**The Fundamental Elements of the Four-Factor Framework**

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**ABSTRACT**

The *Four-Factor Framework* was developed to facilitate the analysis of stories or sequences of narrative that are presented, or develop through a user's agency in interactive media such as mixed realities and 3D narrative games. The approach taken was to observe four constructs: *agency, drama, narrative centrality* and *engagement*, called *Fundamental Elements* at a granular or event level to analyse an interactive experience. In this study, the observation of the participatory narratives of six case studies are presented. The analysis using the methods defined in the *Four-Factor Framework* is then reported.

The framework facilitates the evaluation of interaction and stories by mapping the dynamic connections between the *Fundamental Elements*. A key innovation of this work is the observation and measurement of change in these four elements as a story develops through user interaction and authorial design.

The questions asked in this study were designed to discover information at a deeper level about how interaction and narrative interlink when stories emerge, diverge and cross media. Can we observe how engaging an interaction is by studying changes in the four fundamental elements; or why one sequence of interactions is more engaging than another?

**KEYWORDS**

Narrative, Edutainment, Experimentation, Engagement, Agency, Drama, Measurement, Methodology.

**INTRODUCTION**

This paper presents a novel framework that facilitates the evaluation of visual narratives. The methods described examine and reveal a granular pattern that demonstrates how stories and narratives flow across the expanse of technologies and mixed realities that characterize the way people communicate, share knowledge and are entertained. The study presented in brief describes the methodology called the *Four-Factor Framework*. The sample environment chosen for the initial study was the computer game *Oblivion* (Bethesda Softworks, 2006).
Subsequent to the study reported, the methods have also been successfully deployed for the evaluation of two-dimensional art works.

In Macfadyen’s (1992) two-dimensional representation of a dramatic moment shown in Figure 1. above, there is more than one possible narrative suggested. The experience depicted is not entirely clear, facilitating interaction between the viewer and the image. Although a strong and dramatic narrative is suggested by the portrayal of emotional conflict in the face of the subject in the image, the narrative context is supplied by the observer who uses his or her own experiences and cognitive associations to complete the narrative.

These fundamental elements were selected because of the quantity of literature that discusses each in terms of narrative experiences. The study aim was to enhance our understanding of narrative forms that have developed in response to interactive technology, and to establish if useable data could be collected through the focus on these four elements.

The fundamental elements are described in the following sections. The detailed study is not presented in this paper because of size constraints.

AGENCY

Murray (1997, p. 126) describes agency as the satisfaction of performing an action and seeing results. Mallon and Webb (2005, pp. 10-11) and Bjork and Holopainen (2005, pp. 201-202) highlight the difference between the illusion or perception of affecting a narrative, and the actuality of being able to affect it. Interaction and agency both facilitate a user’s interactive narrative experience. Interaction is, as Wolf (2006, p. 117) points out, a tool that allows a user
to reach through into the narrative environment with agency, to affect and manipulate the developing participatory narrative. In this analysis the metric for agency was defined by the number of choices or responses a user had at any given event. However, working with two-dimensional works promises to yield interesting results.

A defined interaction James attacked by rats, has a low level of agency, since the action derives from the rats and James had no options. An interaction that may follow such as James slays rats facilitates more options for agency since it is James who chooses how to respond the attack. Where low levels of agency were observed, low levels of engagement were shown to follow.

DRAMA

Both Aristotle (350 BC) and Freytag (1863, p. 104) describe the structure of drama as a performance designed with parts that form a plot. In his thesis, Meehan (1915) observed that people live in their own times, and are influenced by the distinct paradigms of those times. Thus, understanding the evolution of dramatic experience and design in communities characterized by emerging technologies and interactive media is critical for the development and the analysis of that media.

In this analysis the metric for drama was firstly defined by the presence of vivid, emotional, conflicting user experiences such as those categorized and described by Polti (1977). This was supported by the results of an anonymous online survey. Of the 88 subjects tested, agreement on dramatic level was shown for all sample words and phrases except the two words love and marry. Further work is needed to understand the patterns of exception where the level of drama for words or phrases are not agreed.

What was learned was that three factors were usually present when dramatic levels were high. These were:

1. Strong emotion or conflict was represented.
2. The inherent level of drama was high.
3. At least one of the 36 Polti (1977) dramatic situations could be identified.

ENGAGEMENT

The observation of levels of user engagement is necessary to determine (a) user involvement, (b) the focus of the user’s involvement, and (c) the type of interaction and narrative pattern in play. Engagement in interactive narratives is described by Brown and Cairns (2004, p.1298) as an initial involvement or interest that precedes engrossment. Murray (2005, p.84) contends that immersion is to some extent an indicator of the power of a
narrative, and this suggests that the level of immersion or engagement in interactive narrative can in some way measure the interactive experience. Aristotle (350 BC) describes a type of engagement with drama as a Proper Pleasure. This, as Hiltunen (2002, pp.5-7) writes, was Aristotle’s measure of the success of a drama, and put simply, why one narrative experience is more engaging than another. If the narrative or interactions are not engaging, then the conclusion or resolution of the story experience may not make sense, or the purpose or point of the story or sequence of interactions may not be understood.

A metric and measurement of engagement was made from (a) the observer’s assessment of the subjects’ engagement, and (b), the subjects’ self-reporting. Cues such as the subjects demeanour and body language were observed. Was the subject leaning back into the room or forward into the virtual world; how was the gaze directed and was it intense or did it appear vague? Another factor was the degree and frequency that subjects became distracted and initiated conversation with the observer. Did this involve the sample interactive environment or other topics? Finally, the subjects were asked to self-report in a questionnaire immediately following each scenario. After each scenario, subjects were given a questionnaire that included questions that asked them to indicate the most engaging and the least engaging things about the scenario. Previous methods to evaluate engagement are discussed in section nine.

NARRATIVE CENTRALITY

In narratives where interaction is present, a story teller or author cannot control the narrative elements to the same extent as in narratives where there is little or no interactivity. Users create and modify their own avatars, select and change environment and system settings, and autonomously explore the environment. They are not completely driven by the designed narrative, the pre-structured plot, or story. Designed narrative is the structure of the sequence of events that have a beginning, middle and end. In interactive narrative environments it is the sequence of story events that have been designed and created for users to experience. In contrast, participatory narrative is the story that develops from a user’s interactions within the scenario, narrative or set of circumstances. The narrative metric was defined by its centrality in the subject’s event experience and was based upon the relevance of the narrative at any given event point.

The goal of the development of the framework described in this paper was to develop a process that could facilitate our understanding of narrative forms that have developed in response to technology. This was prompted by the lack of existing standards or accepted methods to observe and analyse interactive narratives at the granular, elemental level required for a substantial investigation. The study reported in this paper indicated that observations, measurements and comparison of the fundamental elements agency, drama, narrative centrality and engagement could be made. Furthermore, the data returned
suggested there were patterns and links between the fundamental elements that altered as an interactive narrative unfolded.

THE ANALYSIS OF DRAMA

The focus in the previous section was to present and describe metrics developed for the four fundamental elements. This section discusses the fundamental element drama and how Polti’s (1977) 36 dramatic situations describe the participatory experience of drama as it unfolded. The term Interaction Frame is used to describe a single granular event such as those depicted in Table 1.

<table>
<thead>
<tr>
<th>Interaction Frame</th>
<th>Type</th>
<th>LOE</th>
<th>Polti Situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Bee materialises in prison-cell</td>
<td>E-AD</td>
<td>1</td>
<td>9. Daring enterprise.</td>
</tr>
<tr>
<td>3 Bee dismisses dialog boxes</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Bee triggers guard scenario</td>
<td>E-A</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>5 Guard mocks Bee</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Bee hears King &amp; soldiers</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Soldier reprimands prison guard</td>
<td>E-D</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>8 King and Soldiers enter prison-cell</td>
<td>E-D</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9 Bee stands back</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Soldier orders Bee to stand back</td>
<td>E-A</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>11 Bee already standing back</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 King recognises Bee</td>
<td>E-D</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>13 Avatar is immobilised</td>
<td>E-A</td>
<td>0</td>
<td>7. Falling prey to cruelty or misfortune.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6. Disaster.</td>
</tr>
<tr>
<td>14 King opens dialog with Bee</td>
<td>E-A</td>
<td>0</td>
<td>7. Falling prey to cruelty or misfortune.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6. Disaster.</td>
</tr>
<tr>
<td>15 Bee dismisses King's dialogue</td>
<td>0</td>
<td>8. Revolt.</td>
<td></td>
</tr>
<tr>
<td>16 Bee remarks questions are implausible</td>
<td>E-N</td>
<td>0</td>
<td>8. Revolt.</td>
</tr>
<tr>
<td>17 Secret opening appears</td>
<td>1</td>
<td>2. Deliverance.</td>
<td></td>
</tr>
<tr>
<td>18 Soldier commands Bee to stay</td>
<td>E-D</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: An extract from Bee’s Narrative.

Table 1 lists events or Interaction Frames 1 - 18 observed from a subject ‘Bee’. This is a partial event breakdown of ‘Bee’s’ interactive narrative scenario narrative. Column 1 lists the sequence of events. Column 2 describes the events and Interaction Frames. Column 3 shows which of the fundamental elements were connected with Bee's observed engagement. For example, high levels of Agency A were indicated when the subject’s Engagement E levels were high. Connections to the Drama D factor were also observed. Engagement E with the Narrative N was observed only once in this sequence. Column 4 indicates the level of Bee’s
engagement. High, medium or low levels were determined using a Likert scale of 1 to 3 where 1 is low, 2 is medium and 3 high. Column 5 presents the dramatic situations defined by Polti (1977). For example, Polti’s Dramatic Situation Nine is *Daring Enterprise* and Dramatic Situation Eight is *Revolt*. What is indicated by the six case studies, is that when user engagement was observed to be high, the subject had agency.

In the classic dramatic arc described by Freytag (1863), the drama commences at a low level, rises to a peak somewhere in the middle or just after, then returns to a low level. Although this is the well-used classic *Hollywood dramatic arc* described by Iuppa, Weltman and Gordon (2004, p.4), it was not observed in this study. The data returned using the framework suggests that the drama derived from the experience of the subjects as moments rather than as an entire story sequence. Even when the predefined narrative included dramatic events, the subjects were observed to have became bored unless there were opportunities for them to exercise agency. The cut-scene\(^1\) for example, where an old King’s story was narrated to an immobilised subject was shown to cause a sharp drop in all subjects’ levels of engagement. The response by all subjects, regardless of their knowledge of the story, was to exercise agency by terminating the cut-scene.

Engaging drama was observed to have derived from the experience of the subjects rather than the predefined narrative. This is exemplified by using Polti’s (1977) dramatic situations to describe an event as described earlier. In Table 1 for example, the Polti dramatic situations *Disaster*, involving a vanquished power, a victorious enemy or a messenger and *Falling prey to cruelty or misfortune* involving an unfortunate and a master or misfortune are shown in rows 13 and 14. These were evident and repeated in the participatory narratives of all subjects who experienced these events. The *Disaster* and *Falling prey to cruelty or misfortune* situations relate to the immobilization of the subjects’ avatars and the lack of user agency to affect the situation. This had a disastrous effect upon the engagement of the participants because it occurred so early in the scenario, when users were eager to interact and become involved.

The Polti (1977) situation *Revolt*, is shown in Interaction Frames 15 and 16 of Table1. This involves a tyrant and a conspirator and represents an unintended mutiny against the designed narrative by all subjects who experienced these frames. The *Daring Enterprise* situation involves a bold leader, an object and an adversary, and the *Deliverance* situation involves an unfortunate, a threatener and a rescuer. *Daring enterprise* was demonstrated in Interaction Frame 2 where Bee prepares herself for an expected conflict by setting up hotkeys on her keyboard. *Deliverance*, in Interaction Frame 17 demonstrates a convergence between the designed and participatory narratives; following her revolt, Bee is able to progress to another scenario when the secret opening is revealed.

\(^1\) A sequence of video within the interactive environment where users have no agency.
The excerpt from the subject Bee’s participatory narrative represented in Table 1 indicates a strong affinity between her engagement and agency. Indeed this pattern was suggested in all subjects’ participatory narratives. Table 1 also shows seven instances of parallel values between engagement and agency $EA$, but only four instances of engagement and drama $ED$ parallels. Even when high dramatic levels were present, if the interactions did not involve the user and had no impact on the user’s success in the environment, levels of engagement were observed to rapidly drop. Where agency was facilitated, levels of engagement were observed to rise.

More detail relating to the analysis and observations are available in Macfadyen’s (2009) thesis. This is hosted on the Four-Factor Framework website at http://alyxmac.com/four-factors. The next section concludes this paper.

**OBSERVATIONS**

This section presents five indications observed from the analysis of the data.

1. *Agency caused engagement more than any other factor.* In all scenarios examined, the connection between *agency* and *engagement* at a high level on the Likert scale (from 1-3) was shown more than any other element. This indicates that facilitating agency in the design of interactive experience is more likely to yield user engagement.

2. *When not caused by agency, engagement was generally caused by drama.* This trend indicates that dramatic experiences that include user agency are more likely to foster user engagement.

3. *If drama did not involve the user, its ability to engage was reduced.* The observation of dramatic events where little or no user agency was available suggested that it is the user experience of the drama that engages.

4. *Engagement with the narrative was substantially lower than with any other element.* However, the narrative was observed to have had the strongest influence on the direction of the participatory narrative.

5. *Agency and narrative were shown to be connected less than any other pair of elements.* This is a useful observation that shows the weakened link illustrated in the dramatic models discussed in this thesis. Furthermore, the process identified and illustrated the type of interaction and circumstances where agency and narrative were reconciled. This goes some way towards the successful design of strong directed narrative and user engagement.

**FURTHER WORK**

This study has presented a framework that facilitates the granular examination of fundamental elements in an interactive story environment. Its purpose was to understand how agency alters narrative as a user makes choices and influences the direction that an interactive might take. This was motivated by the need for a set of variables that could be deployed in
computational narratives because technological devices cannot understand what is dramatic and what is not. This is further complicated by narrative experiences that traverse media and have expression in augmented and other realities.

What has been learned from the initial study is that the framework does indeed illuminate the behaviour of the fundamental elements as a narrative progresses. This facilitates our understanding of dramatic structure and has application for the development of narrative for learning and teaching, storing knowledge, entertainment and transmedia.

An unexpected result is its relevance to more traditional forms of two-dimensional narrative elements. A new comparative study is in development to understand how identifying the fundamental elements in traditional visual works can facilitate the evaluation of these in scholarly and studio based environments.

REFERENCES


