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The effects of Narrative Generation methods (based on Augmented Reality Interactions) on overall User Experience

Kaloyan Marshalov

University of Dundee

Dundee, UK

kvzmarshalov@dundee.ac.uk

ABSTRACT

This is all from the Ethics Submission Storytelling is amongst the oldest human art forms. It is one of the main methods people use in order to understand an environment and communicate personal experience. The increased popularity of digital entertainment has given birth to Interactive Storytelling – a narrative technique in which the plot of a story is not predetermined. The goal of these systems is to automatically construct fully comprehensive story lines, by observing the users' actions. While most research is focused on the generation of the narrative, barely any work is done in exploring the methods of user interaction. One possible medium for that is Augmented Reality (AR). It encourages an entirely new method for interaction in which user intent is probabilistic rather than deterministic. We therefore invite participants in the study to take an interactively generated narrative tour using Augmented Reality technology. This will challenge the current methods for narrative generation, by providing real-world input. We are interested in the users' perception of such tours and therefore aim to determine: What impact do Narrative Generation methods of storytelling (based on Augmented Reality Interactions) have on overall User Experience?

1 INTRODUCTION

Storytelling in its various forms is amongst the oldest artistic human expressions. Narratives are an integral part of human media, including novels, theatre, movies and video games. Humans use this medium in order to understand an environment and communicate personal experiences. While oral storytelling is perhaps one of the earliest manifestations of this field, the opportunities created by focusing on Interactive Storytelling (IS) have resulted in increased interest in this area from both research and commercial aspects.

In this emerging narrative technique, the plot of a story is not predetermined. Instead, comprehensive stories get constructed based on a user's interactions, allowing for a unique user experience. Because of its relatively young age as a research area, many aspects of it remain unexplored. Some of the most recent work from the field attempts to provide structure to the topic of Interactive Narratives [3, 15] allowing future work to be based on quality concepts. Defining such concepts is a big leap in progress towards better informed design an theory work.

An area that has fully embraced interactive narratives is video games. For example, action games like Mass Effect are entirely

story driven like The Stanley Parable. The medium is perfect playground for IS, as the player has complete control over their actions. Video games have begun expanding outside of their traditional context and into Mixed Reality. These forms of entertainment where the real world is mixed up with the virtual are a fantastic vehicle for improving the intractability and immersion of a story [30]. The popularisation of Mixed Reality as an entertainment medium means that an entire new category of research is needed, in order to explore the new interaction techniques [26]. Efforts can also expand past the fictional and into the factual world [3].

2 RELATED WORK

The ultimate goal of any Interactive Storytelling system is to create a world in which the user's actions result in a cohesive and engaging story. The means through which this is achieved are many, however, existing literature helps define some of the goals of an IS designer [27]. Story plots are created from a subsection of predefined elements which can be combined in order to determine the discourse of the story [13, 14, 23]. Creating an engaging narrative means re-arranging that discourse based on the user's inputs to the system. Integrating interactions within the story should be seen in two ways. On one hand, the interaction should be a driving factor of the story. On the other hand, the choices offered need to be well related to the plot in order to simulate our choices in real life.

Another challenge comes with designing natural interactions. Communicating through human gestures is preferable, however, often times they are replaced with on-screen interfaces. Interactions also need to get offered frequently enough, in order to fight the feeling of being a spectator rather than an actor within a story [27]. Working in tune with these factors results in an increased narrative immersion, in which users start to feel part of the virtual world [33].

2.1 Narrative Generation

The design of a story is usually initiated by the decision of narrative form. Current literature identifies three main types of plot: epic, dramatic and epistemic [27]. An epic plots take the point of view of the hero and follows them through a set of challenges until an ultimate goal is reached. Dramatic narratives follow the progression of interpersonal relations and their impact on the story. Epistemic narratives aim to engage the user in a mystery, in which they have induce and deduce facts as the story unfolds.

Further progress in interactive narrative design requires the actual writing of the story. It has been suggested that stories can be

split into fragments, which need to be carefully examined in order to identify the relevant concepts within them and their meaningful connections to other fragments [14]. Other research demonstrated the role of storytelling artifacts (such as letters, quest items and newspapers) in enriching narratives in video games [13]. These often provide information about the story world and its characters, while further engaging the players in the narrative. Several studies have documented the pillars around which the discourse of a story is built [23, 31]. Narrative constraints try to reduce the number of errors and convolutions of a story by identifying the necessary events of the plot, alongside the final goals of the narrative. A narration agent can then process these constraints (anchor points) and decide if they should be intertwined. User input can also be mapped to anchor points, thus altering discourse.

The nature of interactive storytelling is such that sometimes unpredictable events can emerge. The systems should therefore be designed with that in mind, allowing the unexpected interactions to still have an effect on the story line. Such moments can be predicted when analysing the structure of the narrative for potential inconsistencies [22, 24]. In the cases where these unforeseen interactions come from the player [24], the system could implement a "catch-all" scenario, in which an NPC executes the task at hand and advances the plot. A more sophisticated approach has the story manager identify future inconsistencies and repairs them before they are reached [22]. A preventative approach can also be taken. Certain parts of a story could be structured in a way which allows the user to interact with them, however, these interactions have no effect on the outcome of the particular plot point [34].

Outline different NG applications? Scheherazade, Facade, etc.

An emerging area of research is happening around location-based narratives. Evidence of this can be found in the recent attempts to create a writer's toolkit when designing such narratives [17, 20]. The current literature suggests focusing on factors that disrupt the user experience, alongside pragmatics and aesthetics when writing location-based stories. The structure of these narratives is another topic of research. Spierling and Kampa outline a story and plot structure, intended for use with mobile devices in museum tours [32]. Other research suggest the correlation between location and time when structuring the plot of a story [29].

The majority of studies in Interactive Storytelling focus on Narrative Generation and the algorithms which author plot and discourse. Much less is known about interactions, the way they are classified and their role in stories. Furthermore, there exists little evidence of the role of Augmented Reality Interactions in Interactive Storytelling systems. Location appears to be the only interaction to receive a good amount of focus in literature.

2.2 Augmented Reality Interactions

Augmented Reality applications aim to combine the virtual and physical world into one, increasing the immersion of the user in their environment. The increased popularity of mobile devices has naturally led to a surge of interest in AR. A major interest of this field have been the interactions themselves. Literature suggests the division of AR interactions into two categories: tangible and intangible [1]:

- **Tangible Interactions** refer to interactions based on a physical contact with an interface. These interfaces come with the major advantage of being intuitive to use, as the virtual objects are directly mapped to the physical manipulation [4]. Research suggests a further division to touch-based (touch-screen controls) and device-based (the device's sensors) interactions [12]. A limitation of these interactions, however, lies in the fact that users can only interact with visible objects.
- **Intangible Interactions** refer to interfaces that separate the user from the physical object. While they increase user engagement, a drawback of these is the lack of haptic feedback [12]. Literature further divides intangible interactions [1] into marker based [12] and marker-less [4, 6].

There exist a good amount of literature on designing non-verbal interfaces for Mixed Reality applications [9]

As discussed in the previous section, another vehicle for interaction is the user's location. The obvious method for achieving this would be through GPS tracking, however, it has been demonstrated that a Context-aware indoor AR is possible [7]. Real-world markers, coupled with inertial navigation can help track the user's location indoors. Most modern mobile phones have barometers, which can further increase the accuracy of these interfaces [18]. Another aspect of locations is their relationship with the story [2]. The Augmented Reality application can be either Reinforcing, Re-skinning or Reminiscent.

Designing Augmented Reality applications comes with its own set of challenges when looked through the lens of User Experience. There exists research that provides a detailed look at a user's expectations when engaging with mobile AR [19]. A shortcoming of this work is considering narrative as a factor. Such an effort is made by Grindler-Hansen and Schoenau-Fog, outlining the storytelling design factors that influence the user experience [10].

2.3 User Experience

While User Experience is highly subjective, efforts are made to develop frameworks for understanding the factors that affect it [16, 25, 33].

One of the well established models is that of Roth and al [25]. They identify the key experiential qualities of interactive storytelling systems - curiosity, suspense, aesthetic pleasantness, self-enhancement, and task engagement. Other efforts in objectively measuring an Interactive Story can be seen in the PC3 framework [16]. It proposes Process (the actions that can be executed), Content (plot and discourse), Control (the ability to alter Content), and Context (intended purpose) as the defining qualities of interactive systems.

Some of the reasons Mixed Reality is chosen over other storytelling mediums is the increased immersion and feeling of agency when experiencing a narrative. However, a research on immersion suggested that more is not necessarily better when it comes to enjoyment [5]. Other work suggest that the feeling of agency can be similar between branching and linear stories [8]. Furthermore, there is evidence that the classical approaches of Virtual Reality are not necessarily the most engaging form of media [21].

Perhaps the best way to evaluate an Interactive Storytelling system is to examine the user's desire to continuously engage with the application. This is further examined by Schoenau-Fog [11], who's research suggests that engagement can be defined as a player's pursuit of objectives, accomplished through activities, which result in a feeling. Further research aimed to evaluate engagement in real time by using an emerging narrative [28].

3 EXPERIMENT

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3.1 Related Work Subsection

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4 DISCUSSION

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5 LEGAL, ETHICAL, PROFESSIONAL AND SOCIAL ISSUES

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6 CONCLUSION

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