Emotional Storytelling

Kristopher J. Blom* Steffi Beckhaus†

interactive media/virtual environments
University of Hamburg
Germany

ABSTRACT

The promise of engaging immersive virtual environments has long been a motivating factor within Virtual Reality (VR). One of the greatest potentials in VR has been in the realm of telling stories and provide new and engaging experiences. Research in Virtual Environments is now shifting its focus to creating structures to enable such stories and experiences. In this paper we present a concept we feel can help to enable such experiences, Emotional Storytelling. Storytelling has long been centered on emotions. Whether a break room anecdote or a well crafted drama, the storyteller is hoping to evoke emotions in the audience. We propose extending the structures for Interactive Storytelling, both for VR and generally, to deal explicitly with this implicit emotional aspect. We outline an extension of existing Interactive Storytelling systems with emotional modelling and tracking. The proposed components are an extension of story segments with information about the expected user response, a modelled emotional path for each emotion category through the story, and an internal emotion tracking system, trying to predict the current emotional state of the user.

CR Categories: H.5.1 [Information Interfaces and Presentation]: Multimedia Information Systems—Artificial, augmented, and virtual realities; I.6.8 [Simulation and Modelling]: Types of Simulation—Gaming; J.5 [Computer Applications]: Arts and Humanities—Fine Arts; J.5 [Computer Applications]: Arts and Humanities—Literature;

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1 INTRODUCTION

Virtual Reality (VR) has, in recent years, evolved into a foundationally mature field of research. The potential of Virtual Environments has been recognized by many fields, ranging from engineering to the social sciences to entertainment. One of the potentials of VR that has been particularly motivational across these application fields is that of fully engaging environments that tell a story. The vision of Star Trek's Holodeck's interaction and story capabilities is strongly embedded in many minds.

In the realm of software, research has primarily focused on: frameworks for interfacing VR hardware, travelling in the environments, interaction with objects, and a collection of specialty topics such as avatars. Unfortunately, software structures which make it easy enough to create the envisioned engaging, dramatic environments rarely exist. We feel that development of structures for current VR software to enable the creation of these visions is still needed in order to move VR from a field of potential to a realized tool. At least partially because of a lack of supportive tools, the typical structure of a virtual experience is the self guided exploration of an environment and simple manipulation of objects in the environment. In cases where a story is developed to engage the user, it is typically a simple, strictly predefined story with limited interaction possibilities. An area of research which deals precisely with this problem is the field of Interactive Storytelling.

Interactive Storytelling in Virtual Environments has been attempted in limited quantities. A few research systems, such as in the alVRed and the Geist project, have been created as story authoring systems for VR [1, 2]. These systems strongly structure the segments of a story, enforcing a strict story logic. Interaction in systems such as alVRed is largely limited to the interactions traditional to VR, navigating the environment and limited manipulation of a few objects within the environment.

Interactive Storytelling (IS) is itself a field focused on exactly this problem of creating a story experience with meaningful interaction. While the field uses visual representations, only a small portion of the work is currently realized in VR. For IS to be fully applicable in VR for creating realistic and meaningful experiences for the users, we believe more work must be done. One of these reasons is the large burden on the author of a story to create a meaningful engaging story or experience for the user while struggling with interaction components and VR technology in general. Although authoring tools, like the one developed in alVRed, help in sketching interactive components of story segments and their logical connections, they still lack support for creating drama and story arc, vital for engaging experiences.

We believe that a vital extension to IS systems is "Emotional Storytelling", which can be realized as an extension to existing systems. In this paper we will present our idea of Emotional Storytelling and how it relates to Interactive Storytelling for VR. We will then present a way that Emotional Storytelling can be integrated into a current IS system, using the VR system alVRed as basis for our example system. Included in this description is also a more concrete example of how this concept would play out in such a system, basing it off of a current non-VR Interactive Storytelling system and story, Façade [6]. Finally, we will give some reflections on the idea of Emotional Storytelling and some ideas for future expansion of the concept.

2 EMOTIONAL STORYTELLING

The introduction of interactivity into storytelling complicates the development of stories not only from a philosophical level, but also from an architectural and structural level. In most dramatic and narrative forms, the author has complete control over the structure of the story, i.e. the storyline or story arc. This is largely true across the various traditions of storytelling, even the tradition of the bard. In the bardic tradition the audience exerted some level of influence on the Bard's story as he told it. However, the bard still retained control over the storyline, modifying only local pieces of the story without impacting the overall storyline. Without this control over even the minutiae of the story, the story arc can be ruined, thereby rendering the story ineffective.

*e-mail: blom@informatik.uni-hamburg.de
†e-mail:steffi.beckhaus@uni-hamburg.de

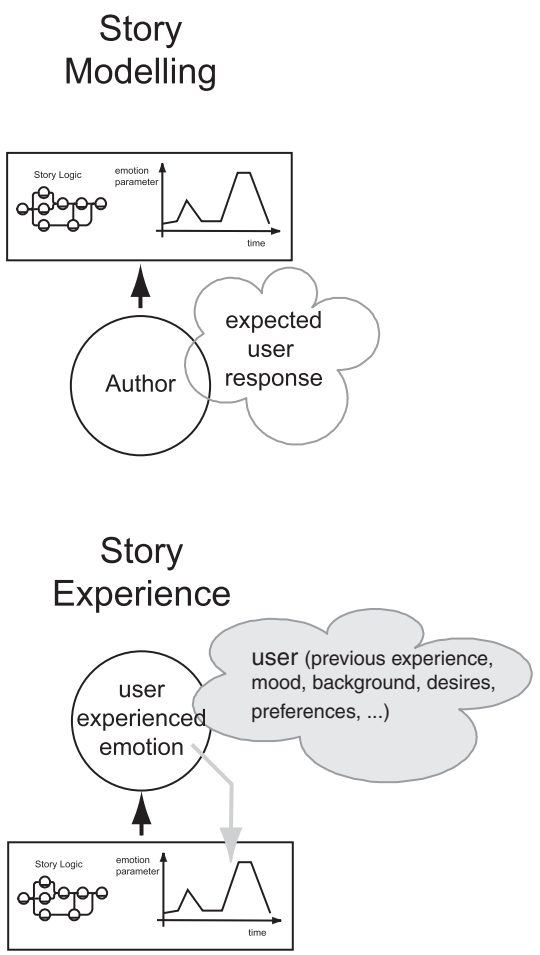

Figure 1: Story Modelling and Story Experience

Perhaps the biggest challenge for IS systems is dealing with the user interaction in a meaningful way. This means, not only that the interface must work, but more importantly the interaction must have an impact on the story in a meaningful way. Research has shown that interaction should not be severely limited in scope by the system. The limited interaction tends to diminish the user's level of agency, thereby reducing their immersion in the story's world. In contrast, giving the user complete autonomous control in turn enable their sense of agency; However, it generally complicates the generation a meaningful story [7], as every possible interaction must be prepared for by the author and IS system. Creating an effective Interactive Storytelling system is thought to be dependant on balancing these two conflicting needs.

Interactive storytelling has dealt with the emotional experience of the users, much as the traditional areas, only as an implicit part of story development. IS systems typically implement stories by dividing the story into smaller components, here referred to as story segments. The size and exact nature of the story segments differ by system. Interactive stories are then constructed in real-time from these sets of story segments. The segments form a set of possibilities for the unfolding story. The decisions of which segment "plays" next is decided by the predefined logic of the story and the interaction of the user. The story segments are designed by the author such that when pieced together, in any allowed order, will form a complete story. The VR IS system alVRed [1], represents a slightly simplified version. In alVRed, the flow of the story segments is strictly laid out beforehand, allowing the story only to proceed along predefined paths. This style of IS is representative of the forking paths style of IS [7].

anger	fear	grief
joy	love	romantic love
reverence	disgust	acceptance
distress	surprise	anticipation

Table 1: Examples of emotions categories. Adapted from [3]

The author of the interactive story carries a large amount of the burden in creating a complete story and all of the burden to see that, when the pieces are strung together at run-time, the emotional journey of the user is complete. The complication in IS is that the author must test every possible story line that could follow in order to make sure the emotional experience always works. The author of an interactive story creates the emotional journey for the user in the same manner as traditional authors, implicitly in the story creation process. As Szilas presents in his fifth principle for interactive drama: "for any narrative, the author is implicitly using an user model to manage the user reaction to its narrative" [10].

We propose the extension of Interactive Storytelling beyond that of implicit emotional content to explicit structuring of the user's emotional experience at run-time. More specifically, we are proposing that the IS system should explicitly parameterize the emotion of the user and use this as a guiding feature for on-line construction the story. It is important to note that this parameterization remains within the scope of the model of the user mentioned by Szilas. Emotional reaction is a very personal experience. It varies, not only with the person and culture, but also with the emotional state of the user at the time. With this in mind, it should be noted that this parameterization represents only the author's expectation of the user's emotional reaction. In other words, the parameterization represents an idealized view and likely will not reflect the user's true experience (see Figure 1, Story Modelling). With the emotional experience of the user continuously considered, the story engine can better choose story segments in an attempt to maintain a cohesive narrowing of dramatic potential and manage the emotional journey of the audience.

At this stage it is necessary to diverge slightly and investigate shortly emotion. The investigation of emotions has been performed within the area of Psychology for many years. Numerous theories of emotions and many possible ways to divide the emotional space into components have been developed. As an example of some of the classifications of emotions we have compiled a short list of some of the basic emotions types used by Healey in Table 1. We are not proposing which theory or division should be used, but rather wish to make the reader aware of this information. The use of emotion in computers is a relatively small, but growing field. The most directing interesting area parameterizing emotions is the small field of emotion recognition [3, 4]. This research attempts to allow the computer to recognize the emotional state of the user using various methods. At this point there is no consensus on which emotions to attempt to categorize or which can be identified. Other potentially applicable parameters then in Table 1, such as attention or interest, are being inspected by other groups. While they may not fit the classifications of emotion, parameters such as these are also of interest in our context as their applicability to creating an engaging story is potential large.

3 Proposed Emotional System

In the previous section we have presented the theory of Emotional Storytelling. In this section, we will propose a method of integrating explicit handling of emotion into a traditional interactive sto-

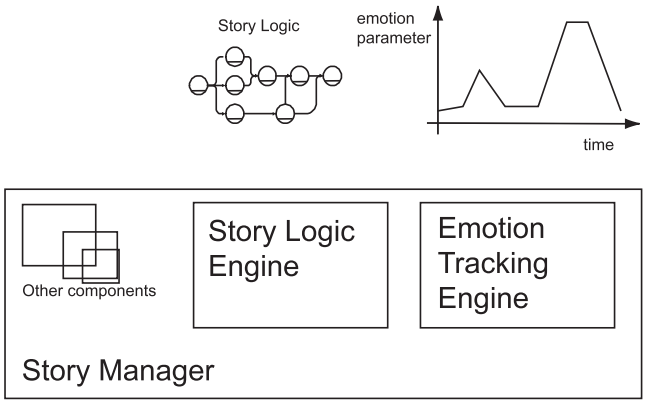

Figure 2: Story Manager with Emotion Tracking Engine and Emotional Path Graph

rytelling system. In this paper we are not providing an extensive background section to the topic of interactive storytelling, filling in information only as it is needed. We suggest the reader who is not familiar with the area refer to Murray [7] and Laurel [5] for an introduction to the field, and [9] for a more recent overview of the field. In the second half of this section we will present a more concrete example of an emotional parameterization in the context of the proposed system.

Storytelling and it's various derivatives have an implicit goal of eliciting emotion in the audience. To our knowledge, all IS systems and theories follow this convention of implicit focus on eliciting emotions. Since the end cause of storytelling is to elicit emotion in the user, Interactive Storytelling systems should take the emotion of the user explicitly into consideration. We believe that emotion can be used as a useful parameter in steering an IS system. An emotional parameter can provide the system with a structure for programmatically maintaining a better story arc and thereby enabling it to create a better user experience. We feel that such a explicit emotional consideration can be integrated into existing systems. As such, our proposal is outlined for inclusion within the framework of a common IS system framework, illustrated in Figure 2.

In this section we will use the alVRed IS system for VR as our example system. Although the system model is a rather simplistic model of an Interactive Storytelling system, such components should be able to be built into many of the current IS systems in a similar fashion. The IS systems has an overarching Story Manager. The Story Manager's responsibility is to maintain the story flow, logical consistency of the story (story logic, see Figure 3) , and any other overarching functionalities. The Story Logic Engine used by the Story Manager operates on story segments. Each of these segments contains certain conditions, which must be met in order for the segment to be used in the story at any given point. Conversely, conditions may also be fulfilled by the story segments, allowing other story segments to be made valid. In a system such as alVRed, these conditions are highly controlled by the structure created by the author rather than the story manager explicitly, but the principle remains highly the same.

To create Emotional Storytelling, we propose extending the IS system with several additional components. A core component to the extensions is the Emotion Tracking Engine, illustrated in Figure 2 . The Emotion Tracking Engine (ETE) is used to keep track of the user's expected emotional state. In addition to the ETE, the story segments have to be extended to include additional information, namely the expected emotional impact of the segment on the user. As we assume the emotion is represented with a number or set of numbers, the values can be simply stored and access made

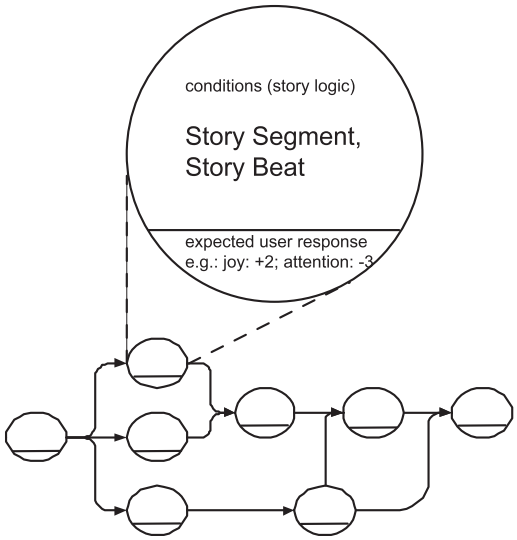

Figure 3: Story Logic and Story Segment. The Story Segment is extended with values for expected user response

available for the ETE. The final component is the Emotional Path Graph. The Emotional Path Graph (EPG) is a time dependent graph of what the author views as the ideal emotional experience for the user, as illustrated in Figure 1, Story Modelling. We expect an EPG would look similar to a modern Freytag's Graph [5]; However, the form of the curve would only reflect the traditional story arc in particular cases. Additionally, we expect that in many cases the EPG will include more than one emotional parameter, e.g. anticipation and surprise, each having a distinct curve.

With the proposed changes, the IS system has to have some changes to the algorithm the story manager follows. These changes mainly introduce additional steps, largely without having to modify the current algorithm. The new algorithm will then be as follows:

- Using current IS system techniques for selection of logically possible story segments(from story logic)
- From these choose based on (a best fit algorithm)
  - time (from system)
  - current user emotion (from Emotional Tracking Engine)
  - emotional story logic
  - values of the available story segments
- Update the Emotional Tracking Engine with the values from the chosen story segment

3.1 Emotional Parameter Example

In this subsection we step through a more concrete example of Emotional Storytelling. The example we will look at is the integration of an emotional parameter into the Façade system and story by Mateas and Stern [6]. Façade is a dramatic piece, centered around the relationship of two characters. The user assumes the role of a friend of the couple invited for dinner. Unfortunately, the evening of the dinner is poorly timed, as the couple is on the verge of a breakup. Through the user's interaction with the two characters, the outcome of the evening and the relationship is decided. A core component of this drama is the tension between the two main characters and the tension experienced by the user. Mateas clarifies his desire to make an emotionally intense drama and the explicit forethought to the emotional impact on the user: "If the player is shy or confused about interacting, the two computer controlled characters can conspire to set up dramatic situations, all the while trying

to get the player involved" [6]. This statement exemplifies one of the strong motivations for the Emotional Storytelling, giving an explicit mechanism for the author and system to deal with issues such the one outlined by Mateas.

In the context of Façade's story, we propose the inclusion of a tension parameter for steering the story. Tension is a convenient parameter as it can easily be represented as a discrete value and is conceptually simpler than encoding a more complex emotional concept such as happiness. In creating a dramatic story, the author has a feeling for how they expect each segment of the story to impact on the tension created by the story. Each story segment can therefore be quantified by the author. In this case, the value of the story segment indicates either a increase to the tension or a decrease. The ETE can keep a simple running accumulative total of the tension the user feels, or in this case what the author believes she will feel. The introduction of the Emotional Path Graph gives the author a method of specifying the ideal development of the tension throughout the course of the story. By taking a simple difference of the ideal tension level at the current time in the EPG and the current tension level from the ETE, the story engine has a value for what the next story segment should provide for tensional change. Using this value, the story engine can then select a segment for use as the next part of the story.

In order to help clarify, we will step through a situation as our theoretical system works. Let us assume that the user is behaving as Mateas' hypothesis above and thereby not facilitating the escalation of the dramatic tension. The story manager determines, through normal IS methods, which of the story segments are possible to use. This step strives to maintain the logic of the story and deals with the immediate consequences of the user input. At this point the story manager requests from the Emotion Tracking Engine the expected user's tension level. The story manager notes that, in the short 15 minutes act planned by Mateas, the current user tension level is too low when compared with the value from the Emotional Path Graph. Taking a simple difference between the expected tension level from the EPG and the current user tension level from the ETE, the story manager analyzes the available set of story segments from the first step. The story manager then selects one of the segments based on a best match algorithm. In our current hypothetical situation, the tension level is too low, leading the story manager to select a segment which has a high tension level. The selected segment is then scheduled to be executed, but first the story manager informs the ETE of the expected contribution of the segment chosen. The higher tension segment is then executed, increasing the expected user tension level and, hopefully, also impacting the actual user.

4 Reflections and Future Work

We feel our proposed extensions to create Emotional Storytelling can be a great help to the area of interactive storytelling used for example in VR. The system extensions necessary for inclusion of direct parameterization of the expected user emotional levels are relatively straight forward to include in many of the modern IS systems. More importantly, we believe that this emotional extension has various benefits. The largest benefit we believe it provides is that of improved control by the author over creating an emotional story arc for the on-line generated, interactive story. An additional benefit could be that, in the end, it will take some of the load off of the authoring process. While the author will have to include more information, the benefit comes from the help in crafting emotional experiences across all the possible story arcs, which will likely outweigh the additional informational load. In current systems, the author must perform a great deal of "hand tweaking" to make sure that whatever path the user may create through their interaction provides a satisfactory emotional experience.

The system we are proposing creates a convenient side-effect of enabling timing constraints implicitly. Interactive Storytelling often involves a time constraint on the story length. The user may have an expectation to be engaged for some roughly defined length of time. Also, with current research systems, the time allotted for the user to use the system is often limited. These limitations are due to reasons such as limited time for use of a VR system or limited time for each user in a study. For these reasons some systems already have the idea of time integration included, but it is not common concept. The authored Emotional Path Graph gives time as a dependent component, implicitly providing the system with a method for attempting to keep a fixed time frame.

In introducing the idea of using user emotion in interactive storytelling, we feel that it is important to again reflect on the effect of the user interface on the emotion of the user. While this is a topic which the community has been mindful of, the design of the interface to the interactive story plays a determining role in the capability of the story to elicit the desired emotion in the user. As noted by Norman, the influence of interface can greatly sway the users emotions [8]. These elicited emotions affect not only the perception of the computer interface, but also the user's perception of the story. While a good interface will not likely make a sad story happy, a bad interface will certainly affect the user's perception of any story.

As a future expansion to this encoding of emotion, we believe Emotional Storytelling can be further facilitated by tying the emotional parameters to the user's actual emotional state, instead of an anticipated value. This is illustrated in Figure 1 on the Story Experience side. The gray arrow denotes a potential future feedback loop from the user to the system, via emotion recognition systems. Automatic emotion recognition by a computer is an area of research which is in its infancy [3, 4]. The first commercial emotion recognitions products are coming to market now, but are limited to recognition of emotion in speech. As the emotion recognition capabilities for computers increase, the integration of the observed emotional state of the audience/user into a system already equipped with emotional parameters would create great potential. Such a system is reminiscent of the tradition of the Bards, who tailored their stories to the reaction of the audience. The system extensions we have proposed lend themselves well to being further extended to including actual emotional feedback. The increased complexity of such a system would be confined to the Emotion Tracking Engine, as its design allows it to be modularly extended or replaced in the future with such an aware system.

5 Conclusion

In this paper we have presented, what we have termed Emotional Storytelling. This concept is an extension to current Interactive Storytelling practices both for VR experiences as well as traditional settings, in an attempt to create structures which enable more engaging experiences for the user. We believe that the creation of such engaging experiences is vital for the future of VR, particularly for its adoption as a tool in many fields. Emotional Storytelling provides an additional structure for enabling the IS system to manage the emotional experience of the user. We believe the explicit parameterization of the user's emotional response to the story must be an integral part of IS systems. We have presented a proposal for the extension of a generic Interactive Storytelling system to include these parameters. This is both applicable for VR and general storytelling systems. In this proposal we have highlighted the components of this extension: the Emotional Tracking Engine, the parameter extensions to the story segments, and the Emotional Path Graph. These components together provide the author and the system with a method for guiding the emotional journey of the user, by specifying expected user emotions like tension, anger, or excitement in different story segments and also their development during

the story. We have also given a more concrete example of how we envision this integration to be useful, using Mateas' Façade. Finally, we have reflected on some additional aspects which we feel need to be considered like timing constraints, the impact of the interface on the emotional state of the user, and the inclusion of an emotion recognition system.

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