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Screenwriting Framework for an Interactive Virtual Reality Film

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Abstract. This paper presents a proposal for a screenplay writing framework for interactive VR feature films made using 360° video technology, presenting possible diegetic and extradiegetic interaction options on a pre-scripted story with different navigation alternatives. The interactive structure is based on the hero's journey and the classic cinematographic structure in order to assure the dramatic tension of the story. The framework for an interactive VR storytelling project can be applied in a Narrative Learning context. Both VR and storytelling have the potential to favor immersion and by this means favor the construction of innovative and effective learning environments.

Keywords: Narrative Learning, Interactive Digital Storytelling, Medium-conscious Narratology, VR Film

1 Introduction

360º video is one of the technologies with major possibilities to become a mass tool for virtual reality (VR) content production, due to its low costs as well as creation and distribution ease. After Facebook and Youtube habilitated the reproduction service on their platforms, a vast number of video makers have started to explore this new medium, using 360º video. The arrival of VR technology into the mass market has occurred in a multimedia context that offers not only 360° audiovisual reproductions but also the possibility to enrich the video through the addition of multimedia elements, offering multiple alternatives of navigation and extra information that enhances the experience. Approximately, 10% of the experiences on the Oculus Store are educational [1] and the field of Educational VR promises a big development in the next years as long as the creation of different kind of experiences and simulations increases and the virtual environments get massive access through internet. In this way, there will be a transformation from E-learning to VR-learning [2], as we also move from the era of information to the era of experience [3].

This screenwriting framework for an interactive virtual reality film is part of my PhD thesis in Immersive Interactive Narrative. The kind of immersive cinematographic experience that is presented in the dissertation can be applied in a narrative learning

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environment (NLE) [4]. Narrative has been proved as a powerful support for learning and skill trainer with regard to cognition, motivation and emotion [4]; the educational use of stories and narrations can be enhanced by multiple technologies and applied in the most diverse fields. In this case, immersive virtual reality (IVR) [5] is proposed as medium, due to the possibility that VR gives to "live" a virtual world with one's own senses and act directly into it [2], this activating a perceptive-motory learning type [6]; storytelling, moreover, works as a conductor that promotes a symbolic-reconstructive learning type [6], leveraging on our "narrative intelligence" [7].

This framework aims to become a conceptual tool for the authorship of a pre-scripted interactive narrative with multiple navigation alternatives in a 360º environment. The main contribution of the framework is to support the design of an interactive narrative that is independent of the user's journey within the story; the plot is always conducted into a dramatic climax, thus the audiovisual experience can be received by the viewer as a fluent and coherent story. This study relies on three elements in order to achieve a fluent interactive VR film: the immersive nature of VR, a well-structured pre-scripted story with special attention to its dramatic arc based on the classical cinematographic structure [8] and the *interactivization* of Campbell's Hero's Journey [9], as an instrument to stimulate activity in the audience, hence intensifying immersion and by this means learning and entertainment.

The next section presents the framework proposed to create immersive interactive 360° films, preserving narratological consistency on one side, and granting real interactive experiences on the other side.

2 Creating an interactive VR film

Theoretical research and artistic creation are working to improve understanding of how to tell an effectively immersive story [10, 11], borrowing some concepts from cinema, television, video and literature in order to design a story in a medium that defines itself day after day, thanks to users' feedback. Adding interaction in digital storytelling increases user's immersion, because having an active role contributes to enjoyment and learning. In a computer generated (CG) virtual environment, there are many possibilities of interaction with synthetic characters and objects, as actions and scenes are generated at run time. On the other hand, in a 360° video, where every scene needs to be created beforehand, the possibilities of interaction are mainly two: the definition of a bifurcated plot where every scene is a video clip, and the overlapping of multimedia elements over each video clip. These options can offer to the viewer a certain level of agency [12] inside the storyworld [13], despite the fact that all video clips are already created. In this sense, an interactive VR film is closer to cinema -as the name indicates- rather than to videogames, both representing different approaches to immersive

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experiences. In fact, one of the main issues in Interactive Digital Storytelling (IDS) from the creator's point of view is to find a good balance between a fluent story structure and the possibility for the user to have some level of agency within the story [14]: how to tell an engaging interactive story without compromising its dramatic progression?

The framework proposed in this study is applied to the development of an Interactive VR film set in Genoa's *vicoli* (narrow streets that form the old town). For the creation of this experience, the project takes as baseline the workflow of a traditional cinematographic project, being this stage the writing of the interactive screenplay. In the same way that Genoa's *vicoli* are a labyrinth of crossroads where the pedestrian is always forced to make a choice, the screenplay of this interactive VR film proposes a graph-based structure [15], using 360° video for the creation of each narrative node. As it happens in movies, the ultimate linear sequence of the videos that the user has chosen needs a dramatic tension that conducts the experience and keeps the viewer's interest alive during the experience. To achieve this goal, the interactive structure takes as foundation the classical cinematographic narrative structure proposed by Syd Field in his book Screenplay: The Foundations of Screenwriting [8]; hence the final experience -which results necessarily linear- can have a dramatic progression similar to watching a movie. Over this cinematographic narrative structure, it is proposed a way to render interactive the Hero's Journey [9]. The Hero's Journey is the result of the research of Joseph Campbell, who highlighted common patterns and basic stages through hero myths and stories from different cultures. This structure, that he called "monomyth", has inspired novels, movies and several artistic creations in history. The monomyth or hero's journey helps to creates empathy with the hero through the telling of a universal story.

2.1 Immersive Film

VR films have been one of the main interests of both technological and cinematographic big companies. Even though, from a narrative point of view, VR films are still in a phase comparable to the first film experiments like George Méliès's "*Le Voyage dans la Lune*", they encompass several genres, as witnessed by the variety of 360º videos shared in internet and social media, most of which are situational or landscape videos, non-fiction experiences. In recent years, the reproduction of 360° video has been the most used technology for videomakers and cinematographers who want to create VR environments. 360° video offers diverse benefits besides its low cost: on one side it is easy to use for those who are not familiar with CG software and, on the other side, it allows the recording of a real place or situation, offering an audiovisual reproduction of the real world. A 360° video reproduced on a Head Mounted Display (HMD) implies the complete cognitive immersion of the viewer into the storyworld; as

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the user simulates the story, his/her mind becomes the theater of a steady flow of pictures [16]. Thanks to recent technological development, the sense of presence within virtual environments is getting more realistic and motion-sickness is less likely, yet the physical experience may differ for every single person. VR provides a paradigm shift from previous interactive computer technologies allowing multisensory integration in a virtual environment that augments learning and entertainment with experience [17].

The study of how fiction's creation and usage change in a 360º environment, on one side, and how interactivity shapes the flow of the story and user's enjoyment, on the other, leads towards a *medium-conscious* narratology [18] for VR. The writing of a screenplay for an immersive film needs to consider in the first place the aspects related with the 360º environment. This conceptual exercise creates several narratological issues that haven't been completely addressed by theory: Who tells the story? Who is the user inside the story? Is the user part of the story at all? The creation of an interactive story is another challenge for the author: What kind of interactions are going to be used and in which way will they affect the story, how to write a fluent and coherent story where a single narrative node is both source and destination of another one or multiple nodes?

Even though interactivity is not an obligatory component to create an immersive film, in this study interactivity is added to a 360° video to enhance immersion. The discussion about interactivity is still one of the main issues of IDS, given that a real interaction is a logically conversation between two agents (human-human / human-computer), where each utterance makes sense with respect to the previous utterances and the agents' relationships [19]. The kind of interactivity that this framework employs is Interactive Fiction [20], a form of narrative based on a bifurcated story. In an interactive fiction users rearrange the fragments into other configurations [21], and the single interactions inside the experience are *reactive* [19], from a technological point of view, but challenging from the narratological/authorial side, in order to keep the flow and engagement of the user with the story.

2.2 Dramatic Pre-Scripted Structure

The main objective of this research is to create an interactive story with a dramatic structure, that leads to a climax; the virtual experience offered is similar to watching a movie, living inside the storyworld thanks to 360º video, and interacting with the story by having decisional power on the narrative development. This conceptual framework provides a way to *interactivize* a cinematographic experience [19, 22], yet without achieving completely interactive storytelling, whose creation requires more advanced technologies and techniques, such as Artificial Intelligence (AI), for the generation at run-time of consistent and interesting stories.

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At present, most 360º videos, both short movies and documentaries, are linear. Therefore, in order to create a non linear story with multiple alternatives of navigation, the proposed framework creates a graph-based preconceived structure formed by unique video clips that correspond to different stages of the Campbell's hero's journey. Each video clip represents a narrative node, so it can be a scene or a sequence already edited in post production. Each narrative node can be source or destination of another one or of multiple nodes.

The Aristotelian narrative structure [23] used by literature, cinema, television and radio dramas is based on the empathy between user and characters and on the obstacles that they need to overcome to finally achieve their goals. In the traditional film structure [8], the story develops itself in a paradigm of three acts: setup, confrontation and resolution. Generally, time is divided as follows: setup (1/4), conflict (1/2), resolution (1/4). The same time division occurs in Campbell's circle of the hero's journey, where key stages are represented as a circle that completes the whole journey: the departure from the ordinary world (setup), the entering into the extraordinary world (confrontation) and the return to the ordinary world with the achievement of the main purpose, that brings peace, mastering the two worlds (resolution). Each act contains specific turning points and stages that continuously add tension and contribute to user's engagement. The writing of this interactive screenplay is, in its first step, based on time and its subdivision in three acts (Fig 1); on the top of this canvas, the interactive narrative structure will be designed. Therefore, the user's journey inside the graph should conduct to a dramatic climax, because of the necessarily linear exploitation of the virtual experience.

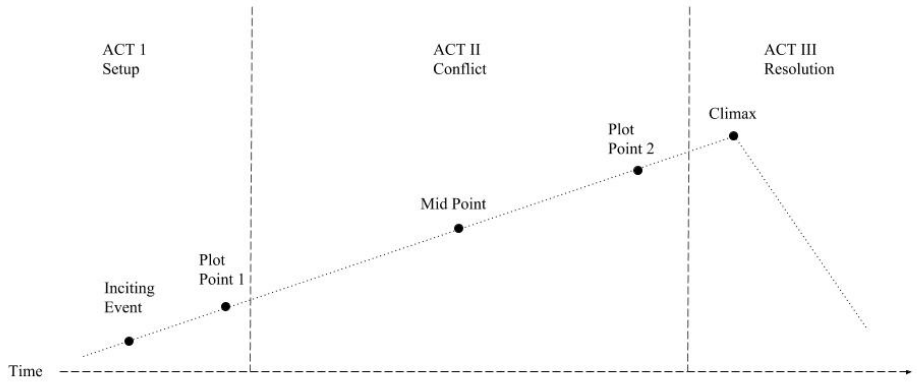

Fig. 1. Syd Field's Film Narrative Paradigm.

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2.3 *Interactivizing* the Hero's Journey

In the present study, the interactive structure goes through each stage of Campbell hero's journey as a linear expression of the cycle that the hero achieves in his/her path into the extraordinary world and return into the ordinary world [9]. Each act – *Separation from the ordinary world*, *Extraordinary world* and *Return* – is subdivided on stages of conflict, illumination, fear and overcome, victory and wisdom. Using the linear structure divided in three acts as a canvas, each stage can be located as an independent narrative node inside its correspondent act. The division of each stage and its location on the timeline allows the creation of a non-linear structure where the order and connections can be made following the specificities of the plot. The use of the dramatic arc as a canvas in which the stages of the hero's journey are juxtaposed, offers an overview of the dramatic progression of the interactive experience which is independent of the user's choices if each stage is located on the right temporal position. In this study is suggested a way to locate each narrative node inside the correspondent act, presenting different alternatives to diversify and combine stages. The choices used on this example are not restrictive.

Act I: The Departure – Setup. On Act I (Fig 2), the first possibility of interaction is related to the acceptance or refusal of the call that represents the inciting incident. These two possibilities (accept or refuse) have been regrouped into one single dramatic stage: the help of a supernatural agent. The simplicity of the interaction in this first act obeys not only to the narrative beginning of the story but also to the progressive multiplicity of the choices that the user will make along the development of the story. In this particular case, no matter his/her choice, the hero has to be conducted to begin the adventure. The call to adventure corresponds to the inciting incident, while the first plot point coincides with the first threshold, the entering into the extraordinary world.

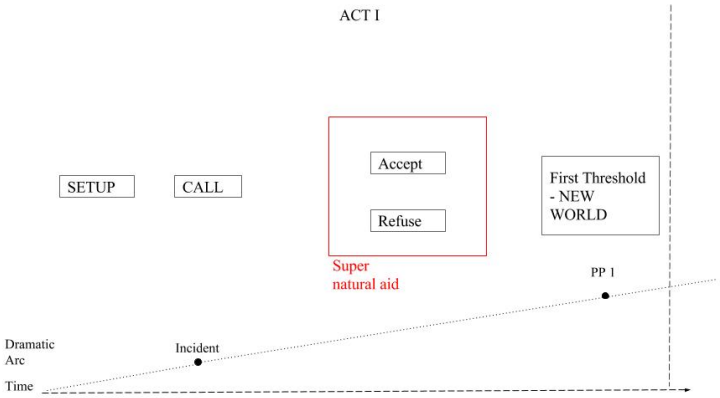

Fig. 2. First Act with interactivized Hero's Journey

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Act II: The extraordinary world – Confrontation. The second act (Fig 3) starts after the arrival of the hero into the extraordinary (new) world and the entering into the *"belly of the whale",* the stage in which the hero descends into darkness and discovers new truths about himself, emerging as a reborn hero. These two stages, as *setup* and *call,* are in this scheme represented as separated but consequential scenes. Scenes-stages can also be edited as one on postproduction in accordance to the plot or the production requirements of the project. From *The belly of the whale* stage, a number of trials are proposed; all these scenes are part of the *Road of Trials* stage. The Road of Trials is a series of obstacles and tests but also the moment in which the hero meets allies and friends. In this scheme three situations are represented: an *inner confusion* of the hero, the encounter with some *ally(s)* as well as the encounter with some *enemy(s)* and threats. Specifically, the encounter with a *deity/oracle* or an *obstacle/threat* are situated on the *Middle Point* of the experience, because according to Campbell, it is the moment in which the hero finds key information that will be helpful on the way to the climax. The *Middle Point* closes the first part of the story and opens the second.
At this moment, an example of double stage is introduced: the approach to the *Ordeal*, which in the scheme is represented with a *Right Approach* and a *Wrong Approach,* each stage adds dramatic tension before getting into the *Ordeal* or climax. This duplicity can be adapted to any stage of the journey.

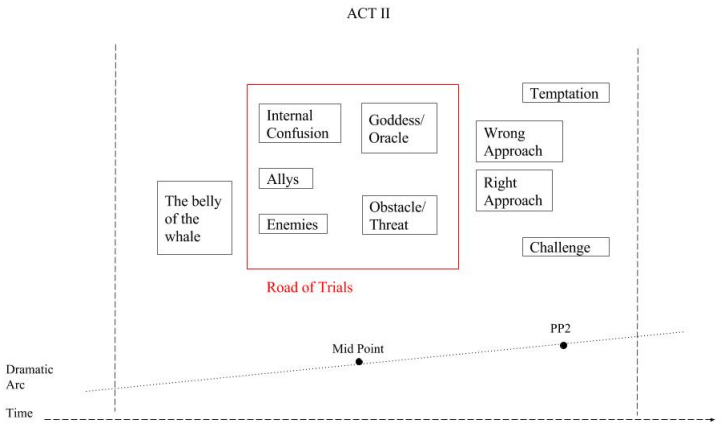

Fig. 3. Second act with Interactivized Hero's Journey

Act III: Return – Resolution. The last act (Fig 4) begins with the climax of the story, the moment when the hero is near to reach the key element that will bring peace and happiness. But as it happens in videogames, reaching the reward can be related to the behavior of the user, its attention to details and commitment with the hero's goal. In this scheme, as example, three possible endings are presented: one negative ending where the hero loses the reward and two positive endings where the hero gets the reward and can choose between two options for a happy life, *mastering the two worlds*:

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ordinary and extraordinary world. An interactive story with only one possible end could destroy the curiosity of the user to try other alternatives in subsequent usages of the interactive story.

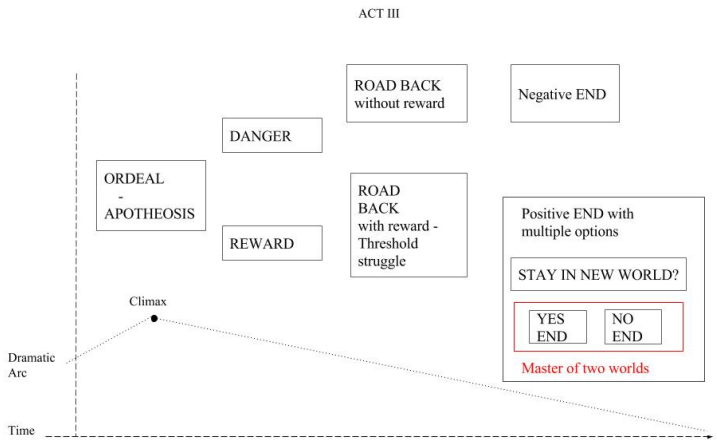

Fig. 4. Third act with interactivized Hero's Journey

The phase of screenwriting -which is a storytelling activity- is a complex and hard creative task, as it is the case in literature and cinema or any artistic work. This scheme offers a visual tool that may be used once the plot is already written and ready to be adapted to the interactive structure, but it also favors the writing of the plot's specific elements during the process of *interactivization*. The overlook of the whole interactive structure and the connections that can be made permits the writing of the plot based on the different navigation options.

2.4 Connecting the nodes

Interactivity is an instrument to incite activity in the audience and encourage them to immerse in the environment's content. In this particular case, interactivity works as the power of the user to select the next scene or to access additional information that enrich the experience. The addition of free information about the storyworld helps to augment the user's immersion [24]. The example presented shows how the stages of the hero's journey are individualized and organized in a temporary line that is divided into the three acts of classic cinematography, where the dramatic arc and its plot points are indicated. The stages of the journey can represent a unique scene or a sequence of scenes, previously edited, so each node corresponds to a unique video clip. Therefore, interactions can occur between narrative nodes (external link) or inside the narrative node (internal link). Interactions can be made through elements that belong to the storyworld (diegetic) or elements that are external to the storyworld (extradiegetic).

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External Links. External links connect a narrative node with another. They represent a change of scene or sequence, a dramatic situation that is different from the previous one. As in films, this change of scene or sequence can be given by the change of the diegetic time or the location. An external link that returns to a previous narrative node can present two possibilities: (i) what in movies is called a flashback or (ii) a return that enables the possibility to make a different choice. In the first case, the dramatic need of flashback responds to the search for key information to fulfill the plot. This information could have been already given but requires a second look or can be added by doubling the narrative node creating two versions of the same scene: the first narrative node and the flashback narrative node that contains the new information. In the second case (ii), the return to the previous narrative node that enables the possibility to take another path requires a number of versions of the same narrative node in correspondence with the number of links that this specific narrative node offers. In this way, it is possible to add free information and new details to each version of the narrative node (e.g. a non fundamental character that says hello or some casual situation). An external link can also conduct to an extradiegetic node which contains useful information that enrich the experience (e.g. instructions, learning content, historical facts, credits).

Internal links. Internal links connects diegetic or extradiegetic elements inside a single narrative node. Technically, the diegetic or extradiegetic hotspot is linked to a multimedia element (video, image, sound, text) that is overlapped above the 360° video or can transport to a new node that comes back to the same narrative node. Diegetic hotspots can be represented by the activation of an element inside the diegesis (characters, objects, sounds) that adds information to the narrative node. An extradiegetic hotspot is represented by an element linked to multimedia elements that do not belong to the storyworld but helps to enhance the experience through the addition of extra information.

3 Conclusions

The study offers an option for enhancing learning by merging interactive fiction and immersion, through the design of a virtual interactive narrative within a Narrative Learning context, in which pedagogical content from diverse fields can be conduct the storytelling. The main purpose of the framework is to ensure the linear progression of the dramatic arc independently of the journey shaped by user's choices, in order to create a meaningful story capable to generate empathy and help the student immerse in the story's content. Such immersion is essential not only if the VR interactive video is created for amusement purposes, but also if the video has educational aims, to both favor the cognitive appropriation of learning content included in the story and to increase interest and motivation.

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This framework makes a step back on more complex interactive storytelling systems because it aims to propose a design method that can be useful to teachers and artist wanting to create interactive narratives. The scheme does not intend to be a unique solution for the screenwriting of interactive movies but tries to offer a simple way to organize and visualize an interactive story ensuring the progressive dramatic tension during the temporal linearity of the experience. The pre-scripted structure has been thought for being used with 360º video, a low-cost and easy to use technology, in order to create an immersive experience, but it can also be used with traditional video or a CG 360º environment.

4 Further work

This study can open the way to further investigations in many directions, such as exploring spherical virtual environments and the various possibilities of interaction between user and storyworld, being 360º video the medium used. At present, most of the interactions occur through visual hotspots; auditory hotspots could be added, using 360° sound. In this scheme interactions have been thought as conscious choices that users have to make along the development of the story, but it is also possible to determine the user's journey through its biological data (e.g., breath frequency or sweating) while he/she is living the experience. Also in such case of unconscious choices, the creation of an engaging and fluent story must prevail. From the educational point of view, it will be necessary to investigate in depth how to integrate learning content in a story without disrupting the story interest and consistency, nor the effectiveness of the interactive experience.
This screenplay canvas aims to be useful for interactive pre-scripted stories where any kind of Human Computer Interface (HCI) could be used to activate the links. Further research will be conducted in order to study the different HCI and its matching with the purpose of achieving a look-like cinematographic experience.

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