enough to reliably control while maintaining a consistent musical coherence, we have chosen to limit adaptive musical changes to variations in the instrumentation and orchestration of the piece. This choice was inspired by the classic 1936 Prokofiev piece *Peter and the Wolf,* in which instrumentation choices are tied directly to the narrative and emotive qualities of the story which it accompanies. When the model is in the "happy" state, bright trumpets and horns surge to the foreground and carry the melody. When it is in its "scary" state, *marcato* violins take the lead. In the default state, a mournful solo english horn carries the tune. Together these changes of instrumentation and song choice combine to form a wide range of potential musical moments in *SSAU*.

We have taken a similar approach to the ambient audio elements. The story setting determines which particular ambient environment is selected, but the user model determines the mood of that environment. This is done by layering many separate tracks of audio. The modularity of the ambient sounds allows us to parameterize them and map them to different levels of the moods represented in the model. For example, if the "scary" mood is moderately weighted, then nighttime sounds, like crickets chirping and owls hooting become audible. If the reader further weights "scary", then it begins to rain, and the wind begins to blow. If they continue to push the model towards scary then wolves begin to howl, babies cry, and the rain becomes a thunderstorm. Each of these elements is independently controlled by the state of the user model.

5.3 Visual Feedback

It is widely accepted within the field of Visual Arts that color is one of, if not the single most effective and direct means by which an artist may influence the mood or emotional state of the viewer (Ocvirk et al. 1994) (Wallschlaeger and Busic-Snyder 1992), or in the case of *SSAU*, the user. One of the primary reasons for this is that people have a universally immediate reaction to color without the need to rationalize how we are supposed to feel about it, thereby rendering it one of the most expressive elements of visual design. (Ocvirk et al. 1994) While there is not a general consensus as to why this phenomenon occurs, there is however, a "general assumption among behaviorists that many people have similar reactions when exposed to a specific color". (Wallschlaeger and Busic-Snyder 1992) For example, it is generally accepted that cool, dark colors have a depressive influence on most people, while warm, bright colors instill feelings of joy and happiness. As early as the 19th Century Goethe wrote, "We also experience a very warm and cozy impression with yellow" in reference to the feelings engendered in people through their phenomenological experiences with color. (Clark 2004)

Table 2. Positive and Negative Color Associations (Conover 1995)

	Positive	Negative
Black	accomplished and worldly	desolate
Blue	secure and peaceful	depressing
Brown	dependable and logical	plain and boring
Yellow	happy and sunny	show-off
Gray	secure and calm	plain and colorless
Green	calm and natural	jealous
Red	power and excitement	aggressive
Pink	sweet and soft	femininity
Tan	calm and natural	ordinary

As further stated by Youngha Chang, Suguru Saito and Masayuki Nakajima in *Example-Based Color Transformation of Image and Video Using Basic Color Categories*, the mood of an image can be controlled by managing its saturation, brightness and hue:

> For example, if a user changes the color of a forest to green-yellow, we may perceive the forest as being vivid. On the other hand, if it is changed to dark-olive-green, we may perceive it as being calm. (Chang, Saito, and Nakajima 2007)

It is these principles upon which we designed the color component of the feedback systems for *SSAU*.

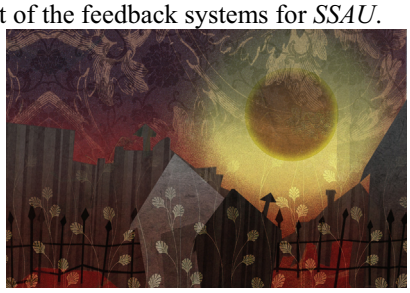

Figure 2. Default "Melancholy" Visual State of *Scarlet Skellern.*

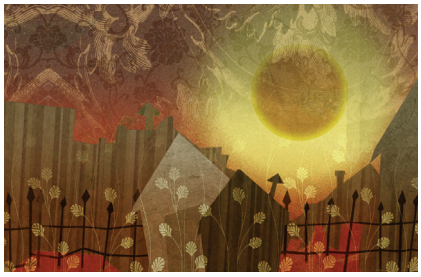

Figure 3. "Happy" Visual State of *Scarlet Skellern.*

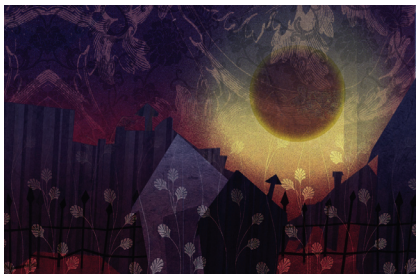

Figure 4. "Scary" Visual State of *Scarlet Skellern.*

In SSAU, successive choices mapped to "happy" cause an incremental increase primarily in the yellow and, to a lesser degree, red color values creating an impression of a bright, sunny day. Choices mapped to "scary" increase blue values, while simultaneously darkening the image, creating an impression of encroaching darkness. No choice at all, or an even balance of choices mapped to both "happy" and "scary" result in a sustained state of "melancholy" which is represented using muted color values giving the impression of a rainy afternoon/twilight.

6. Future Research

In this paper we present a discussion of the design theories that underlie *Scarlet Skellern and the Absent Urchins*, a work in progress. At the moment *SSAU* represents a promising venue for exploring a variety of new applications for adaptive narrative techniques and for non-plot-driven interactive narratives. In the next stages, we hope to implement a somewhat more sophisticated modeling mechanism and an additional feedback dimension.

One area which we haven not yet had the opportunity to pursue is a full user study. We intend to complete a survey of user experience before continuing with the design phase. This will guide all future revisions of the system. In the absence of user data, we have a list of additional features and approaches that we see as logical next steps, but these are subject to revision as we assess the success of our current prototype.

Currently the mechanism for assessing the meaning of an interaction is somewhat one dimensional: did the user click on an object, or not? While this is sufficient for low granularity approximations of user intent, it does not yet provide the amount of nuance we believe is possible for this system. Suchman, Fisher, and Picard all advocate for providing the system with additional contextual information about the setting in which the user is situated. One possible way of doing this is to gather biometric information about the user, and map this to various additional control systems. However, our intent with *SSAU* has always been to make the story accessible via the web to a diverse body of readers, and thus we are restricted to inferring meaning from the interaction record. In spite of this limitation, there are several dimensions to the user's interaction that could still be explored. One possible next step would be to track the order in which users explore minor choices, and apply a rule-of-diminishing return to their interactions. This is predicated on the assumption that users will interact with those things which they are most interested in first, before moving on to the remaining possibilities in a scene. Another possible interactional dimension that bears exploration is the highly subjective realm of time: how long does a user linger over a choice? How long does she spend engaged with a particular piece of media? Both of these dimensions offer additional contextual information to the system, while still remaining within the domain of the interaction record.

In addition to developing new systems for measuring user intent, we intend to implement another layer of feedback within the system. This third feedback channel would be typographic in nature. In the study of Visual Communication Design it is understood that specific fonts can be used to convey specific moods or emotions within a given context. In keeping with that assertion, we will be exploring the use of expressive typographic representation to further reinforce the existing emotional model. An example of the use of typographic elements to enhance the impact of a story is found in Christine Celano's "A Typographic Visualization of the Narrative Structure of On the Road." (Celano 1992) In this work Celano uses typographic elements such as typeface, size and layout to represent individual aspects of the novel such as characters, place and time in a unique way. Celano uses "visual contrast and flow from each scene to the next" to "reflect the influences of bop and jazz improvisation on

Kerouac's literary style." (Celano 1992) While typography is used in this example to enrich the reader's understanding of the characters and storyline, our intention is to use similar techniques to enhance the depth by which the presentation of the story is mapped to the users perceived mood at the time of reading.

We will also be exploring the field of rhetoric (both visual and literary), adding changes in wording throughout the story, in all three emotional states, placing emphasis on the emotional connotations of specific word choices. These word changes will reflect the emotional state in that adjectives and adverbs used in the happier state will be softer and more slanted toward humor, while the same phrases in the scarier state will become more strongly, perhaps even harshly worded to add another level of menace to the story.

Scarlet Skellern has a long way to go before we will consider the project complete. However, we hope to have shown in this paper the potential offered by a non-plot-centric, user modeling approach to interactive narrative.

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