Grammar of VR Storytelling: Narrative Immersion and Experiential Fidelity in VR Cinema

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ABSTRACT

As grammar of VR storytelling evolves, we must look beyond the technical capabilities of the medium and associated perceptual immersion, in order to better understand the effect of narrative on the users. This paper presents a qualitative analysis of the experience of a VR Cinema and the experiencer's connection to the narrative. The study attempts to illustrate the significance of narrative immersion with respect to the 360° medium of storytelling in VR. In addition how the various elements in such a narrative lead to experiential fidelity is examined. We believe that the insights gathered would help VR filmmakers in creating effective narrative experiences.

CCS CONCEPTS

Human-centered computing → Virtual reality; User studies;
Computing methodologies → Virtual reality; • Applied computing → Media arts.

KEYWORDS

360° Narrative, VR Storytelling, Presence, Narrative Immersion

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1 INTRODUCTION

In order to effectively create the illusion of presence in VR, storytellers are constantly experimenting with novel techniques and methods, be it interactive or 360° film experiences [Pillai and Ismail 2017]. Although advances in VR filmmaking technologies has increased opportunities for creating 360° content, the storytelling techniques have been adopted from those used in traditional (frame-bound) films. Researchers and filmmakers have understood the importance of relooking at the storytelling techniques used in VR films and redefine its grammar [Brillhart 2016; Nielsen et al. 2016; Pillai et al. 2017; Xu et al. 2018].

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Previous works on understanding the grammar of VR storytelling suggest certain guidelines and techniques for creating effective VR films [Pillai et al. 2017]. The recommended guidelines were associated with visual focus and elements of interest in a 360° space, spatial and temporal arrangement of visual elements, action and duration of plot points, scene transitions, elements of interactivity in VR cinema, primary and secondary experiences, perceptual cues, language and subtitles, as well as genre and style [Gödde et al. 2018; Pillai et al. 2017; Rothe et al. 2017; Vosmeer and Schouten 2017]. In this study, we examine the impact of a specific narrative that was created using these guidelines and the associated effect on the users understanding of the story. We also examine its 'experiential fidelity' [Lindeman and Beckhaus 2009], i.e. how close the experience of the user (experiencer) was when compared to the director's intended experience.

2 BACKGROUND

In VR Cinema, immersion can be viewed from two aspects - Narrative and Technical. Narrative immersion deals with the impact of content and structure of the story on viewers. This includes a spatial and temporal arrangement of the composition of the VR world, the genre of the movie, expectations linked with it, the focus of the story, integration of the viewers within the story, actions of the characters and the emotions it evokes in the viewers [Elmezeny et al. 2018]. The technical immersion is about how the perceptual environment triggers immersion. It is manifested through perceptual cues like visuals, sounds, movements, gaze, animation, interaction and gestures [Pillai et al. 2017]. These two aspects support and strengthen each other. In this research, the focus is on the narrative immersion of an experiencer in the VR Cinema "*Dragonfly*" [Pillai 2018].

2.1 Narrative Immersion

In VR, reality need not be perfectly replicated but important stimuli need to be presented well in a manner that the mind fills the gaps [Jerald 2015]. In effective narratives, experiencers fill in the gaps with their imagination which reshapes the storyline [Lescop 2017]. The main factors instrumental in creating illusion of reality through media can be classified into Perceptual illusion and Psychological Illusion [Pillai et al. 2013; Slater 1999, 2009; Slater and Usoh 1993]. VR content creators have no control over the subjectivity of one's experience but they can attempt to make the most important aspects of the story consistently interpreted across users. Experiential fidelity is the degree to which the user's personal experience matches the intended experience of the VR creator [Lindeman and Beckhaus 2009]. The primary focus would be to make the core

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experience pleasurable for higher engagement [Brillhart 2016] and rewatchability [Elmezeny et al. 2018; Pillai et al. 2017].

In a narrative there can be three forms of involvement, spatial - response to the setting i.e a sense of place and pleasure taken in exploring the storyworld, temporal - structure of the plot, emotional - affective reactions to the story and response to a character [Ryan 2015]. The design of an interactive medium starts with the type of story. A dramatic plot focuses on evolving network of human relations, and hence the action is mental rather than physical [Ryan 2008]. In VR cinema attributes that contribute to great experiences are strong emotion, deep engagement, massive stimulation and escape from reality [Lindeman and Beckhaus 2009]. Coherence or uniformity in style is also an important consideration in content creation [Brooks 2003]. It is using the VR film *Dragonfly* as a case study that we explore these aspects of narrative immersion.

2.2 Research Questions

The purpose of this study is to understand the immersion experienced by the users as well as examine the experiential fidelity associated with the narrative of *Dragonfly*. The following research questions formed the framework for studying the extent of alignment of the core experience of the users with the intended experience:

- (1) How closely was the outline of the narrative followed and how was the story comprehended by the participants?
- (2) How the emotions and reasons behind the actions of the characters in the film were interpreted?
- (3) How much attention was given to the subliminal story elements?

A larger study was conducted to understand the effect of perceptual cues in 360° films with *Dragonfly* as a case study. This study also included the understanding of subjective perception [Brooks 2003; Gödde et al. 2018] of the experiencers in order to derive answers to the above research questions.

3 NARRATIVE OF DRAGONFLY

Dragonfly is an emotional drama, designed specifically for the VR storytelling medium. It presents the journey of the protagonist Aisha, and how she copes with the loss of her partner Priya. The title "*Dragonfly*", comes from the common link to her memories with



Figure 1: Plot Points in Dragonfly

Priya and a symbol of hope in the film. The first scene is almost onefourth of the complete duration of the movie, that establishes the cause of the loss and also hints about the relationship which Aisha and Priya share. This scene is predominantly an indoor shot with a portion showing simultaneously the outdoor plot point, leveraging the 360° space. The second scene depicts the yearning of Aisha for Priya and her losing patience, her hallucinations, memories linked with dragonflies and Priya, and how she manages with her loss. This scene contains an outdoor shot, depicting a terrace top. At a certain point in this scene Aisha's current and memory plot points are presented simultaneously but spatially 180 degrees apart. *Dragonfly*, the link to her memories and also her hallucination, in a way, helps her manage with the loss and bring hope in her life.

Figure 1 shows the different plot points within the two scenes of *Dragonfly*, spatially arranged as seen from above. In scene 1 plot points 1 and 2 are when Aisha is anticipating some news from Priya, and plot points 3, 4, 5, 6 are during her phone conversation with Priya. In scene 2 plot points 7 and 8 are when Aisha is on a terrace making a call, plot point 9 is related to her memories with Priya and dragonflies, and plot points 11, 12, 13, 14 are related to Aisha's hallucination and how she copes with the loss of her partner. SC and EC shown in the figure are the starting and ending credits respectively. The total running time of the VR film is 11min 11sec. Figure 2 represents its narrative structure with the same plot points on a temporal base.

Dragonfly is a VR film with stereo 3D and spatial sound, which gives the experience an additional sense of depth [Bala et al. 2018; Fearghail et al. 2018]. Certain aspects of the narrative were kept subtle and understated and open for interpretation, for example, the relationship between the protagonist Aisha, Priya and Veeru. The focal point was the emotional journey of the main character Aisha.

4 USER-EXPERIENCE OF VR CINEMA

The broader purpose of the study was to understand the experiential fidelity in terms of perceptual cues and narrative immersion. In this research paper, we discuss experiential fidelity in terms of narrative immersion. A pilot study with 5 participants set the basis for the questionnaire and the design of the main study that was conducted with 99 participants. The participants were within the age range of 18-61 years and had a basic understanding of VR, of which half of them (56.1%) had previously experienced VR. The participants had a seated experience on a swivel chair. Before they experienced *Dragonfly*, two short VR films (help videos) were shown: 1. Replaced [2:32 min, live-action film] - to familiarise and encourage chair rotation in experiencers and 2. The trailer of Invasion [4:05 min, animation film with stereo 3D] - to experience the depth in 360° space. HTC Vive VR headset fitted with aGlass eye tracker



Figure 2: Narrative Structure of Dragonfly

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Figure 3: (above) Participant experiencing the VR Film and (below) the corresponding equirectangular image with the point-of-view and the eye-tracking data

was used to record eye-gaze data and head orientation of the participants. Help videos were shown on Vive cinema and *Dragonfly* was played using Unity game engine which recorded participants' gaze position and head orientation for every second of the film and saved as equirectangular images during the experiment. Figure 3 shows a participant experiencing the VR Film and the corresponding equirectangular image with her point-of-view (POV) and the eye-tracking data. Director's experience was separately recorded to get the intended viewing experience.

A subjective questionnaire, interview, and participant-feedback were used to understand the narrative immersion of the experiencer. In the subjective questionnaire experiencers were asked about their understanding of the story, relationship Aisha and Priya shared, their observation at different plot points, how they connected the dots and interpreted the story and also their prediction of the climax which was purposely kept open-ended for subjective interpretation. POV and eye-tracking data were recorded primarily to study the participant-responses to the perceptual cues in the narrative. It was later noted during the analysis that the perceptual cues also acted as stimuli for one's narrative immersion. The results of the study were qualitatively and quantitatively analyzed, this paper elaborates on qualitative analysis with respect to the narrative immersion in VR Cinema.

4.1 Observation and Analysis

In order to understand the experiential fidelity for *Dragonfly*, and how close the participants' experiences were to the director's intended experience, multiple methods were used [Blascheck et al.

2017]. To study narrative immersion, primary observations were made during the experience (along with video recordings of the session for later recollection), and then further analyzed through the questionnaire responses and post-experiment interviews. The POV and eye-tracking data was helpful in correlating each participant's subjective response to their viewing behavior at different points in the narrative. Figure 4 shows a screenshot from the video representing the experiences of all 99 participants along with the director's intended experience (right-bottom frame) arranged on a 10x10 grid for analysis.

Figure 5 shows the closeness of the average viewing experience with the intended one. In the spectrum, dark green areas represent the times when perfect orientation towards the intended POVs was observed. Light green areas represent high affinity, i.e. when the majority of the participants were oriented towards the intended Regions of Interest (ROIs) (above 50%), while the yellow areas represent low affinity (less than 50%). Peach represents the times when the average viewing was completely misoriented with the intended ROIs. This helped us better understand how and at which points during the experience of *Dragonfly* the planned perceptual cues in the narrative structure led to strong experiential fidelity.

Based on these observations during the study and the insights from interviews of the participants, the narrative structure of *Dragonfly* illustrated the following aspects of narrative immersion.

4.1.1 Presence. The narrative in 360° space made the experiencers immerse in the story spatially and temporally, providing them a sense of presence [Slater 2009; Slater and Usoh 1993]. For instance, the feeling of story happening around the experiencers and them being a part of the story was reported. Few participants even instinctively tried moving a little away when they felt characters coming closer [Sheikh et al. 2016] to them.

Some of the responses in this regard were: "I was completely involved in the story as if it was happening around me", "The story and storytelling, both are really awesome and touching... Also, the VR pushed me more into the beautiful world that these two lovers had



Figure 4: A screenshot showing the experiences of all 99 participants and the director's intended experience (rightbottom frame)



Figure 5: Experiential fidelity with respect to the Intended POVs and ROIs in Dragonfly

made...", "Placement of miscellaneous objects, like the purse, chairs on the terrace; made me think further about the current context I have been placed into."

4.1.2 Spatial Immersion. Spatial Immersion was also experienced, especially due to the stereo 3D effect and the placement of the plot points. A participant noted: "... I find it interesting that when I try to recall the story, I keep rotating myself to orient myself towards where I saw the 'memory'; which is now making me wonder where my 'origin' was 'initialised'. It's fascinating how events and memories which were virtual have been grounded in space and orientation."

4.1.3 The VR Medium. VR Cinema being a new medium of experience had mixed responses. Few experiencers felt the medium came in the way of storytelling while some felt totally immersed in the story regardless of the medium. Few responses with respect to the medium were: "The urge to look at the surroundings distracted from the story a bit. I missed the accident scene as just the moment before that I had turned to look at Aisha...", "... Due to focusing more on the visuals, people might find it difficult to concentrate on the script, but that too I feel is part of the story itself.", "I feel viewer bias may come into the picture because he/she may not just be completely invested in the storytelling experience as this is a new medium [...] So the viewer may be inclined to digress a bit from the storytelling and sometimes concentrate on the technical aspects more." While another participant noted: "...Overall I was able to be immersed in the story of Aisha and Priya regardless of the 360 degree experience."

The two short VR films before the *Dragonfly* experience helped the experiencers, especially for the ones new to the medium, to get accustomed to experiencing 360° spatial narratives, which is unlike traditional film-watching. They noted: *"I don't know If the movies* shown earlier were intentional and deliberate, because it influenced my way of finding out if I am the second or first person in the movie. It also made me familiar with the 360 degree movie. But it was good for the novice.", ".. Liked the fact of using the two short-films as a way to adapt to the 360 degree storytelling experience. The rotating chair was a comfortable option."

4.1.4 Experiencer's Role. Experiencers took some time to understand their role [Bender 2018] during the narrative. It could be partly because the help videos shown prior to it had a first-person view, whereas *Dragonfly* has a third-person view. Once the experiencer understood their role and the style of the movie in the first scene, there was greater experiential fidelity during the second scene. Two connected responses were: "I was curious to know if I am the first person or the second... It's an open-ended story which adds more to the curiosity.", "The camera placement didn't let me understand the world... In the second scene, it didn't cause that feeling." 4.1.5 Plot Points. In the first scene, simultaneous plot points were placed beyond one's field of view, which required 180 degree head rotation. At the same time, the critical aspects of the storyline were also being established. So some experiencers required more time to get familiar with the setting. Two participants noted: "...Maybe some more time can be given for the user to get used to the setting, before moving towards starting the storyline.", "...Story progression was very nice. I also felt that at some point of time, too much was happening (Visuals, Audio etc.)" However, experienced participants took less time for orienting themselves as per the plot points [Löwe et al. 2015; Vosmeer and Schouten 2017]. Parallel plot points, scene transition, fading out of scenes and plot points added to engagement and seamless flow in the story [Ko et al. 2018; Serrano et al. 2017]. Few related responses were: "...The overlapping of different moments were an interesting thing.", "The blending of scenes to show two parallel stories (Aisha in the room and Priya in the car) was quite good and even the emotions of the second scene could be felt while Aisha gave her monologue...", "Loved the couple of times the characters faded or the wheelchair faded into a chair ... ", "Multiple scenes in the same screen prompted me to constantly be engaged through movement. Though initial few minutes were invested in understanding the setting of the movie and the environment..."

4.1.6 Subliminal Details and Connections. The subliminal details and subtlety of various aspects of the storyline raised interest, curiosity, suspense and kept the experiencers engaged throughout the movie. Participants mentioned points such as: "Things are quite understated, and that is great.", "The subtleties of the story make it interesting.", "It was a nice movie, it wasn't very obvious that they were in a relationship ... Could the cafe had shut down during the three years of her coma.", "...even though it was simple, I felt like they did not spoon-feed the emotions and the events. I could follow everything and could interpret the story in my own way.", "The relation between the characters as well as the next activity were perceived from signifiers and was not directly known which kept me engaged.", "The storytelling felt organic in the way the scenes revealed themselves during the movie", "....there were a lot of subtle hints on what type of a relation Aisha, Priya and that third guy, [...] had between each other."

The narrative structure of *Dragonfly* did not lose the experiencers' attention and they were also able to relate the subliminal details and connect emotionally. Participants noted: "…really liked the way the story unfolded. It kept me riveted throughout and I did not lose attention or drift away in the middle. Towards the beginning, I turned towards the accident a bit too late, but could successfully connect the dots soon.", "The flow of the story was really good, was able to connect emotionally." Narrative Immersion and Experiential Fidelity in VR Cinema

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The climax is open for experiencer's interpretation which left them curious, interested and engaged. They noted: "The open ending, the telephone-ring at the end is nice, leaving the viewer to guess", "Story was well told. [...] left me wondering what could have happened in the end.", "I like the way the film ended on a cliffhanger."

4.1.7 Perceptual Cues. Perceptual cues acted as a stimulus [Zhu et al. 2018] for the Narrative immersion for the experiencers [Pillai et al. 2013; Slater 2009]. Spatial sound [Dowling et al. 2018; Fearghail et al. 2018; Knorr et al. 2018] and stereo 3D provided a technically immersive experience leading to an increased emotional immersion. Some experiencers also had an urge to get up from their seat and examine the 360° space. Few responses that point to this were: "Felt a good boomerang effect when the dragonfly popped in. [...] The audio cues were used pretty well in all.", "The sound cues are amazing.", "It was very immersive, I could perceive depth pretty well and the sound was well designed." "... it was amazing to experience our presence in the narrative space.", "...The surround sound was well done in almost every instance", "wanted to see the view from the balcony", "...I love that scene when the protagonist is texting and I turn around 180 following the trail of sound as well as the whatsapp icon. That scene is spot on." , "the editing was excellent, the blurring in between the two scenes, the car and the wall amalgamation, the dragonfly coming into focus, the flashbacks and hallucinations were blended quite well to give the feeling that it is indeed normal to have these type of stuff in real life. Even the faces and bodies looked quite 3d and gave depth. the 3d ness was achieved flawlessly."

4.1.8 The Experience. It was noted that the experience of the story which is subjective, was influenced by the participants' past experiences, external stimuli, user values and their state [Lindeman and Beckhaus 2009]. When questions were asked regarding the relationships between the characters, their answers depended on the interpretation of the crucial plot points. Majority of the experiencers followed the basic outline of the story. There were different interpretations regarding the relationship of the characters, the number of primary characters, and a few plot points which indicated the subject of the storyline. Even though some experiencers followed the perceptual cues perfectly as intended, they still deviated from the anticipated emotional response. This may perhaps be connected to their previous film-viewing experiences. Experienced film watchers were easily able to connect the dots and make sense of the storyline. Some experiencers also mentioned very subtle details and clues which appeared in the scenes, that had certain hints towards the theme of the story. Many experiencers even expressed an interest in watching the film again, in order to put in greater attention to details in the VR environment and the story in case they missed [Rothe et al. 2017] something. A participant noted: "It was done well. I would like to see the movie again as I am curious about whether the experience would be different the second time."

4.2 Inferences & Guidelines

From the qualitative analysis, we could draw the following inferences. A dramatic plot like *Dragonfly* has deep emotional involvement and the content creation has uniformity in style [Brooks 2003]. The factors which contribute to deep engagement are emotional experience, subtleties in the story, open-ended climax, the temporal

and spatial setting which further increase the chance of rewatchability [Brillhart 2016; Elmezeny et al. 2018; Pillai et al. 2017]. In an immersive narrative, the spatial and the temporal setting are closely interrelated [Ryan 2015], and thus while planning the plot points one must carefully consider both their timings and positions in the 360° space. The experiencer is the storyteller here, and the way they construe the story is determined by the extent of attention paid to the plot points and audio-visual details in the story, their state of mind while observing and their previous film viewing experience [Lescop 2017; Lindeman and Beckhaus 2009]. Perceptual illusion and psychological illusion through stimulants like spatial and stereo effect contribute to immersion [Pillai et al. 2013; Slater 2009]. It is evident that perceptual cues and narrative immersion are interlinked and that they also strengthen each other [Ryan 2015]. Placement of the plot points and the VR environment contributes to the feeling of being there i.e spatial immersion [Pillai et al. 2013]. Participants with less VR experience have higher chances of getting digressed from the main storyline and paying more attention to the medium itself. Participants with less experience in VR Cinema and who were more accustomed to the traditional way of watching films have lesser chances of exploring the 360° space and may require more time to understand the narrative style of Dragonfly [Ryan 2008].

5 CONCLUSION

The study presented a qualitative analysis of VR cinema experience using the film *Dragonfly* as a case study. It illustrates the importance of appropriate design of narrative with respect to this medium of storytelling. How narrative immersion was experienced by the users was explored by examining the experiential fidelity associated with the narrative. The research questions - how closely was the outline of the narrative followed, how was the story comprehended by the participants, how the emotions and reasons behind the actions of the characters in the film were interpreted, and how much attention was given to the subliminal story elements, were explored in detail. Based on the responses from the subjective questionnaire, interview and feedback inferences were derived. We believe that these insights would help storytellers and filmmakers in creating effective narrative experiences in VR Cinema.

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