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Developing a Media Hybridization based on Interactive Narrative and Cinematic Virtual Reality

Abstract: While the media ecosystem changes in a vertiginous way, interactive narratives make their entrance in the mainstream distribution platforms and VR looks for its feature content, new media hybrids continue to emerge from the mixture of different communication forms, narratives and supports. This article discusses the evolution of a hybrid narrative form (that we name IFcVR) born from the convergence between Interactive Fiction and cinematic Virtual Reality. The interest for such hybridization arises from the communication and sense-making potential of narrative, and from the high level of perceptive and narrative immersion granted by virtual reality and interactive storytelling. This study works out a definition of IFcVR by investigating each of its roots in earlier media. Merging different forms of media entails tackling issues of various kinds. We highlight such issues, which leads us to identify the main characteristics of IFcVR: (1) its definition and components as a form of interactive digital narrative; (2) a shift from the authorial point of view of classical media, literature, cinema and theatre; and (3) the creative challenge that interactivity poses to authors, that of creating a coherent narrative development with consistent dramatic tension throughout the variety of possible paths determined by user's choices. We discuss the effectiveness of IFcVR as a consistent and entertaining experience by describing the creation and evaluation of an IFcVR prototype, a short film entitled *ZENA*.

Keywords: Interactive Fiction, Cinematic Virtual Reality, Interactive Digital Narratives, Interactive Immersive Film.

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Crossing Narrative Boundaries between Cinema and Other Media
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1. Cinematic Virtual Reality

Sergei Eisenstein points out that "cinema is not altogether without parents and without pedigree, without a past, without the traditions and rich cultural heritage of past epochs" (232). As a matter of fact, it could be said that cinema

has its foundations in literature, photography and theater; television is rooted in film, and radio stems from theater. During the twentieth century, the innovative structures proposed by cinema and new media were remediated by means of artistic forms with secular existences (Bolter and Grusin). Accordingly, we cannot look at a new medium or artistic form as an unrelated phenomenon: the challenges and novelties that a new artistic text proposes need to be understood by defragmenting its nature, identifying the intermediations that are generated between the different ways of transmitting and representing a story (Chatman). This article summarizes the evolution that led to the birth of interactive immersive film, through the convergence of cinema, Virtual Reality (VR) and Interactive Fiction (IF).

On the reality continuum proposed by Milgram and Kishino, Virtual Reality is at the opposite end to the Real World. Reality is mainly represented by what is visible and audible. The *virtual* is turned into *reality* by technology, intended not only as a set of hardware and software tools, but in a broader sense as the *dispositio* (Agamben 23) that cyberspace (Heim) represents in the current socio-cultural landscape. Technology mediates the human relationship with the world, and art represents the visual metaphors that allow humans to interact and live in the cyberspace. Virtual Reality opens a new chapter in the relationship between art and technology, as Marie-Laure Ryan observes in *Narrative as Virtual Reality 2* (50), and locates itself at the core of the relationship of the human being with images (Grau 3). The challenge that VR presents us with goes beyond the mere reception of the digital 360° image: it requires us to coordinate different sensory languages within a virtual environment (VE) that completely encloses our sight and hearing. In other words, we need to learn how to *live* in new realities.

As Rebecca Rouse writes in her book *Media of Attraction: A Media Archeology Approach to Panoramas, Kinetography, Mixed Reality and beyond* (97), the evolution of a medium should not be interpreted under a media-centered approach in which a medium is a sort of "final result" or is accepted as "serious art." Instead, she proposes to consider every medium experiment as an autonomous art form that contributed to its evolution. This suggestion is effective to understand the historical moment of VR. Several VR devices have had brief and exciting moments of hype in the 70s, 80s and 90s, moments in which the arrival of VR to the mainstream seemed imminent. Nonetheless, among the common consumers, VR never had a massive reception. The leap into everyday life is still waiting and we do not know if it will ever happen. This may be due to the fact that, from a macro-social point of view, media are the spaces in which we build our social realities (Strate 133) and VR is still far from that stage.

VR is a late successor of the panoramic or panoptic vision. The panorama[1], with its applications and derivations in different media, laid the foundations of the optical simulation by forcing the viewer to observe the external world through its replica (Oetterman and Schneider 21). Paradoxically, over the course of time, the frameless view not only released image and vision, but also became a prison for the eye, as head

mounted displays (HMDs) evince. The frameless view sets a clear separation between the reality that is contained inside the HMD or Heilig's *experience theatre*, as Schreer *et al.* put it (13), and the real reality. There is no escape, the viewer must choose between one reality or the other. This is one of the main obstacles that VR has been confronted with from its beginning: people's hesitation about whether to enter the new reality or not. This problem was also faced by the Panorama (Oettermann and Schneider 5) when initially introduced as a new art form, but one "conceived to create a market for mediated realities and (seemingly) emancipated gazes" (Huhtamo 5). If the content of any medium is always another medium (McLuhan xii), the content of VR is the frameless/omnidirectional image. As an evolutionary process and not as a finished product, the panorama represents the code that sets the foundations for the evolution of VR as a visual medium; its hardware differs from other visual media where the viewer is placed in front of an apparatus with a defined range of visual and/or auditory transmission (cinema, television, computer, radio, smartphone, tablet, newspaper, etc.). Strate (127) contends that, when a medium becomes the content of another medium, it sets up the symbolic form and the aesthetic style used to create messages. The aesthetic paradigm that VR is proposing has consequences for the transmission of messages on both sides of the communication process, posing a challenge for both sender and receiver, who must both place themselves at the center of the *world* in order to experience what the other is experiencing.

For the authors of VR artifacts, this means transmitting not only contents, but also their physical perception of reality. This transmission of reality requires a comprehension of the VR semiotic sign which transcends the complexity of the audiovisual sign constituted by the combination of two types of discourse, visual and auditory (Hall 129), and opens up to spatial perception, haptic stimulation and interaction with the virtual environment (VE), through different types of conscious and unconscious user's inputs in real time. For the interactors, this gate to that other dimension implies trusting the author and abandoning themselves, losing connection with the outside.

From the narrative point of view, several challenges face the creators of VR immersive experiences. In order to tackle them, it is useful to examine the conceptual bases of earlier media and artistic forms, comprising literature, theater, cinema, architecture and videogames. Cinema and videogames, as interdisciplinary audiovisual art forms, offer a complex understanding of audiovisual and interactivity techniques; at the same time, the spatial nature of VR requires insights from theater as regards managing how performer, spectator and space come together, as well as from architecture in order to re-define scenic space (Carlson 25) and users' behavior in space by applying the *wayfinding theory* approach, that studies users' ability to learn a route through an environment they are visiting (Blades 137). Today, the attitude towards VR is similar to Eisenstein's view of cinema's early stages: an attention that "gradually shifted from curiosity concerning excesses towards an interest in the

nature of this language itself" (248). Such standpoint towards the development of VR is evidenced by the fact that the cinema industry has been showcasing VR experiences into its most important film festivals (e.g. Cannes, Venice, Sundance, Tribeca, among others), letting us see an organic connection between these two art forms which share a counterpoint logic between different types of stimuli: visual and auditory in cinema's case, multisensory in VR's. Following a change of the aesthetic paradigm in the history pointed out by André Bazin (26, translation by Hugh Gray) − "the art of cinema consists in everything that plastics and montage can add to a given reality" − the art of VR consists in the reality that human perception and computers can build together.

Cinematic VR (cVR) is the variety of VR closest to cinema. In cVR, the VE is created by capturing real environments with a 360° video camera; this differs from Computer Graphics (CG) generated environments, which remain flat[2] in front of (or around) the users rather than enclosing them. The cVR category also includes 360º 2D and 3D animations, as well as 360º 3D video and volumetric video. Some of these categories, as 2D and 3D animations, in their flat version, have been already recognized by cinema industry. However, cVR differs from VR in that it does not allow the interactors to modify the VE or to interact with its agents in real time. In cVR, interactors can only observe the VE and activate interactive objects overlaid upon the interface. The cinematic interface does not allow user manipulations; it produces fixed and finite objects, an enhanced film (or video) experience. Therefore, it offers a limited level of interactivity, when compared to what VR can actually achieve. Current research in this respect is focused on unveiling the film language and production methods of the linear cVR experiences (Tricart).

In cVR, the nature of cinematic reception predominates and works in the same way as cinema: "Metz argues that cinema installs the spectator in a situation in which his gaze is inoculated from reciprocal awareness. Spectatorial voyeurism is further promoted by the keyhole effect of the screen which suggests we are looking through an aperture/apparatus upon the actors" (Allen 130). This sense of "spectatorial voyeurism," even though the term may seem a conflicting one, could be the hidden resource that can develop the potential of cVR. It is fascinating to be "present" inside the scene, and excellent results can be achieved if cinema's spectatorial voyeurism is enhanced in cVR. Adding an extra level of interactivity to the filmic immersive experience can overcome the incongruence generated by being immersed but having little agency within the scene-space. Through the implementation of an interactive fictional narrative structure, interactors can directly manipulate both the course of the story and the discoursivization (Gaudreault and Jost 45) of the filmic experience, besides looking at the omnidirectional image, that is, the process in which different expression modes combine to represent something that is virtually but not materially present.

2. The Interactive Immersive Film: A Media Hybridization between Interactive Fiction and Cinematic Virtual Reality

Currently, on the different online video distribution platforms, or on VR platforms such as Oculus Video (www.oculus.com), Samsung Video (https://samsungvr.com), Within (www.with.in) or Daydream (https://vr.google.com/daydream/), it is possible to find a large number of narrative cVR projects, fictional or not, whose duration does not exceed eight minutes. Although users have a certain level of autonomy within the cinematic VE (cVE), there are no mechanisms that provide them a greater level of interaction with the narrative text. The interaction with the environment is limited to the sensation of immersion and to the possibility of visually exploring the cVE, without any real power over the development of the story. The feeling of being immersed in the cVE, therefore, contrasts with the inability of the user to get involved with the storyworld.

The addition of interactive elements within a 360º video allows the users to have a greater degree of interaction with the virtual experience (Vosmeer *et al*. 202), even though the VE still remains unmodifiable. The creation of an interactive structure, however, with links that connect different thematic units or story beats, and the incorporation of diverse multimedia materials inside the storyworld, can generate experiences with multiple navigation alternatives and a high degree of realism. The final output is an interactive narrative experience that relies on the users' individual decision-making process while living the immersive environment: they can choose *what-to-see* and *when-to-see* within the sphere, and have the power to decide the development of the story by carving their own path, possibly a different one at each usage, within a compound storyworld.

We call this possibility Interactive Fiction in cinematic Virtual Reality (IFcVR). It can be defined as an instance of Interactive Digital Narrative (IDN), placed at the intersection of IF (computer-mediated Interactive Fictional narratives) and cVR (VR experiences with a cinematic interface). As a narrative form contained in another narrative form, it can take different shapes, based on the different intersections that are possible between its components, as shown in Figure 1.

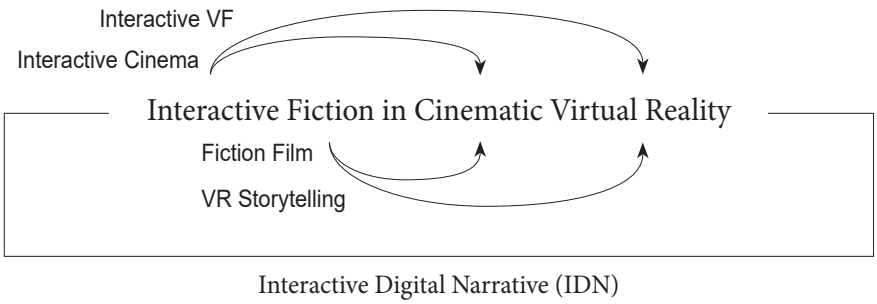

Figure 1. The various possible combinations among IFcVR components. Reproduced from Reyes "Interactive Fiction in Cinematic Virtual Reality: Epistemology, Creation and Evaluation" 36

A media hybridization can be thought of as a long history of contamination between media, technology and art. It is not possible to state if media pioneers were artists or engineers, as technological development has always been accompanied, or even led, by artistic creation. In the case of IFcVR, we can draw an evolution of merging elements that moves from fiction to interactivity, passing through the moving image and up to the immersive experience.

Fiction is the essence of a storyworld, whether it is narrated in linear cVR or IFcVR. Nonfictional texts refer to the actual world, while fictional texts create non-actual possible worlds (Ryan "Impossible Worlds" 131). In "Fiction, Cognition and Non-Verbal Media," Ryan (8) notes that fiction is based on the pretense of representing reality, not on being a representation of reality. Nonetheless, fiction takes different forms in photography, cinema or video, in opposition to literary fiction: fictional literature differs from fictional cinema in how we access the storyworld. In fictional verbal language, we have a report of events by a narrator, while in film we are looking at the events that someone else is showing us. Audiovisual media capture realities visibly and audibly, further defying receptors' cognition to separate fiction from nonfiction, because fiction films present simulated events relying on the assumption that the actors are indeed the characters.

Ergodic Literature (Aarseth), Interactive Fiction (Blank and Lebling; Buckles; Reed), Hyperfiction (Douglas; Bell) or Text Adventures (Monfort 1) are some of the names that have been used to describe fiction narrative with alternative storylines, while the expressions *Interactive Narratives* or *Hypernarratives* designate nonfiction interactive narratives. Since the advent of digital supports, these terms reflect the intersection between hypertext (Nelson; Landow) and narrative: hypertext fiction. Yet, IF was born before the digital era. Most research on IDN points to Jorge Luis Borges's short story "El Jardín de los senderos que se bifurcan" (472) as the seed of interactive narratives, with its idea of multiple futures, forking paths in time, possibilities that give rise to other possibilities, and possibilities that converge in one particular time.

In general, interactive narratives never had "an operable business model, nor a significant cultural apparatus" (Rettberg 174). Nevertheless, IF established itself as a narrative method and continued to migrate to new digital platforms with new human computer interfaces. We contend that IF *is* a theoretical and technical basis for the creation of intricate and complex narratives, a great authorial tool for the creation of meaningful interactive digital experiences, hence providing a meaningful background for the development of IFcVR. This is how IF also broke through to a format that seemed to be far from novels and books: videogames, which usually unfold in the framework of a storyworld, even though they do not obey classic narrative mechanisms but rather need to comply with game rules.

In the realm of cinema, the idea of creating an interactive film experience hybridizing it with other analog media and art forms is old as cinema itself, and not

a fashion that came along in the digital age. One experiment, however, defined the Interactive Film: *Kinoautomat*, created by Raduz Cincera in 1967, in Czechoslovakia, and presented at the Expo 67 in Montreal. Kinoautomat was designed to exhibit 35mm films with numerous narrative pathways in which the audience voted, from among several alternatives, which path to take. This voting system "brought a novel democratic aspect to the cinematic experience" (Hales 143). Cincera's Kinoautomat, however, was not intended to be an on-screen interactive film but a movie theater for interactive films, a "system designed to function with any non-linear film that had been created correctly for it" (Hales 153). One major difference, therefore, marks out IFcVR from Kinoautomat: the individual experience. In Kinoautomat, as in cinema, spectators were "together alone" (Huhtamo 175) in a physical space where they voted the alternatives and afterwards watched a sequence that perhaps they did not vote for. In new media, on the other hand, the users' decision-making, or even just "clicking activity", is an individual process leading to an individualized narrative.

With the massification of the personal computer and afterwards with internet access, along with the constant evolution of the digital audiovisual supports, a new format emerged: The Interactive Video (IV). The IV proposes browser-based experiences whose backbone is video or other audiovisual content. Two genres in particular have had a humble success among web surfers, the Interactive Music Video, music video-clips made interactive, and the Webdoc, the interactive documentary genre. In both cases, the hyper-reading dynamic prevails over the "watching-a-video" feeling, decreasing the relevance of the audiovisual content and maximizing that of navigation. New frontiers of Interactive Cinema are moving towards the *Enactive Cinema* (Tikka), in which interactors' biofeedback and brain activity change the course of the story. In this way, the final output of the non-linear film is perceived by the interactors as being linear, which validates the filmic experience but removes the conscious decision-making process during the experience. While viewers are immersed in the film's narrative, a system called Eisensteinian Montage Machine tracks their unconscious emotional and bodily responses and modifies the film based on these changes.

The Interactive Film is a content, an autonomous interactive narrative text, independent of its reproduction support, whether it is an interactive cinema with a democratic voting system, a video installation connected to brain sensors, a DVD or a webpage, and it can present a fiction story, a documentary, a mockumentary, or an experimental film. The differences between interactive film media (interactive cinema, interactive video, enactive cinema, etc.) seem to be rooted in the kind of interactivity that is required from the interactors. This could be a collective experience in a physical space or an individual experience entered through a desktop computer or an HMD. The interactors' input could be conscious, stimulating cognitive participation and active role during the filmic experience, or the storyline could vary based on physiological data without involving interactors' decisions. On the other hand, all

interactive film media gave two things in common: (1) they separate the film, as narrative entity, from the single outputs and from one-time readings, and (2) they involve interactors' thoughts and/or emotions in the filmic discourse.

It is relevant to point out that IFcVR differs from narrative VR videogames in two major aspects: the role of narrative and the extent of the user's involvement. This issue has been widely debated in the past couple of decades and is often mentioned as the "Narratology vs. Ludology debate" (Koenitz "Narrative in Video Games" 2), yet without ever reaching an ultimate differentiation. This issue is made more complex by the fact that the term "narrative" is often used in improper way, to simply mean discourse or report, and many environments are called "game" even though they should more precisely be considered narrative or explorative (learning) environments (Dettori and Paiva 55) because they mainly let the user discover facts or places by exploration and lack the challenge that constitutes the main characteristic of games of any kind. In videogames, narrative is often used only as a background to justify the user's actions, whose aim is always to achieve some goal rather than to develop a "real" story (i.e., consistent and meaningful). In IFcVR, on the other hand, narrative is its very reason of being and the key focus of the user's experience; interactions have the aim to foster the user's immersion in the story, rather than to achieve a goal. While a game writer is always communicating with the player -by offering narrative context, passing on game information regarding goals and missions, or tutoring the player on the game rules and mechanics (Bateman 85) - the communication between filmmaker and spectator moves in other terms: in IFcVR, narration does not pass information but generates experience. "Film narration only needs to provoke experience to communicate" (Carmona 7). Although the reception of the IFcVR implies a cVR aesthetics, a non-linear narrative structure offers the possibility of counteracting the limited interactivity of the cinematic interface. In IFcVR, interactors' interest is stimulated towards the *continuation desire* (Schoenau-Fog 388), the wish to carry on or repeat the experience to look for missed details or to discover different endings.

3. Living the Film: Creative Challenges

Each kind of text requires its own mechanism of transmission; the creation process becomes a kind of struggle between what the author wants to express and the materiality that will support and transmit it. The creation of interactive experiences challenges both authors and receivers. This challenge implies, first of all, knowing the materiality and the different functionalities of the object-medium that will instantiate the experience during use. It is emblematic that the distorting power of a medium is considered neutralizable by an intellectual mastery the properties of the medium so that it becomes effectively transparent through an exercise of reason (Crary 66-67).

From a narrative point of view, the convergence between story and interactivity leads to the "narrative paradox": the higher the level of interactivity, the less control the author has upon the story unfolding. According to Aylett and Louchart: "[T]he

contradiction between authorship and participation is an important element of the mentioned narrative paradox. On one side, an author seeks control over the narrative in order to give it a satisfying structure. On the other side, a participating interactor demands autonomy to act and react without explicit authorial constraints" (2). Marie-Laure Ryan points out that "the major obstacle to the development of truly interactive narratives is not technological but logical and artistic. How can user's freedom be reconciled with the need to produce a well formed, aesthetically satisfactory story?" (Narrative as Virtual Reality 2 48). Throughout IDN history (Koenitz *et al*., "Interactive digital narrative" 11), the issue of *narrative vs. interactivity* keeps re-emerging, from mainly two points of view: (1) level of authorial control vs. level of user agency and (2) narrative coherence and engagement vs. level of interactivity. This entails addressing some recurring questions: how to create an engaging and coherent interactive story? How to achieve that feeling which maintains our attention and emotion throughout the story? In this respect, the keyword is *engagement*. Novels, films, theater shows, TV series and oral storytelling achieve this challenge by stimulating the receiver's need to know what happens next. Genre patterns and structural divisions are used.

The implementation of a narrative structure, such as Syd Field's paradigm for dramatic structure of classic Hollywood movies[3], responds to the authorial need of "narrating" or "showing" the storyworld (21). During the discoursivization process undertaken by interactors, they will expect something to happen: conflict. For Brooks and Warren (65), conflict is what links plot to characters, but as Iser (172) remarks, the immersion is not accomplished by the mere presentation of the conflict. This immersion, however, includes the multiple solutions that the text can imply, thus "the more explicit the text, the less involved the interactors will be, leading them to the feeling of anticlimax" (Reyes "Interactive Fiction in Virtual Reality " 46). This concatenation of conflicts creates a dramatic progression in time. During the time in which interactors live the storyworld, there is hope or desire to reach a peak moment in which they find the message, live a strong emotion, or discover the truth. The arrival at a climax, or a narrative (experiential) discovery, is a reward for the interactors after taking the decision to access the proposed storyworld. The debate, beyond the underlying temporary structure, falls back on having a narrative climax or not. This opens up different concerns: Why not talk about multiple climaxes? Or even, is it necessary to reach a climax at all?

Regarding the interactive immersive film as an IDN, the challenge is to create interesting interactive stories that take interactors into a narrative experience leading to enjoyment, transformation and satisfaction, without discarding the concept of climax, but embracing and multiplying it according to the number of possible paths, scenes or narrative nodes that the predefined structure engages. Today, most IDN prototypes and experiences are based on a fixed structure of predetermined hyperlinks, a structure that can be limited in terms of user agency while we move towards a "constructive hypertext" that "aspires to its own reshaping" (Joyce

quoted in Koenitz *et al*. "Interactive digital narrative" 93). In Interactive Films, the predetermined hyperlinked mind map is the most common structure, if not the only one, since the costs of production of each audiovisual node are higher than those of other media. The same happens in IFcVR.

However, what may seem a disadvantage can actually become a potential benefit. Since IFcVR is based on an interactive fiction structure with prerecorded narrative units, the creator effectively has a higher control over the narrative text. The variety of navigation outputs relies on two features: (1) the richness of auditory and visual inputs within each scene-space, and (2) the multiplicity of links between nodes. In IFcVR, the fictional pact implies the fruition of a cinematic experience (with a limited amount of personal activity), rather than the extensive activity (with a looser narrative) granted by games. This characteristic determines the position of the creator towards an experience that finally seeks a linear and fluid output, and frees her from proposing an experience in which interactors assume a player role. The success of the final linear output, like in a film, depends on the coherence between all the details and events, so that, at the end of the experience, interactors can draw conclusions from a unified whole. Interactivity cannot yet, for the most part, be created in exactly the same way in games and in hypernarrative films, because the former bring users' action to the fore while the latter relies on the evolution of a consistent and meaningful storyline. Divergences from coherent storylines result in unsatisfactory stories, just as playing restrictions result in unsatisfactory games (Ben-Shaul 55). Assembling a coherent story that can take different paths is a hard creative work. There are, however, interactive structures that facilitate this task and support the narrative coherence.

4. Case Study: *Zena*, an Interactive VR Film

In order to put into practice the above theoretical background and investigate the possibility to create a satisfactory example of IFcVR, as well as to test if such hybrid medium could be able of transmit different types of messages and enable entertaining and meaningful experiences, we designed, implemented and evaluated *Zena*, an interactive VR film. With a length of 18 minutes for the longest path and 8 minutes for the shortest, *Zena* has a longer length than traditional VR films. This is an attempt to create an experience that could be perceived as a film despite the presence of several moments of interaction. The prototype was shot in 4K 360° video, with stereo audio[4] and hotspots which are activated by head-tracking gaze.

The film narrates the story of Lorenzo, a young apprentice of alchemy and member of the *Knights of Saturn* congregation, living in Genoa in 1517, who is asked by his master to travel to the future to save a magic clepsydra on which the safety of their congregation depends. Accepting this request, Lorenzo finds himself in the present time in the historical center of Genoa, and must find the clepsydra by collecting information from a variety of characters, whom he must decide whether

to trust or not to trust. Following one advice or the other, as well as going through an alley or the other, represent the possibilities of choice for the interactor; these are made accessible through icons superimposed over the scenes during the film post-production, and can be selected through head movements by the user. The film has four possible endings (two positive − the clepsydra is recovered − and two negative − the clepsydra ends in the wrong hands) whose access depends on the combination of all choices made by the interactors during the experience.

The main objective of *Zena* is to bring an interactive narrative in a cVR environment to be enjoyed with a HMD, in order to create an Interactive VR experience in which interactors rearrange story fragments into different configurations, placing themselves at a middle point between the passive reception of cinema and the highly active role of videogames. *Zena*, which means Genoa in Genovese dialect, was shot on location in the historical center of Genoa, the perfect place for developing a cVR project: the high buildings invite the visitors to always look up to discover an ancient fresco, or to say hello to someone who hangs laundry out of a window. In *Zena*, interactors have an active role inside the narrative by deciding, at some pre-planned points, which way to go in a maze-like structure (Ryan *Narrative as Virtual Reality 2* 171), or to access extra information that contributes to the story understanding.

The interactive screenplay contemplated a screenwriting framework for the creation of interactive immersive films, in order to support the design of an interactive narrative that is consistent independently of the user's journey within the storyworld, with a plot that leads to a dramatic climax, so as the audiovisual experience can be received by the viewer as a fluent and coherent story (Reyes "Screenwriting Framework" 92). A careful documentation of the shooting was undertaken in order to keep a record of production workflow, focusing the study on the similarities and differences between the cinematic shooting workflow and the shooting of an immersive and interactive film (Reyes and Zampolli "Shooting and Interactive VR Film" 93).

Zena was tested on a total of 60 participants (66.7% of which were female), in the age range 12–64 years old (M/average = 30.46, SD/standard deviation = 15.02), one user at a time, in three different sessions organized by groups: G1 = 24 middle and high school students, to check IFcVR reception by people more familiar with video games than with films of any kind; G2 = 19 adults non-residents in Genoa, to check the level of immersion of people not familiar with the physical space where the film's action takes place; G3 = 17 videomakers and/or researchers, to collect the point of view of people with knowledge in cinematic language, VR development and new media applications. These three groups have comparable size, even though not exactly the same one. During the tests, the experience was played through a Samsung Gear HMD, in field sessions: at a school classroom, at the living room of a house, and at an office. We did not want to make people feel that VR is something that only belongs to laboratories, but rather make them feel that it can be used anywhere, as

long as there is someone taking care of the person using the HMD or that at least the use takes place in a controlled and safe environment.

Due to its interactive nature, the evaluation approaches currently used for any single component of IFcVR are obviously inadequate for the evaluation of the whole, while their joint application is cumbersome and fails to grasp the peculiarities of the synergy. Therefore, we worked out an evaluation methodology apt to test if an IFcVR can be received as an engaging immersive film experience (Reyes "Measuring User Experience" 295). This is an important step to carry out in order to establish IFcVR as a viable and effective new medium, because a positive assessment would stimulate and guide the creation of numerous and interesting products of this kind. The evaluation procedure worked out is divided into two moments: a *During-the-Experience* phase, focused on observing the interactor's movements during the experience and recording their possible utterances; and an *After-the-Experience* phase, geared towards collecting each of the users' final comments by means of a questionnaire and a semi-structured interview.

In order to give more meaning to the *During-the-Experience* observation phase, the experimenter (the first author of this article) made use of a mirroring software allowing her to follow on a computer screen which point of *Zena* the interactor was experiencing at any moment, so as to associate movements and comments to the correspondent narrative unit or decision point. An observation grid was created, to collect such data in a homogeneous way for all interactors. As concerns the *After-the-Experience* phase, the questionnaire included 12 questions on demographic and background data, plus 61 appreciation questions (57 to be answered on a 1-5 scale plus 4 open comments), related to 5 areas: *Agency* (usability, effectance, and agency), *Perceptive Immersion* (flow, presence, cVE realism), *Narrative Immersion* (curiosity, music, voice-over, role identification, story participation, visual exploration of space), *Transformation* (enjoyment, affect, perception of the artifact as a film or as a video game, desire to repeat the experience), and *Physical Discomfort* (general discomfort, visual discomfort, nausea). The semi-structured interviews (lasting about 5 minutes each) consisted of a short dialogue in which users were invited to retrospectively share their thoughts and feelings about the experience.

During-the-Experience Outcomes

The System Mirroring: First the Story, then the Space

All participants were moving, in different ways and extents, while watching *Zena*. Confronting the system mirroring with the participants' body movements, we could detect some behaviors related with how the immersive storytelling was approached. In the first place, the majority of the participants looked for the protagonist every time they found themselves in a new space, and only after this character was spotted did they feel free to visually explore the space and the elements around. We could notice from all the participants' body movements that they were following the

characters' movements and actions, especially in those scenes that were designed to make them turn around to follow the characters or to find the hotspots. This suggests role identification, curiosity and suspense, all of which contribute to a high level of narrative immersion. Interactors wanted to know what was going to happen to the characters, how the story was going to unfold. Based on this insight, we suggest that IFcVR creators need to work out a reliable story and organize the space around it, rather than adapting the story to the chosen space, even though space has a central role in 360° VR.

Body Movements: Interactors are Present

Observing how interactors move in physical space, while their minds actually are in the virtual space, gives us precious information about their level of immersion. Users actually disconnect their cognition from the real space, and the more time they spend in the cVE the more comfortable they feel exploring the virtual space. A characterizing feature of cVE, which differentiates if from computer-generated VE, is that it actually looks like reality (being recorded in a real place), even though the users quickly realize that they can only visually explore it all around, but they cannot interact with the VE any further, touching objects or people.

Some participants moved around in the room, others simulated walking during scenes in which the camera moved (in order to avoid nausea), others tried to touch characters and objects during the experience; some also tried to get closer to certain objects they wanted to see in greater detail. Participants who tried to touch the VE or to change position in space were shown experiencing a higher level of VE realism; some even reported smelling the sea or the streets. The locations that looked most real were reported to be the favorite ones.

The bodily activity of the participants was generally increased at the decision-making moments, because interaction icons had been positioned in different ways in the various scenes, so as to force the interactors to look around for them. However, participants who reported to be mainly focused on the narrative events, rather than on exploring the space, were often late in making decisions, considering the visual exploration of space a distraction from the narrative. On the other hand, those who privileged the overall space instead of concentrating on the story were more bodily active, spotted the hotspots easily and made their decisions faster.

When designing VR experiences in general, we must remember that interactors are aware of being about to enter a different reality. During the user evaluation of *Zena*, two participants took the HMD off. One of them (from G1) was afraid and refused to continue the experience; the other (from G3) needed some time to accept being isolated from reality with the HMD, after which he was able to restart the experience. This is a relevant aspect that IFcVR creators should remember to take into consideration.

Thinking-aloud: Living the Film

Expressing out loud one's thoughts during the experience was encouraged but not requested. Taking a record of such comments provided some insights about the participants' narrative immersion. Most of them expressed their feelings or thoughts about the experience by using the verb *To Be* in the present tense to indicate where they were, whom they were with or to declare their choices (e.g. "I am at the tower" "I am Lorenzo!" "I am going this way"). Likewise, they always commented on situations using the first person as if they were taking part in them (e.g. "I don't trust the Master"). However, each group had different thoughts when talking during the experience, and those thoughts were in line with their ages and expertise with videogames, VR or films. Participants from G1 (middle and high school students) expressed their feelings regarding the story. They talked to characters giving them suggestions, or they spoke loud to themselves about the choices available. G2 participants (non-resident adults) shared comments about the novelty of the VR experience and the places in Genoa they were already familiar with. They were trying to recognize the streets and squares of the city. G3 participants (videomakers and researchers) shared thoughts about the quality of the audiovisual experience (e.g.: "I can feel the different heights of the camera," "the cuts between scenes are practically imperceptible") and about the system usability by asking questions about the technical development of the experience (e.g. "How did you do this?" "This camera position/movement works").

After-the-Experience Outcomes

We now summarize the outcomes of the questionnaires and interviews, divided in the 5 areas of interest.

Agency. Most participants felt that the interactive system was intuitive and easy to use. Regarding effectance, participants felt that their choices were actually modifying the story, even though they did not feel fully autonomous during the experience.

Perceptual Immersion. This category takes into consideration the factors supporting a sense of presence within the cVE. The high values obtained for both aspects confirm that cinematic VR can indeed generate a good level of presence. Flow shows a slightly higher level, which is interesting because *Zena* experiments with a large variety of camera positions, transitions, points of view, and spaces. The fact that participants felt that the audiovisual content flowed naturally motivates further audiovisual experimentation with 360º video and spatial audio. It is interesting to see how each group was immersed in the IFcVR experience, at the perceptive or at the narrative level, or at both levels. In many categories, especially those related to the Perceptive Immersion, there are no significant differences among the groups, nevertheless we can learn something from these slight differences. Regarding Flow, G2 (non-resident adults) felt a higher level of fluency and logic continuity between scenes, while the feeling of

Presence was perceived by all the groups at almost the same level, except for G3 users who showed a lower level of sense of presence. The realism of the cVE shows greater skepticism on the part of the G3 (videomakers and researchers) who are less prone to the suspension of disbelief, having more experience with VR and videomaking.

Narrative Immersion. This category shows data regarding narrative elements and the role they played during the experience. The lower level was Story Participation, which regards how much the participants felt they were taking part in the story. We think that the low score obtained by this aspect is consistent with the type of interactivity limited to choice selection and medium that we selected, and should therefore not be considered negatively. cVE is not modifiable as CGVE; at the same time, interacting only with the head to choose between a range of options does not represent a real participation in the event that is unfolding in each scene. Curiosity and Role Identification reached a fair score, while items as Voice-Over and Music showed to have a determining role in enhancing the narrative immersion. This suggests that VR is an effective medium for visualizing oral stories and sound landscapes, and that voice-over and music are powerful instruments for audiovisual storytelling. The highest score in this respect was obtained by the Visual Exploration of Spaces. Within this category, we wanted to know the level of curiosity of the participants in exploring the spaces, if the film allowed them enough time to do so, and wished to find out if the choice of the locations contributed to the narrative immersion.

An interesting result emerges from comparing the answers to the open questions "What was your favorite scene?" and "What was your favorite place and why?" Generally speaking, the favorite scene matched with the favorite place, and the preference was due to the level of presence that the users felt in those places, the particularities of the spaces, and also the narrative events that took place in them.

The Narrative Immersion category shows major variations between groups. Regarding the curiosity micro-category, it is possible to notice a lower level of curiosity from G1, while G3 was more involved in discovering what would happen next. The musical and the voice-over components do not present major differences, even though there was a greater appreciation on the part of videomakers on each category. Role Identification, instead, reveals the greatest difference between G1 and G3. Young participants (the students) identified highly with Lorenzo, choosing him as their favorite character; on the contrary, videomakers and researchers, with an average age of 45, did not feel so involved with the adventures of our hero. The curiosity of this group was more directed towards discovering the other characters and spaces than with feeling empathy with the avatar character. The same reading can be made about the level of participation in the story: younger people were more connected with the adventure.

The Visual Exploration of the Space was considered a relevant aspect in this study, in order to investigate the relationship between space and narration in cVR. The data collected suggests that it is important to connect the narrative event with

its location. All groups have shown high levels of interest in visually exploring the space, but G2 (non-resident adults), were the most impressed by the spaces where the scenes are located, most likely because these people had visited the city only rarely and superficially, hence going around in the cVE stimulated their curiosity, being a good opportunity for them to visit Genoa's old center. This group also showed high and constant levels of flow, presence, realism of the cVR, role identification and story participation. These values suggest that the visual exploration of spaces does not interfere with following the narrative development but rather enriches the narrative experience with a further element of interest.

Transformation. This category contains four micro-categories; Enjoyment, Affect, Continuation Desire and Videogame vs. Film Feeling. While Enjoyment received high scores, the feeling of having been affected by the experience is lower. We think this feeling is closely related to the fact that *Zena* is a fantasy story, most likely unrelated to the interactors' life experience.

Regarding the desire to continue using the film, 58% of the participants wished the experience to continue. This is a meaningful result if we consider that *Zena* is long in comparison with usual VR and cVR experiences. Interestingly, 15% of the participants restarted the experience immediately after it was over, so as to explore other possible narrative paths.

In this category, three questions were included to check if using the artefact raised the impression of watching a film or playing a video game. The results show a close balance between both feelings: 56.3% for film, 43.7% for playing a video game. A detailed view on how each group perceived the experience shows interesting results. The youngest group (G1) did not reveal such a big difference between the two possibilities, despite their large familiarity with playing video games. G2 shows a slightly higher perception of *Zena* as a filmic experience. The most interesting result is shown by G3 (filmmakers and researchers), who claimed without any doubt that IFcVR was, above all, a filmic experience, even though recognizing the presence of a game-like component.

5. Conclusions

We have presented an evolutionary point of view on *Interactive Fiction in Cinematic Virtual Reality*, a narrative and media hybridization which could be consolidated, in a not distant future, as a major audiovisual genre of VR narratives. By reducing the contrast between the perceptive immersion felt through the use of an HMD and the slight or missing level of agency in linear cVR experiences, the IFcVR offers interactors a higher level of interaction with the VE, leveraging on narrative to empower the interactors and make them influence the narrative development, thus giving them a feeling of creating their own unique journey. Throughout this theoretical path, we pointed out how the panoramic vision evolved into VR, a medium that locates the human perception at the center of the (story)world.

Our IFcVR idea was put into practice through the production of the prototype film *Zena*, which was then submitted to user evaluation, through an approach worked out to capture the peculiarities of this media hybridization. Results from the evaluation of *Zena* show that it was deemed very pleasant and perceived as the narration of a story; the interactors were keen to follow the characters' adventures; even when they were exploring the space, they were constantly building relationships between space and scene. The virtual environment was thought to have a high degree of realism, generating a feeling of presence; the availability of selection points was appreciated for giving the interactors decisional power, even if not a complete control on the story development.

The outcome of this study shows that IFcVR is worth further investigation. Not only is it a conceptualization rooted in a consistent theoretical background, but its implementation is possible, and it can lead to the production of sound and enjoyable interactive immersive films that represent a new genre for cVR experiences. The IFcVR could become one of the future star contents of VR, as a worthwhile approach to the creation of immersive film experiences. For this reason, we think that IFcVR could represent for VR what the feature film has been for cinema: it can foster further development and support its dissemination among a broader public, oriented towards entertainment as well as art creation.

End Notes

1. The Panorama (initially called *La nature a coup d'oeil)* was a spherical landscape painting in which the viewer was placed at the center of space and could walk while observing the paintings around him. It was patented in 1787 by Robert Barker (Oettermann and Schneider 40).
2. In Cinematic VR jargon, traditional videos are called "Flatties." This term was coined by Google VR artist and theorist Jessica Brillhart https://vimeo.com/jessicabrillhart. Accessed 12 Nov. 2019.
3. This consists in a 3-act structure: a Setup with an inciting event, a central stage with the Conflict development, and finally a third stage with the conflict Climax and subsequent Resolution.
4. Questions regarding spatial audio were not included in our research assessment.

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