Aigars Ceplītis

RHIZOMATIC NARRATOLOGY IN 360° STEREOSCOPIC SPHERICAL CINEMA

Summary of the Doctoral Thesis

RIGA TECHNICAL UNIVERSITY

Liepāja Academy
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DECLARATION OF ACADEMIC INTEGRITY

I hereby declare that the Doctoral Thesis submitted for review to Riga Technical University for the promotion to the scientific degree of Doctor of Science (Ph. D.) is my own. I confirm that this Doctoral Thesis has not been submitted to any other university for the promotion to a scientific degree.

Aigars Ceplītis ……………………………. (signature)
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The Doctoral Thesis has been written in English. It consists of 7 chapters, 80 figures, 30 tables, and 12 appendices; the total number of pages is 233, not including appendices. The Bibliography contains 337 titles.

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ANNOTATION

The entertainment industry's digital technology advancements have brought about the era of cinematic virtual reality (cVR), showcasing its ever-increasing complexity and diversity. With the presence of technological innovations such as Insta360 Titan, OZO, Jaunt, and KanDao Obsidian Pro, the capture and display of 360° ultra-high-definition video that aims to offer an immersive physical and visual experience on both big screens and portable devices is gradually becoming accessible to the everyday consumer. Notwithstanding the advancements, the current 360° stereoscopic spherical cinema (**3DSC**) filmmaking still parrots the narrative and aesthetic schemas of flat 2D films, and, in doing so, it binds the medium into an inelegant representation, unfit for the new digital setting. Because 360° film production inevitably gravitates towards the breakdown of authoritarian structures, it produces a novel narrative and visual regime that departs from classic spectatorship and moves towards an **episodic neuro-visceral immersion** (ENVI), where, as warranted by XR technologies, its residual, **platial experientiality**, is best served when a narratological approach is applied. This Thesis, therefore, undertakes comprehensive and rigorous research at the intersection of narratology and immersive technologies, as it aims to push the boundaries of both fields beyond what has been characterized as "emerging vectors of narratology" to form a specialized sub-field of narrative studies focused on Cinematic VR. The overarching goal is to propose a 3DSC narratological typology that can aid both industry professionals and academics in developing effective stereoscopic immersive narratives not contingent on specific VR technology. Additionally, the typology is tested within **rhizomatic space** to substantiate whether the communal template of spectatorship provides a foundation upon which social, aesthetic, political, and human interactive models can be built and whether the cVR format itself encapsulates rhizomatic qualities inherent to the medium of 360° film.

CHAPTER ONE: RATIONALE OF RESEARCH

1.1. Objectives of the Research

1.1.1. Actuality of the Topic

In 1947, Sergei Eisenstein an iconic film director and a pioneering force in film editing and cinematic grammar, was asked about his reflections on stereoscopic cinema to which he gave both a contemplative and prophetic response: "Asking this question I think is as senseless as asking me if I believe that two comes after one or that snow melts in spring or that trees are green in summer and apples ripen in autumn. It is as naive to doubt that stereoscopic film is the future of cinema as it is to doubt that tomorrow will come" (Eisenstein, 2004, p. 77). The journey towards the realization of Eisenstein's vision has been long, with stereoscopic cinema experiencing cycles of popularity and decline, only to be revitalized by two seemingly distinct yet interrelated developments: virtual reality (VR) and 3D cinema. While 3D cinema has seen a resurgence due to reduced costs and standardized formats such as dual-digital single-strip 35 mm and DCI-compliant digital projection, its popularity has waned, even though the film industry insists that stereoscopic film is not the thing of the past but the future standard in 4D movie theaters (Jones, 2020). Meanwhile, the temporary decline in 3D films can be partly attributed to the rise of 360° spherical video, often called cinematic VR (cVR) (Williams, 2021), which immerses viewers in a photorealistic environment where they feel as if they are inside the movie, interacting with other characters (Wohl, 2017, pp. 12–14).

The collapse of physical and psychological barriers between viewer and narrative is even more significant in 2024, with technological advances in VR across various fields – education, entertainment, medicine, and more – offering enhanced image quality and performance (Zaralli, 2024, pp. 37–38). Although the initial hype of 2016 has plateaued, cVR is poised for substantial growth with innovations like the Meta Quest Pro 4 (Heaney, 2024) and 18K-resolution cinematic cameras, driving the entertainment industry forward (Orrall, 2024). Not only is the cross-disciplinary usage of VR increasing (Li et al., 2022; Uskali et al., 2020, p. 22; Amrhein, 2022), cVR is still viewed as the next logical step in cinema's evolution, as Nick Kraakman predicted years ago (Kraakman, 2018).

Notwithstanding the advances in immersive technologies, the debate on whether 360° video constitutes a true VR experience is ongoing. Some argue that VR must be rendered in real-time and must exhibit interactive features (Cone, 2015), while others assert that cVR meets crucial VR criteria through its pre-rendered content and passive interactivity. This loss of interactivity is seen by some as beneficial, as the audience is often a poor storyteller (Jones, 2015), and there is an expectation that the audience should not fully interact with characters (Moody, 2017, p. 44). But even the best computer-generated stories are limited by what they can deliver since their VR-capable graphics do not provide the photorealism of the ultra-high resolution that 360° 3D video cameras present (Bowditch & Williams, 2021, p. 81; Gerhard & Norton, 2023). Moreover, 360° content disrupts traditional cinematic storytelling (Vosmeer et al., 2017,

p. 231), with no standardized screen grammar for VR content creation (Kelling et al., 2020, p. 123; Kostyk et al., 2022, p. 213; Cannavò et al., 2023, p. 2). The desired features for a compelling VR experience remain elusive (Doerner et al., 2022, p. 11), with limited storylines and no agreed-upon narrative structure (Bowditch & Williams, 2021, p. 82; Fisher et al., 2022, p. 673).

Historically, it took decades to establish the first rules of screen grammar, beginning with Louis Lumière's *Employees Leaving the Lumière Factory* (1895) and Sergei Eisenstein's *Battleship Potemkin* (1925). A similar time frame might be expected to establish a universally accepted 360° film narrative grammar. Palmer Luckey, Oculus VR founder, for instance, noted in 2016 that VR storytelling would take decades to refine, a statement still relevant in 2024 as research into cVR remains in its infancy (Jones, 2019, p. 323; Cannavò et al., 2023, p. 1), and long-form narratives are still experimental (Moody, 2017, p. 43; Damas & de Gracia, 2022, pp. 342–343; Fisher et al., 2022, p. 673). Furthermore, any attempts to create longer cVR stories often reveal narrative and technical challenges, compounded by physical discomfort from prolonged HMD use, which can lead to negative health effects (Stanney et al., 2021; Stadler & Chardonnet, 2024, p. 15).

Editing in cVR is another significant barrier. Traditional editing techniques are often incompatible with cVR's narrative structures (Ceplitis, 2016; Wohl, 2017, p. 18; Dooley, 2017, p. 165; Cao et al., 2019; Ryan, 2022), building tension between interactivity and dramatic structure. Some creators believe that guiding the viewer's focus through spatialized sound, choreography, and lighting cues can enrich the narrative, seeing VR as an extension of traditional cinema (Wohl, 2017, p. 18). However, this view is debated, as not all games rely on narrative experiences (Zhang, 2021, p. 371), and narration in cVR often conflicts with immersive psychological states (Bekhta, 2017, pp. 105–107; Ryan, 2018, p. 94; Riggs, 2019, p. 88; Deck, 2019). This conflict may be inherent in human neural circuitry (Rey & Alcaniz, 2011; Gamez-Djokic et al., 2015; Riva et al., 2019, p. 88; Akbal, 2023, p. 110), a challenge that cVR is only beginning to address (Jones & Osborne, 2022; Coutinho, 2022, p. 6).

1.1.2. Object of the Study

This practice-led Thesis explores 360° stereoscopic spherical cinema (**3DSC**) and its narrative structures, focusing on how they influence **episodic neuro-visceral immersion** (**ENVI**). It is important to note that the term 3DSC is used correctly in a specific format in the Thesis and semantically does not duplicate. This distinction between 360° (viewing angle from a central point) and "spherical" (projection geometry) is fundamental in VR/360° video terminology. While 360° video captures omnidirectional views in azimuth, not all such media uses spherical projection, such as 6DOF systems and CAVE installations that may enable full 360° viewing angles without spherical geometry, demonstrating their conceptual separation in immersive technologies.

With respect to ENVI, the author of the Thesis considers 'episodic neuro-visceral immersion' to be a prolonged state of narrative engagement where cognitive, emotional, and physical states fuse to trigger a strong sense of spatial presence and experientiality rooted in

personal and self-other differentiation. While "visceral" refers to the instinctive sensory input flow of haptic-like feeling, "episodic" underscores the intermittent yet coherent essence of 3DSC viewing, where the audience engagement oscillates between intense states and less immersive ones due to prolonged VR exposure risks, such as cybersickness, necessitating breaks.

The core argument is that delivering a neuro-visceral immersion in 3DSC depends more on structured narrative codes than on technical enhancements by reducing the subjective distance between the viewer and the virtual space, creating a strong sense of presence. Since much of the current academic discourse in cinematic VR has been technology-driven, overlooking its narratological opportunities, this Thesis addresses these limitations, arguing that despite advancements like VR tracking devices and haptic feedback, these technologies do not guarantee an enjoyable immersive experience. Additionally, there are significant challenges in achieving effective immersive states, such as most head-mounted displays (HMDs) having a limited field of view (FoV) around 110°, although some offer larger FoVs, which require substantial computational resources and unnatural interactions (Stadler & Chardonnet, 2024, p. 14). Also, cybersickness remains a complex issue with no definitive solution, further hindering the sense of presence (Stadler & Chardonnet, 2024, p. 15).

1.1.3. Aim of the Research

The aim of the Thesis is to expand the boundaries of narratology into the realm of immersive technologies, beyond what is characterized as "emerging vectors of narratology" (Hansen et al., 2017) and "transmedial narratology" (Thon, 2016) in order to offer a subcategory in narratology designed exclusively for cinematic VR with a focus on stereoscopic spherical cinema. The key objective is to propose a 3DSC narratological typology that will aid professionals and academia alike in building effective stereoscopic 360° narratives that are not contingent on the VR technology used yet deliver an episodic neuro-visceral immersion.

1.1.4. Tasks of the Thesis

The tasks in support of the aims rely on an extensive review of both technical and theoretical literature on cVR and 3DSC, as well as audiovisual artifacts that serve as prototypes for rhizomatic spectatorship, redefining key concepts in 3DSC and narratology. These concepts include, but are not limited to, experientiality, narrative empathy, spatial immersion, multiperspectivity, focalization, voice, mentation, narrator, implied author, oscillation, sequentiality, narrativity, narrative levels, metalepsis, rhizome, narrative constitution, place, and time. Thus, the Thesis connects and extends narrative models by Gérard Genette, Seymour Chatman, Manfred Jahn, and Peter Verstraten, as well as "experientiality" concepts by Monika Fludernik, Marie-Laure Ryan, and David Caracciolo, alongside spatial theories by Eleanor Andrews, Richard Koeck, and Yi-fu Tuan to form a comprehensive 3DSC narrative system.

The trajectory of this approach questions the perfunctory and direct applications of cVR narrative design that focus too narrowly on technological aspects, as evidenced by existing

research (Nielsen et al., 2016, p. 229; Kjær et al., 2017, p. 1; Fisher et al., 2022, p. 673; Brade et al., 2023, p. 428) in which this dissertation sees as two fundamental challenges: the absence of a widely accepted film grammar for 360° spherical video and the complexities of VR post-production pipelines.

Despite these challenges, the potential for a breakthrough in cinematic VR, akin to the foundational work of Pudovkin and Griffith in film, is still plausible. As a solution and a crucial step in this direction, the Thesis presents a formal 3DSC narrative typology that may assist academia and film professionals alike in addressing structural gaps in cinematic VR. The backbone of the methodology used is Grounded Theory (GT), which has been employed to code and transform research data into unique narratological categories relevant to 3DSC. Additionally, the Thesis aims to characterize and demonstrate the **rhizomatic spectatorship** of 3DSC, which not only advances spectatorship models in rhizomatic spaces within evolving VR technologies but also significantly contributes to the field of narratology in the virtual domain.

1.1.5. Limitation of Related Work

The existing research generally falls into two main camps: those proposing a "uniform" cVR narrative grammar (Dooley, 2021; Reyes, 2023; Dooley, 2024) and those viewing it as a set of production techniques during 360° video post-production stage (Van der Burg et al., 2008; Damas & de Gracia, 2023; Morgan, 2025).

Some of the analyses of the related research overlap with the analyses of case studies given by Dooley and Munt (2024) who have documented the various methods in which immersive VR narratives are created, formulated, and scripted. While their approach gives a comprehensive overview of existing scholarship, highlighting the interdisciplinary nature of VR research and the diverse approaches, too much of its focus is on cinematic technologies, prototyping, and user testing, which does not fully capture the complexities and affordances of the cVR medium, particularly in terms of narratological processes and its effects on cognitive embodied experiences.

To the first group also belong such scholars as Afshin Nasrabadi, who proposes a narrative typology for 360º videos based on cinematic motion (Nasrabadi et al., 2019; Fisher et al., 2022), exploring scriptwriting for "Virtual Reality Interactive Digital Narratives" (IDN). Nasrabadi et al. (2019) provide a narrative classification based on viewing patterns, yet their findings do not definitively prove immersive viewer engagement, focusing more on technical approaches to narrative grammar.

Other scholars in this group include Kath Dooley, Maria Reyes, Sarah Jones, Laurent Lescop, Simone Arcagni, Julia Gutiérrez, Michael Vallance, and Paul Moody, whose research is situated at the intersection of philosophical approaches to immersive media and technology, historical surveys, and their subjective theoretical rhetoric. Moody (2017) critiques the notion that 360° films are incompatible with traditional narrative approaches, suggesting that the limitations of 360° film could become future conventions for VR, while Weaving (2024) explores the condition of narration in cVR, offering three unique narrative approaches based on the viewer's positioning: "invisible witness," "acknowledged witness," and "embodied

witness." Notwithstanding his interdisciplinary approach, he borrows quite a bit from film studies, theater, and psychology, which results in his research lacking empirical data as it relies heavily on theoretical analysis.

Similarly, the heavily cited and richly detailed book *Virtual Reality Narratives: Embodied Encounters in Space* (2024) by Kath Dooley is a revision of her previous work and focuses on the evolution of narrative-based virtual reality encounters through case studies, blending documentary, fiction, and video games. In her book, she uses game engine-driven VR experiences such as *We Live Here* (2020) or *Gumball Dreams* (2022), a one-hour-long psychedelic virtual experience, to illustrate how VR can immerse users in emotionally engaging and interactive storytelling by adopting avatars. However, her narratological take is very much monoscopic and cVR format-driven. While she acknowledges technological advancements, particularly with 6-DoF headsets like the Oculus Quest, Dooley's analysis does not fully explore how cVR risks stagnating by borrowing too heavily from cinematic conventions and relying too much on traditional film grammar, rooted in framing, editing, and the illusion of continuity. This overlooks important distinctions between cVR and 3DSC, which provides immersive experiences and effective immersive storytelling through enhanced presence without the need for Unity-based 3D modeling, which is, in part, the aim of this Thesis.

Likewise, Lescop (2017) and Reyes (2019) attempt to apply narratological frameworks to cVR, though both approaches are more theoretical than empirical. Lescop suggests that time in cVR is converted into space, but his work does not provide rigorous data to support this claim. Reyes builds on Chatman's (1980) narrative model, applying it to "Interactive Fiction in Cinematic Virtual Reality" (IFCVR). However, her use of Chatman's model is speculative and lacks grounding in practical prototypes, making her findings more conceptual than applicable.

Fisher et al. (2022) introduce the "System-Process-Product" (SPP) model to explore narrative complexities in IDN, identifying key differences between linear cVR and IDN. However, their insights remain largely conceptual, and the model does not adequately address the challenges of interactivity in cVR. Jones (2019) argues that cVR transcends traditional media, merging technology and narrative through simulation. Her analysis emphasizes the importance of presence and plausibility, though it offers little practical guidance for constructing cVR narratives. Vera and Gutiérrez (2023) propose a typology for audience engagement in cVR, offering roles such as the immobilized protagonist and the observing ghost. Their typology, while insightful, serves more as a basic screenwriting template than a comprehensive narratological framework.

As for the second group of scholars who focus on practical techniques in cVR production pipelines, directing viewer attention in cVR is explored by several studies. Kvisgaard et al. (2019) use a "frames to zones" technique to manipulate viewer focus, though their study's limitations call for further research. Mateer (2017) examines the applicability of traditional filmmaking techniques to cVR, even though he does not yield a formal cVR grammar. Nielsen et al. (2016) and Sheikh et al. (2016) investigate audio and visual cues for guiding attention, with fairly mixed results for practical everyday applications on the ground. Gödde et al. (2018) and Rothe and Hußmann (2018) propose frameworks for directing attention through cinematography and sound but do not address narrative immersion. Alves et al. (2023) make

strides toward a cVR narrative framework by remodeling existing screenwriting patterns, but their attempts remain incomplete and require further refinement for universal adoption. Finally, in *Storytelling for Spatial Computing and Mixed Reality* (2025), Rob Morgan proposes "embodied spatial narrativity" as a framework for augmented reality (AR) and mixed reality (MR) environments, rejecting linear narratives in favor of his "dual-axis augmentation theory," which combines metacognitive identity constructs (avatars and role internalization) with hybrid staging (real and virtual scenography). Since most of his research relates to production in AR, it overlooks the alternative storytelling techniques used in cVR, where viewers cannot physically alter pre-rendered 360° films yet still experience deep immersive states. Additionally, his book fails to adequately explore stereoscopic 3D's narrative potential in cVR as it lacks case studies of landmark 360° films, leaving gaps in its analysis of spatial augmentation in immersive media. Because the current research, as previously presented, tends to focus on the technical aspects of cVR, often at the expense of exploring the deeper narratological and cognitive dimensions, there is certainly an urgent need for more empirical studies and practical research to advance the field that makes cVR a unique storytelling medium. This is the point at which the dissertation becomes relevant.

1.1.6. Knowledge Gaps and Addressing Inadequacies in Related Work

What becomes apparent in all of the surveyed research is that it conflates the *narrative grammar* of cVR with the *cinematic grammar* used in the 360° video production pipelines.

The narrative grammar of film can be best understood as a complex multi-dimensional system where the three key dimensions in film narration (semantic (story world), syntactic (plot structure), and narratorial) (Bordwell, 1985) intersect with epistemological hierarchical boundaries in narrative structures (Branigan, 1992), Chatman's (1990) concepts of a "cinematic narrator" and an "implied author" that orchestrate the narratorial intentionality. This structural framework is also modulated by Genette's (1988) conception of "narrative mood", "distance", and "focalization" patterns, through the expansion of a narratological toolbox, chiefly the "filmic composition device" (FCD) (Jahn, 2021), the film's creative intelligence that structures narrative elements through recursive patterns across different scales of storytelling, as shaped by both geometric principles and technological evolution. While the film's narrative grammar, ontological and structural in essence, governs the story progression and narratorial control and strives to maintain story engagement without breaking immersion in a viewer-targeted medium, the cinematic grammar relies on visual syntax, shot composition, editing techniques, the 180-degree rule, visual silences, or the cVR specific applications with focus on creating presence through technical means. Notwithstanding the technical means that may help to enhance immersion and narrative engagement, they cannot be regarded as components of an effective immersive narrative.

In part, the root of the problem lies in the status quo of interactivity and its impact on immersive experiences. Marie-Laure Ryan (2022, p. 181), for instance, doubts the reconciliation of narrativity and interactivity is ever possible, asserting that VR's narrative potential rests on whether creators can exploit narrative effects to enhance the experience, such

as suspense or user-driven outcomes. Conversely, Moody (2017, p. 44) claims that the 360° film audience may even be satisfied with the lack of interactivity, though without providing any compelling evidence to his claims. What both scholars overlook, however, is how to use these restrictive features to enhance immersive experiences, regardless of interactivity. This is exactly what the Thesis proposes. Through an extensive narratological ecosystem, both in the production pipeline and final viewing platforms of 360° stereoscopic films, as well as by developing a narrative matrix for 3DSC that makes 360° stereoscopic films neuro-viscerally immersive, a prolonged sense of presence across various narrative configurations may be achieved. To this end, three research questions have been formulated.

1.1.7. Research Questions

1. Are there limits to the degree at which we can effectively assess *narrativity* in 360° stereoscopic spherical film (3DSC) against interactivity, and what are the most prevalent components of *narrative constitution* currently used?

2. Germane to the dominant narratological categories observed in 3DSC, how do they affect the narratorial functions of a *narratee* (i.e., the audience/viewer) who is geospatially placed at the "bull's eye" of 3DSC and exists on the intradiegetic plane only since the viewer is *never* external/outside the frame of cVR or 3DSC?

3. Which variables of the key typological categories in narrative constitution (implied author, space, narrative levels, metalepsis, focalization, etc.) are most effective in supporting an *episodic neuro-visceral immersion* for long durations and when deployed under a *rhizomatic* spatial configuration?

1.2. Rationale for Chosen Research Design and Methodology

The social sciences and humanities employ various research methods, with cVR being a powerful tool to explore experiences beyond the physical world, used both as a research object and a methodological tool (Jones & Osborne, 2022, pp. 4–5). Although narrative research as a methodological framework might seem appropriate to be used with its focus on individual stories or a phenomenological approach with its emphasis on shared experiences (Creswell & Poth, 2018), the grounded theory methodology is chosen because it extends beyond mere description to *generate a unified theory* for a process or a phenomenon lacking an existing theory. Since available literature models exist in cinematic VR, but they are incomplete or developed on different samples, grounded theory is more useful in explaining how people experience a phenomenon of immersive states in a cVR setting.

Urquhart (2012) argues that for grounded theory to generate new theory by focusing on audience interaction with the phenomenon, the residual data should come from fieldwork and interviews, analyzed through various coding stages until saturation is achieved. These traits

align well with research in the virtual reality domain, where a solid methodology is necessary to construct a *lingua franca* for 360° stereoscopic spherical cinema, resulting in a narrative typology for 3DSC. The grounded theory's constant comparative analysis and theoretical sampling are also fitting. Creswell and Poth (2018) describe this process as having inherent movement, with phases based on observations, audiovisual materials, and interviews, involving 20–60 participants, with data collection through repeated field visits. The research design's phasing categorizes the neuro-visceral immersion experience more objectively, using "initial (open) coding", "re-focused coding" (focused and axial), "theoretical coding", and "saturation", sorting narratological categories for cinematic VR usability and veracity. Data is further processed from transcribed interviews, notes, and memos and compared with post-interview questionnaires. Respondents complete the **Immersive Factor Questionnaire** (**IFQ**) and the **Immersion/Narratological Factors Questionnaire** (**INFQ**), based on studies by Brown and Cairns (2004), Jennett et al. (2008), and Witmer et al. (2006), using a Likert scale to assess the **immersive factor** (**IF**) for narratological concepts at each coding phase, with Cronbach's alpha reliability coefficients validating the survey. The preliminary 360° stereoscopic spherical film typology is refined in the final saturation coding stage, where "theory-generating experts" assess six original 3DSC prototypes for neuro-visceral immersive states using semi-structured interviews and "abductive reasoning", which includes "thematic analysis" and "deductive reasoning".

1.3. Scientific Novelty

The unique aspects of the Thesis can be summed up in the following:

- The Thesis puts forth a pioneering theory on the narrative processes of dramatic construction in 360° stereoscopic spherical cinema within the context of narratology. This theory delves into not only the narratological structures but also the ways in which they shape our perception and enhance the depth of neuro-visceral immersion.
- This Thesis outlines a structured set of narrative codes and narrative typology in 360° stereoscopic spherical environments.
- The Thesis is unique in its use of methodology, as the *constructivist grounded theory* (CGT) research method is used to produce and verify the topological categories within the framework of transmedial concepts where narratology acts as the backbone of the scientific domain in this approach.
- The Thesis is original in its formalizing of the ambisonic narrative processes in ambisonic sound design as a subset of *audionarratology.*
- The Thesis is a pioneer endeavor to advance narratology as a science into the sphere of immersive technologies.

1.4. Key Terms and Concepts

The Thesis uses the abbreviation "cVR" for cinematic VR to refer to monoscopic 360° video and spherical video in general, while "3DSC" denotes stereoscopic 360° video. Although widely adopted by both academics and professionals, the original titling of cVR is ambiguous. VR experts such as Chris Milk, Nonny la Peña, and Jessica Brillhart, who are recognized for pioneering 360° video production, insist that cVR encompasses a broad spectrum, from passive 360° videos to interactive narrative videos (MacQuarrie & Steed, 2017, p. 45). However, the Thesis aligns with Nick Kraakman's (2018) perspective, which defines cinematic VR as a high-quality immersive experience in 3D, ideally with ambisonic audio; without these elements, cVR in monoscopic form falls short of the immersive potential of VR. But not to muddy the distinction between the two, the term "3DSC" designates cVR in 3D mode, as its stereoscopic aspect results in a sense of "presence", specifically "spatial presence," which is a "psychosomatic response to the environment" (Vosmeer & Sandovar, 2018, p. 223) and is distinguished from "telepresence," a term originally linked to the user's psychological experience (Gutierrez et al., 2008, p. 3).

Initially, "presence" referred to experiences in natural settings, while "telepresence" described mediated virtual experiences. Over time, the distinction blurred, and "presence" began to encompass both (Valenzise et al., 2023, p. 5). Another key term in virtual reality discourse, besides "presence", is "immersion". Not only does it underpin the Thesis's theoretical framework, its central function also underscores the context of stereoscopic film production. "Immersion" refers to the cognitive experience of being absorbed in a story world (Ghazouani, 2017, p. 2). Slater and Wilbur (1997) describe immersion as a physical experience induced by technology, characterized by vividness, interactivity, and spatial audio (Dutta, 2024). While immersion pertains to the technology, presence is more about the user's internal psychological state (Stankovic, 2024, p. 46). Finally, in line with Eisenstein's projections of stereoscopic cinema (Eisenstein, 2004, p. 77), the future of cinematic VR lies exclusively in 3D, making "3DSC" the technological crux of the Thesis's research. It exhibits geospatial attributes that enhance virtual experiences, aligning more properly with the principles of psychophysical transportation into artificial spaces (Ceplitis, 2018) and the technical requirements of stereoscopic VR and spatial audio in support of immersive states.

Finally, it is useful to remember that original concepts or terms generated by the author of the Thesis initially are highlighted in bold, whereas words for semantic emphasis have been given in italics. The terms created by other authors are indicated in double quotation marks, while the single quotation marks are used for the Thesis author's terms that are repeated or set apart for better clarity.

CHAPTER TWO: THEORETICAL FOUNDATION IN THE CONTEXT OF 3DSC

Narratology, originating from Russian formalism and shaped by French structuralism in the 1960s (Herman, 2018, p. 338), provides a valuable framework for understanding the narrative structures that are increasingly relevant to new media, especially 360° stereoscopic spherical cinema (3DSC). At its core, narratology seeks "to understand how recurrent elements, themes, and patterns yield a set of universals that determine the make-up of a story" (Pradl, 1984, as cited in Spore & Harrison, 2002, p. 19). The implicit underpinning is "the logic, principles, and practices of narrative representation" (Meister, 2014, p. 623), which " holds that the world is not given to humans in pure form but is instead always mediated or *re*-presented" (Groden et al., 2012, p. 349). Hence, narratology becomes especially pertinent as it helps to decode the immersive narrative experience, where traditional storytelling mechanisms are transformed by new technological affordances.

The historical development of narratology charts four different periods of the discipline: the pre-structuralist stage, French structuralism of the 1960s, poststructuralist narratology of the 1980s and 1990s, and post-classical narratology of the 1990s and beyond (Meister, 2014, pp. 626–635). It is this post-classical era, with its focus on media beyond literature, that intersects most directly with the study of 360° stereoscopic film. It broadens the scope of storytelling to include interactive and immersive formats, drawing on theoretical frameworks like *contextualist narratology* (Chatman, 1990), *natural narratology* (Fludernik, 2002), *cognitive narratology* (Herman, 2009), and *affective narratology* (Hogan, 2011). Each of these frameworks provides insights into how the unique affordances of 3DSC – such as "spatial immersion", "interactivity", and sensory engagement – can be understood narratively. Because the choice of a particular narrative model often provides the core function of the medium where it is being used (Chatman, 1980, p. 197), the question remains whether one can and to what extent certain narrative models are applicable to cinematic VR. In this context, Chatman's theory of "story-space" and "discourse space" may be useful.

Chatman (1990, p. 15) posits that the space within the story, as experienced by the characters and audience, differs from the broader discourse space, which can include elements beyond the immediate frame, such as off-screen sounds and invisible spaces. This distinction is crucial for 360° cinema, where the viewer, who often acts as a "focalizer", has the freedom to explore both seen and unseen parts of the narrative environment, and his shift from passive observer to active participant mirrors this dynamic between story and discourse spaces, as the viewer must engage with both visible and invisible narrative elements to fully grasp the story. Besides Chatman, Monika Fludernik's (2002) "*natural" narratology* further enhances our understanding of 3DSC by emphasizing the importance of human experientiality in storytelling. In her view, narratives are constructed around human experience, and the immersive nature of 3DSC heightens this experiential focus. Even in the absence of a traditional plot, it can evoke strong emotional and cognitive engagement through its immersive environments (Fludernik, 2002, pp. 21–32).

Natural narratology is also the bedrock to understand the second-person perspective, where the audience is directly involved in the action: in 3DSC, viewers are not just watching a story unfold, they are placed within the story, experiencing it through a perspective that Fludernik identifies as essential to immersive narrativity (Ceplitis, 2018). This approach aligns perfectly with the technological possibilities of 3DSC, where the narratological theory intersects with immersive media.

Traditionally, in film, the narrator is either "overt" (explicitly telling the story) or "covert" (subtly guiding the audience through visual or auditory cues). However, in 360° cinema, the role of the narrator becomes more complex. While Chatman (1990) insists that narration must involve a narrator, whether human or not, scholars like Bordwell (1985) and Branigan (2013) argue that in film, the viewer plays a more active role in *re-constructing* the narrative, piecing together the story from the spatial and visual information provided, making the process far more participatory. Their argument is not entirely baseless, as it can be seen in Roland Barthes' influential essay, *The Death of the Author* (1967), where he challenges the traditional view of the author, shifting the focus of literary analysis towards the examination of discursive practices. By reducing the author to a "scriptor" – a figure devoid of transcendent authority and existing solely within the act of writing – Barthes (1977, pp. 145–147) reconfigures textual authority, arguing that meaning emerges not from authorial intent but through the reader's engagement (in Bordwell's (1985, p. 62) case, through the presupposition of a perceiver, but not any sender, of a message). While, as a formalist, he may reject Barthes' radical dismissal of authorship, Bordwell (1985, p. 62) nevertheless posits the filmic narrator as an "anthropomorphic fiction" rather than a conscious, intentional creator, by emphasizing how formal cinematic techniques shape viewer cognition and, therefore, complementing Barthes' focus on the target's agency, creating a dialectic between structural mediation and interpretive freedom. These dynamics are crucial in cVR environments, where such a theoretical interplay manifests as a dual dynamic: interactivity empowers viewers to construct personalized narratives (embodying Barthes' "readerly freedom"), while technical and compositional frameworks subtly guide interpretation (reflecting Bordwell's structural mediation). In addition, insofar as rhizomatic spectatorship is concerned, it echoes Barthes' transference of textual authority to the reader's engagement with cultural codes into the proposed rhizomatic model that disperses narrative agency across a collective intelligence, where viewers reconfigure story pathways through ideological, perceptual, and psychological filters. The erasure of fixed authorship, well aligned with Bordwell's structural mediation, as the platform's technical parameters (like interactive triggers or environmental semiotics) replace traditional directorial control, creating a "scriptor"-like system where meaning emerges from viewer-pathway interactions rather than authorial intent, in a Deleuzian-Barthesian hybrid where narrative authority rhizomatically proliferates through spectators' cognitive and visceral reactions, dissolving linear progression into a multiplicity of co-created trajectories that resist closure.

Central to this discussion is the typology of Gérard Genette, regarded by many specialists as an important milestone in the development of narrative and discourse analysis (Guillemette & Lévesque, 2006). In separating "who sees", Genette's (1983) clarification makes it easier to also assess the effectiveness of narrative edifices in 3DSC, where the viewer, a passive but

operational agent in 360°, does not narrate and may optically see the events inversely to what the author had originally intended. Through his exploration of "voice," "focalization," and "perspective", Genette's concepts provide insight into how immersive narratives are constructed. In the spirit of his *Nouveau Discours du Récit* (1988), in which Genette finds that the dichotomies of *"story/discourse, narrative/discourse, story/narrative [are confusing]* confusing unless we are willing to show respect for contexts and let everyone tend to their own cows" (Genette, 1988, p. 14), the Thesis proposes a new typology designed specifically for narrative processes in 360° stereoscopic film, where the time of narration is of lesser significance, and the dynamics of "narrative levels", "voice", and **oscillating point of view** support new core narratological categories in 3DSC.

These new narratological categories rely on the proper reconfiguration of the already established "implied author", "real author", "implied viewer" (narratee), "narrative levels", "focalization", "metalepsis", and "narrative voice", where they are essential in guiding the immersive narrative experiences in VR environments. The reasons are many, but the chief one is that cinematic VR has shifted the narrative discourse from "What happens?" to "Where am I and what am I looking at?".

This transition has introduced intense discussions surrounding the "implied author" (Kindt & Müller, 2006, p. 63) versus the "real author". Coined by Booth (1961), functions as a "second self," reflecting the ideological and aesthetic norms of the narrative work (Hühn et al., 2014, p. 291) implied author is distinct from the narrator and the real author, becoming a viewer-generated construct within the narrative (Hühn et al., 2014, p. 288). For example, Tarantino's *Inglorious Basterds* (2009) presents multiple narrative points of view, blending historical figures with fictionalized narratives, and uses character actions – such as Donny's violent execution of a Nazi soldier – to construct a morally conflicted implied author (Boswell, 2011, p. 176). Tarantino critiques the audience's pleasure in violence in constructing a complex narrative persona, while in auteur cinema, directors like Kurosawa craft a clear implied authorial presence through recurring motifs and stylistic choices. With respect to cVR and 3DSC, such examples also shift attention to the concept of "implied viewer" ("implied narratee") since the identity of the implied author is constructed by the audience.

In cVR works, this implied viewer emerges on a paradiegetic level, particularly due to VR's immersive nature. Here, the viewer plays a decisive role in meaning-making through interaction with the narrative, where the audience experiences narrative immersion through second-person perspectives, blurring distinctions between real and implied viewer.

The second-person perspective, often rare in classic cinema, finds a natural habitat in cVR works, where the viewer is addressed as "you". Neuroscientific studies suggest that second-person perspectives are essential in human cognition (Garfield, 2019, pp. 42–49), and this makes them ideal for cVR experiences. By contrast, the third-person perspectives common in traditional narratives present challenges in cVR, such as heterodiegetic narration (narrators outside the storyworld) and extradiegetic narrators, which typically guide the viewer's experience (Herman, 2018, p. 336), where misalignment between perspective and narration can disrupt the immersive effect.

The application of the first-person perspective also presents unique challenges in 3DSC. Traditional first-person narratives, like in novels, involve the narrator being a character in the story, while the reader has access to their internal perspective (Fludernik, 2009, p. 145); in 3DSC, in turn, the viewer's internal perspective is inaccessible to the narrator or other characters, creating a conflict between first-person perspective and first-person narration. Furthermore, as outlined by Genette (1983), narrative levels – first, second, and third-degree – are crucial in sustaining narrative engagement, very often by means of embedded narratives, like a "matryoshka doll," which allows complex layers of storytelling without overwhelming the viewer (Jahn, 2001). This technique becomes important in 3DSC, as seen in *Limbo: A Virtual Experience of Waiting for Asylum* (2017), where narrative immersion affects the viewer's spatial presence, focalization, or point of view (PoV) through framing, multiperspectivity, and metalepsis.

Metalepsis, where narrative levels are breached by a character or narrator (Neumann & Nünning, 2014, p. 344), can disrupt immersion by creating an effect of strangeness in 3DSC, and, while metanarration and metafiction, where the narrative comments on its own storytelling, offer reflexive engagement with the medium, as seen in experimental VR works like *Limbo,* it can destroy the illusion of reality in non-experimental formats.

Finally, without the depth of the dramatic and emotive engagement rooted in "experientiality" (Caracciolo, 2014), 3DSC spaces are positively or adversely affected through neuro-visceral immersion that a story tries to accomplish. The impacts greatly depend on how well the allocation of narrative levels functions in what may be viewed as the transmediality of 360° space.

Transmedial narratology, rooted in Jenkins' concept of transmedia storytelling (Scolari, 2014, p. 70), is vital for understanding narrative strategies across different media. When applied to 3DSC, transmedial narratology enables the modification and adaptation of classical narrative concepts to suit immersive environments.

Thon (2016, p. 7) emphasizes that building a new narrative framework does not involve starting from scratch but rather updating existing narratological tools. Thus, the transmedial approach may address the unique immersive states that 3DSC can create, navigating between two extremes: media blindness, the uncritical application of concepts across media (Ryan, 2004, p. 34), and media relativism, the idea that every medium requires its own narratological toolbox (Rippl, 2015, p. 441).

The navigation, fusing the extremes and choosing a middle ground, is a particularly useful concept for 3DSC, where audience interaction with the medium enhances the cognitive and emotional connection of the viewer by expanding fragmented narratives across multiple platforms into a cohesive whole. The narrative gaps that emerge in fragmentation echo the matrix of Riggs (2019, p. 140), *Storyplex*, where storytelling traditions merge with the psychology of immersion to build environments in which audiences not only watch but also *experience* stories in cognitive adhesion. It is, therefore, appropriate to review the techniques of *cognitive narratology* that offer insights into how 3DSC environments affect the mind's processing of immersive narratives.

In stereoscopic cinema, narratives become mind-relevant, with cVR spaces requiring more than just intellectual engagement – they prompt physical and emotional "action readiness". Hogan's (2011, pp. 2–3) four-part system explains how emotion governs story structure, a key concept for 3DSC. Tan (2014, p. 107) underscores the psychological effect of virtual action readiness, where emotional involvement with a scene can create the *sensation* of readiness to act. By transferring this concept to 360° immersive spaces, emotional involvement triggers what Ceplitis (2021, p. 96) terms **haptic Call to Action** (**hCtA**), the visceral impulse to amend or influence the unfolding narrative despite the physical inability to do so. This aspect is not diminished by the passive spectatorship role in VR, as viewers are cognitively prepared to act where sound, as a subunit of audionarratology, plays a critical role.

Audionarratology, introduced by Mildorf and Kinzel (2014), delves into how sound functions not merely as a complement but as a fundamental narrative component, driving immersion in various media formats. The importance of an audionarratological approach in creating immersive states is evident in the use of ambisonics and soundscapes that guide the viewer's experience through a 360° navigation. Soundscapes, as described by Chion (1985), elicit emotional responses independent of visual cues, significantly enhancing the immersive narrative experience in 3DSC (Dima, 2017, pp. 23–24), while the 360° stereoscopic spatial positioning creates a unique form of narrative immersion that traditional media cannot replicate, chiefly through "auricularization" and "situatedness".

Auricularization, the auditory counterpart to ocularization, places the viewer within the narrative as both a listener and participant (Mildorf & Kinzel, 2016b, p. 14). This technique, more pronounced in 3DSC than in text-based media, allows the sound to align with the viewer's geospatial and "natural" positioning in the virtual world, creating a multi-sensory experience that deepens narrative engagements (Gaudreault & Jost, 2005, as cited in Andrews, 2014, p. 158) as well as shape their phenomenological states.

Both phenomenology and rhizomatic theory provide essential insights into the evolving model of spectatorship in cVR. While phenomenology emphasizes subjective experience, rhizomatic theory introduces a non-linear, multi-entry narrative structure. Together, these frameworks challenge traditional passive models of spectatorship, instead proposing a more interactive, fluid, and immersive experience that is central to the cVR format.

Phenomenology considers the world as perceived through human consciousness, with the body as central to all experience, in line with Merleau-Ponty's argument that subjectivity is inseparable from the body and the world: "my existence as subjectivity is merely one with my existence as a body and with the existence of the world" (Merleau-Ponty, 2002, p. 208). His take is advanced by Sobchack (1992), who introduces the idea of "phenomenological spectatorship|" where cinema functions as a "viewing-view/viewed-view" bodily organ, suggesting a dynamic relationship between viewer and film (Sobchack, 1992, p. 133). This is particularly relevant in cVR, where the audience's physical situatedness and immersion shape their narrative experience.

Bullington (2013, p. 31) reinforces Sobchack's point by noting that the body "inhabits" space rather than merely existing within it. Nevertheless, in traditional 2D cinema, where the audience is bound by the frame of the film and the darkness of the cinema, spectatorship is

limited, reducing engagement to a passive experience (Sobchack, 1992, p. 25). It is the unique quality of 3DSC that *eliminates* this darkness, allowing the viewer to transition from a passive observer to an active participant in the narrative, charged with "action readiness to amend the situation". The absence of "dark" makes 3DSC also conducive to shifting from phenomenological engagements to "rhizomatic spectatorship" in its narrative core.

The concept of rhizomatic spectatorship, inspired by Deleuze and Guattari, proposes a decentralized, non-hierarchical narrative structure. In *A Thousand Plateaus* (1980), Deleuze and Guattari (1987, p. 21) describe the rhizome as having "no beginning or end," functioning through connections, multiplicity, and heterogeneity. Wallin (2010, p. 83) adds that this rhizomatic structure resists the "sedimentation of life into taxonomic orders and moribund habits of representational thought," allowing for non-linear, evolving narratives that engage viewers in a continuous process of interaction, such as it happens in 3DSC, where narratives can break and reassemble from anew. A good case in point is Mark Lombardi's *Narrative Structures* (2000), which exemplifies the practical application of rhizomatic spectatorship. Lombardi's *Narrative Structures*' diagram drawings, which map intricate networks of corporate and political connections, illustrate a non-hierarchical narrative where elements are connected in dynamic, non-linear ways (Lucarelli, 2012, pp. 22–25). These diagrams invite the viewer to engage not with individual points but with the connections between them, mirroring their rhizomatic x, y, z planes. What emerges at the end is the concept of *rhizomatic narrative kinetics* and its propagation in public spaces, which, in itself, becomes a default model for 360° cinema. Whether the experience is labeled as *Storyplex* (Riggs, 2019, p. 139) or a "rhizomatic spectatorship" platform, as proposed in the Thesis, their purpose is the same: to induce sensorimotor activity that replicates a realistic environment in which it transpires.

However, monoscopic cVR, most often used in news production due to its flexibility and quick deployment and often referred to as Immersive Journalism (IJ) (Pavlik, 2019), performs worse (Fisher, 2017, p. 233) in replicating a realistic environment. By contrast, 360° stereoscopic formats enhance depth perception (Wohl, 2017, pp. 152–153), which remains one of the key considerations in choosing 3DSC over cVR.There are two main factors that describe any cVR experience from both a physical and psychological perspective: "immersion" and "presence". In 3DSC, however, these two concepts are triangulated in dynamic processes with narration. In comparison to immersion and presence, "interactivity" – the third component in cVR discourse – is not as essential as the former two (Nae, 2021) since the purpose for which cinematic VR exists equalizes immersion and narrativity, where an episodic neuro-visceral immersion, not stringent on interactivity, may address the entire inventory of narrative processes in stereoscopic spherical film

Immersion in 3DSC involves psychological and physical states. Ryan (2022) extends this concept by examining immersion in narrative, incorporating spatio-temporal, temporal, emotional, and ludic extensions. Caracciolo (2014) adds another extension, experientiality, whereby narrative persuasion in VR formats depends on aligning the recipient's past experiences with the narrative, heightening the immersive experience through tension between the narrative and the viewer. Finally, the technical aspects of 3DSC influencing immersion and

narrativity are centered around parallax and proximity, degrees of freedom (DoF), resolution, lenses, and display systems, as well as professional camera standards.

Parallax, the optical effect of different viewpoints, can cause stitching errors in 360° stereo cameras (Wohl, 2017, p. 29), while proximity effects on immersion depend on object distances, with optimal stereo effects achieved between 3–15 feet (Wohl, 2017). Narrative immersion is influenced by head-tracking systems: 6-DoF allows for greater spatial movement, which enhances immersion compared to 3-DoF, which is more constrained (Trivedi, 2019). High-end 360° cameras, such as the Insta360 Titan and Kandao Obsidian Pro, support high-quality immersive experiences with up to 12K resolution and FoV up to 180º (Wohl, 2017). However, the limitations of current HMDs mean prosumer cameras like Insta360 Pro remain a practical choice. That is why the Insta360 Pro camera, used in this Thesis, provided an optimal 6400 × 6400 pixel resolution, and the choice of rectilinear lenses over fish-eye lenses helps to minimize distortion, improving image realism (Wohl, 2017). The main takeaway of all the technical and theoretical concepts previously explored is that "episodic neuro-visceral immersion", as defined in the Thesis, is a prolonged state of narrative engagement where cognitive, emotional, and physical states fuse to create a sense of physical presence in a virtual space, driven by spatial presence and experientiality rooted in personal real-life experiences and self-other differentiation. This is further amplified within the framework of communal spectatorship based on network models, as framed by the six principles of Deleuzoguattarian rhizomatic spectatorship, Vivian Sobchak's spectatorship theories, and Lombardi's social space.

CHAPTER THREE: METHODOLOGY DESIGN FOR 3DC TYPOLOGY

3.1. Application of Constructivist Grounded Theory in Research Design

Grounded theory is one of the most widely used methods in qualitative research that was initially applied in the social sciences, but it eventually began to be used in almost any discipline in which people are observed or interviewed as participants, and the data is abstracted as a result (Bryant, 2017). As a methodology, GT is a *Kunstlehre* (art), and so its procedure cannot be learned in the form of prescriptions (Böhm, 2004, p. 270). When theories do not emerge from the data but are constructed by a researcher through his or her inventive interaction with it, one speaks of a "social constructionist version of grounded theory" (Willig, 2013, p. 77). Because the key characteristics of *constructivist* grounded theory are used to generate a *theory*, building a typology for stereoscopic 360° video requires an ongoing social interaction with research participants who evaluate assorted cVR films and log their multimodal impressions: it is the researcher who filters and constructs the meaning of the data. Introduced originally by Kathy Charmaz in her publications of *Constructing Grounded Theory* (2014), CGT asserts a plausible relationship between concepts and sets of concepts, derives data exclusively from fieldwork interviews, observation, and documents, and proceeds through identifying categories and

connecting them. Since the concepts of immersion and presence are directly linked to the sensorimotor and neuro-visceral inquiry, CGT is chosen as the most appropriate methodology to gauge the extent of immersion under various narrative categories and, by using the four-part coding phases, to eventually build a narrative typology for 3DSC.

3.2. Coding Phases in the Context of 3DSC

What makes CGT a preferred choice is that it lies squarely in the interpretive tradition (Charmaz, 2006, p. 130), and it is influenced by the researcher's perspectives, privileges, positions, and interactions (Morse et al., 2016, p. 130). And, while Glaser had objected to Charmaz's principle that the researcher should not impose their own views on the data, Charmaz asserts that it is impossible for the researcher to construct an unobtrusive relationship with the data. Thus, CGT is permitted to use, what Dervin and Machart (2017) refer to as *pre-set* codes that allow the process of building a theory to stay within the parameters of narratology so that the emergent labels applied were accepted by the scholastic network of narratologists who may have little or no experience with virtual reality. Bryant (2017, p. 108) underscores that during the "theoretical coding" phase, it is imperative to substantiate the emergent concepts by referring back to the original literature source. This flexibility allows for the use of *in-vivo* codes, which are defined by the words of research participants, as well as pre-set codes (Khandkar, 2013) borrowed from provisional concepts that exist in a particular research domain (Charmaz, 2014). In the spirit of transmediality, the Thesis triangulates the two-tier structure with theoretical coding in order to deliver a narrative typology for 3DSC and test it with the framework of rhizomatic spectatorship. The overall methodological tree is as follows: initial coding, re-focused coding, theoretical coding, and saturation.

CHAPTER FOUR: INITIAL AND RE-FOCUSED CODING

4.1. Initial Coding Phase: cVR Artifacts

Initial coding, whether done line-by-line, paragraph-by-paragraph, or section-by-section (Willig, 2013, p. 73), can also be in a key-point manner (Bryant, 2017, p. 181), staying open to interpretations of the code (Urquhart, 2016, p. 788). Charmaz prefers line-by-line coding but notes that word-for-word coding suits phenomenological studies (Bryant, 2017, p. 176), such as cVR testing where in-vivo codes are respondent-driven (Dervin & Machart, 2017). Because the core of virtual reality is to access a user's sensorimotor and cognitive activity in a digitally created environment (Fuchs, 2017, p. 9), GT is employed to develop a model for "episodic neuro-visceral immersion," using data from those in the cinematic VR milieu. However, measuring immersive states lacks standardized criteria, with some methods requiring costly specialist equipment (Rothe & Hußmann, 2018), while others, such as heatmap systems, track viewer gaze in a 360° sphere (Pillai, 2019). The first tools to gauge immersion were developed by Witmer and Singer (1998) and Slater and Wilbur (1997), who distinguished immersion from

mere involvement, highlighting that presence – a state of mind – necessitates qualitative approaches (Ghazouani, 2017). Psychological immersion in interactive mediums like video games can be measured via facial electromyography (Nacke & Lindley, 2008, p. 87), yet data objectivity remains insufficient. Additionally, the relationship between narrative structures and immersive states is difficult to quantify, as individual experiences vary (Göde et al., 2018, in Pillai, 2019). Researchers rely on self-reports, semi-structured interviews, and user behavior analyses tailored to specific projects; this highlights the novelty of systematic investigations into immersion and presence as psychological phenomena (Grassini & Laumann, 2020, p. 1). In coding, narratological terms from interviews and focus groups have been used to relate immersive experiences to the immersive factor, where immersion is assessed via questionnaires and compared to field notes to label narrative sets.

4.1.1. Data Collection Methods and Results at Initial Coding Phase

In view of the multi-level research objectives in the Thesis, "non-probability purposeful (judgmental) sampling" and "expert sampling" methods are used to gather data. The rationale for choosing the "judgmental sampling" plan is rooted in the methodology by Moser and Korstjens (2018, p. 10), who point out that participants are to be deliberately sampled with varying pool sizes, mostly small numbers, and a design driven by conceptual requirements rather than primarily by representativeness. Additionally, the setting and situations of user testing at RISEBA University provide easy access to potential participants, making it an ideal location for the study where, in total, 89 interviews were conducted. Participants were primarily recruited from RISEBA University, and convenience sampling was used to gather individuals aged between 20 and 27, along with a few faculty members aged 50 to 63. Many participants had experience with immersive VR systems and video games, but no specific attention was given to gender demographics. The study acknowledged potential biases, such as gender influence, but did not consider them crucial for the initial coding phase.

With respect to apparatus, the field experiments utilized six smartphone-powered Samsung Gear VR headsets, an HTC Vive Pro, and an Oculus Quest 2 headset. Differences in frame rates and compression quality were addressed during interviews to ensure data reliability. During the initial coding, the films were primarily delivered in UHD resolution (3840 × 2160) or full 3840 × 3840 resolution at 60 frames per second, and ambisonic sound mixes were used during different phases of coding, depending on the experimental requirements. The data collection methods explored the narrative constitution in 360° stereoscopic spherical film (3DSC) by means of extensive literature reviews, summarizing over 180 peer-reviewed articles, unstructured "creative expert" interviews, field notes, and memoing, all aimed at capturing the immersive experience in both monoscopic and stereoscopic spherical films.

The data was coded and refined iteratively with the ATLAS.ti software used to develop a preliminary typology for 3DSC narratives, while "creative experts" were defined as individuals with in-depth knowledge in a particular area since these individuals were viewed as having

gained erudition through their academic and professional activities (Thompson & Dowding, 2009).

Observation played a key role, as experts' physical reactions to virtual environments were logged to supplement the interview data. The follow-up **Immersive Factor Questionnaires** assessed the **Immersive Factor** (**IF**) in various narrative scenarios that had focused on immersion, closely linked to the concept of presence, and were measured using the framework of Jennett et al. (2008), modified for Cinematic VR. The aim of the IFQ was to determine the IF in **Participatory Story-Space** and "Spatial Frames", as opposed to **Surveillant Story-Space**, in order to see the prospective hierarchy in the final narrative typology and compare these parameters with each other. The first version of the survey consisted of 26 statements, which were subject to an internal coherence test using the Cronbach alpha ratio and were rated on a 7-point Likert scale (where "1" indicates strongly disagree and "7" indicates strongly agree).

The resulting data analysis unequivocally demonstrated that space in 3DSC is mostly thought of as a chain of spatial frames, sovereign in essence, only loosely relevant to the issues of temporality, and unambiguously *platial*. The vast majority of respondents who had perceived spatial frames in terms of "place" exhibited a propensity towards a stronger involvement with the VR environment and a more distinct expression of empathy towards the subjects. A slightly weaker but still in the majority was the group that had viewed 'Surveillant Story-Space' in connection with place as well, even though the hypermodal narrative instance in such an equation was ocularized in the third person. Only 'Participatory Story-Space' is thought of as place and space at the same time, where the first-person perspective and hCtA are sustained by the Dantean element of space. Both IFQ and initial coding, in symbiosis, had confirmed that "space" and "perspective" are key players in the narrative typology of 3DSC and may redefine the cinematic chronotopes, the configurations of time and space, that govern literature and film. Whether space is the preeminent between the two, or the other way around, has been distilled in the re-focused coding phase.

4.1.2. Analysis of Research Findings at the Initial Coding Phase

Originally, the concept of "immersive journalism" was introduced by Nonna de la Peña who argued that, apart from gaining a first-hand experience of the events or situations described in news stories, the aim of IJ is to "elicit a connection between the audience and the news story" (la Peña et al., 2010, p. 291), the catch phrase recycled by another pioneer of cVR Chris Milk, who, in his 2015 TED talk titled *How Virtual Reality Can Create The Ultimate Empathy Machine*, went even further by implying the cVR format was sound enough to stimulate empathy a "*feel her humanity in a deeper way*". An example of this is the film *Clouds Over Cidra* (2016), deemed to be "the first ever 360° stereoscopic film" (Irom, 2018, p. 4270) commissioned for the United Nations by Chris Milk, the founder of WITHIN, who follows a twelve-year-old girl in the Zaatari refugee camp in Jordan, using the proprietary breakthrough spherical technology developed at that time.

Despite all the excitement surrounding it, *Clouds Over Sidra* falls short of fully capturing its narrative due to its presentation of two separate narrative threads: one following a 26-year-old woman and the other focusing on a young girl. She conveys the story in the present tense, making the narrative effectively analytical. Sometimes, her comments also shift between the past and present, with the narrator's oral achronies injected that may or may not correspond to the girl's visual perspective. The fluctuating point of view by no means benefits any empathy or immersion it aims for. Instead, it underscores the intricacy of empathy in the digital world, rejecting the false assumption of what truly triggers an empathetic response.

The origins of the concept of empathy stem from the German Einfühlung (Happ & Melzer, 2014, pp. 3–4), which involves perspective-taking, affective matching, and self-other differentiation, something akin to Brecht's "alienation effect", suggesting that critical engagement, rather than simple immersion, is necessary to provoke empathy. But because this "alienation effect" is influenced by a cross-cultural framework and various ideological and perceptual factors, it may, in fact, hinder any possibility for empathy or sympathy; hence, the author of the Thesis does not agree with Fisher's (2017) distinction, where the idea of an "empathy machine" suggests a user's profound empathy for characters in cVR, while his concept of an "empathic actuality" highlights the cVR designer's portrayals in relation to the individuals in virtual reality. Instead, a more accurate way to describe the dynamics in cVR is as the succession of *empathetic stimuli,* which can vary in both duration and intensity.

Take, for instance, the much-lauded *Lesbos Heroes Refugees* (2016) by Scopic about asylum seekers taking a leap into Europe from the years of hunger, lack of prospects and the Syrian civil war. The documentary opens with two tracks: the textual overlays, informing the viewer of a death tool – immigration – and the off-screen sounds of explosions and firing assault weapons in the distance. The information presented is menacing: three million in forced migration, the largest number since the Second World War. The information presented is short; one has to rewind the film to grasp the message. The emotive reaction the narrative bracket expects to evoke is hardly sustainable since one has to rewind the film a number of times to be able to read the important facts, a rather serious technical glitch if immersion is vital. The following spatial frame is in an empty boat, establishing the narrative edifice as that of the first-person protagonist, followed by a wide 360° panoramic shot, where the viewer is clearly a witness, from which point, the viewer no longer focalizes as the protagonist. The oscillation between the perspectives is by any means critical: what unsettles immersion are two voice-over tracks, speeches by U.S. President Trump and Geert Wilders, a 2017 candidate for prime minister of Holland, both condemning what they see as an "illegal immigration".

Trump and Gilder are framed by the film's ideological aspect of the *apex narrator* who coordinates its FCP, fully on show, as their presence is highlighted by the choice of a non-diegetic musical track (an overly romantic mournful wail) and close camera proximity to children, contrasting with Wilder's speech. Unless one's political and ideological position is in tune with that of the apex narrator, the lack of subtlety in editing may miss its target, in addition to its monoscopic mode of display, also seen in *NYT the Daily 360 Sleeping on Denver's Bitter Cold Streets* (2017).

The story centers around Denver's laws banning urban camping and its immediate effects on the city's 3500 homeless inhabitants. As late autumn becomes colder and more bitter, the Denver police seize blankets from Jerry Burton and others in late November, creating a public outcry. It is difficult to process the parallel flow of both text and voice-over. The approach does not seem particularly immersive but rather informational, as the pressure of looking at the text and the shots at the same time conflicts with the speed at which the shots change. While one is expected to elicit enough compassion, the empathetic response is cognitive and hardly visceral or haptic; however noble the intentions may be, the aforementioned illustrations suggest that narrative empathy, greatly influenced by the ideological asset, is not a leading narratological category for 3DSC.

Additionally, narrativity, linked to the first research question as to whether there are limits to the degree to which we can effectively assess narrativity in 3DSC, also addresses the ongoing debate over whether cinematic VR is primarily about storytelling or *experiencing* a narrative situation, which may not provide much clarity on the matter. Many scholars have weighed in on this issue, with the majority of evidence pointing towards the latter. Marie-Laure Ryan (2019, p. 94) has emphasized that not every sequence of events constitutes a well-formed narrative. She believes that either the freedom of a target needs to be restricted to create a coherent narrative or, otherwise, one has to sacrifice its narrative form. The narrativity in either case is stringent upon coherence; for this reason, non-coherent cVR stories can be deemed to have weak narrativity, if one takes into account the classic definition of narrativity by (Herman, 2018, p. 339), which states that it is "a property of the discourse that more readily lends itself to being interpreted as a narrative".

In reviewing the initial coding data, one can deduce that cinematic VR varies in its degrees of narrativity, ranging from very low to medium high, such as, *WORLD TOUR: A Jump VR Video* (2015) would be viewed as a mere short-term virtual experience, low in narrativity, due to its lack of logic, sequentiality, and coherence. On the other hand, the immersive journalism shorts, such as *CNN's Mosul: Victory at What Cost?* (2018), *CNN Refugee: 'We Are Not Animals'* (2017), *Refugees (Scopic)* (2015), or *NYT The Daily 360: Enter the Chaos of Duterte's Philippines* (2017), would be appraised on the medium spectrum as they would require a proper experiential orientation, with the ideological facet considered, in order to be gauged as high in narrativity. Therefore, it is clear that coherence is more important than narrativity in maintaining immersive experiences in cinematic VR.

Coherence is essentially a matter of narrativity, substantially overlapping with the latter, in that, stories that defy normal expectations about time, intention, goal, causality, or closure may be judged incomplete where those high in narrativity will by high in coherence as well (Toolan, 2014, pp. 66–75). If one compares *WORLD TOUR: A Jump VR Vide*o and *Refugees (Scopic)* with *In the Presence of Animals* (2016) by Condition One, the former two wrestle with conveyance of space and time, which strikes them as being incoherent, the very view supported by the reactions from the respondents who had analyzed them.

WORLD TOUR uses the scheme of a "deputy focalizer" trespassing various spatial frames of global sites to tell the story of the global travel, but, more importantly, testing what Jessica Brillhart, a former Google principal immersive filmmaker calls the *probabilistic experiential*

editing, a concept that proclaims a new montage theory in the VR age. Setting aside one's personal view on the concept, the topographic travel of an anonymous focalizer is carried out through spatial frames, not connected by any tangible global theme or visual syntax, in addition to being so short in duration as to give any meaning to why one is placed in a specific location. *Refugees* struggles with confusing structure in narrative layers; with no specifically anchored main narrator and oscillating focalization, a rather precarious narrative technique if not executed well, as it disorients the audience. By contrast, *In the Presence of Animals* (2016) suffers none of the deficiencies referred to. As the deputy focalizer moves from one location unto the next, from being surrounded by a massive bison herd on the move, into the territory of a prowling grizzly, then into the presence of an endangered jaguar, a rainforest sloth and an olive ridley turtle laying on a beach, the travel is as logical as it is binding in its overarching theme. What appears as distinct spatial frames, both in their visual composition and 3D dexterity, the narrative space reads as one, accentuated by relatively long shots, acceptable in their unity, even if stacked in a non-linear fashion from time to time. Similarly, *The Recruit: R U In* (2015), an immersive VR experience in 3D produced by metaverse VR and directed by the former creative director for Digital Domain, David Rosenbaum, puts the audience in the seat of a second-person addressee who is being interviewed for an opening in the secretive world of a high-level, technologically sophisticated agency; the experience maintains its coherence due to the homogeneity of its setting; although timing and locations may change, the setting remains consistent. Even if one decides to mix up the order of its spatial frames, coherence remains intact. Just because there is consistency in the setting, it does not guarantee coherence throughout; the viewpoint from which it is presented can either disrupt or enhance the unity and logic of the narrative flow, especially when there is a shift in perspective or when using third-person ocularization, in the form of "third-person witness" in cVR.

On its own, cVR uses third-person witnesses to portray distant virtual environments in an aesthetically pleasing way, prompting viewers to see the scene as a living picture or grand spectacle rather than a harsh reality. When amplified by the extradiegetic narration in such *a* **hypermodal narrative situation***,* the narrative distance between the subject and the viewer increases and interrupts the intensification of immersion. To clarify the status of narrative distance and in opposition to the third-person witness, the author of the Thesis suggests the use of the **third-person actant** and **apex narrator** in 360° stereoscopic film. For instance, in *The Mercury Crisis 360° FRONTLINE* (2017)*,* extradiegesis by William Lyman *is* the voice of PBS Frontline, an instance of "heteroglossia" above and beyond the mere status of a cinematic narrator or a unit in the film's FCP. Because in cinematic VR, no first-person account exists, optically speaking, the ocularization of the events is exclusively seen through the third-person actant, outside the frame of narrative space, as in *CNN Idlib – the Next Aleppo?* (2018), where CNN's Arwa Damon travels to Syria to find her native Idlib province eerily reminiscent of the devastation in Aleppo.

Fully colored by CNN's orthodox ideological and perceptual facet, the narrative strikes to be nothing short of a propaganda film with the usual suspect Russia as being a chief bogeyman in town ("you're [the audience] standing in Idlib province in Syria…we are now seven years in conflict [of] Syrian regime Russian backers"). No word of the US involvement

in Iraq and Syria is ever mentioned; one is really taken aback when Damon talks about 2.5 million displaced people as if the United States had no role in the devastation. Her report reads like a quick overview with no relevance to the seriousness of the subject, weakened by the lack of a 3D experience whose stereopsis would have otherwise underlined the destruction in terms of size, height, and spatial properties.

In addition to the monoscopic inferiority, the complexity of voices distributed on various narrative layers also affects immersion in cVR. As the field notes and memos deduced from the unstructured interviews during the initial coding phase have revealed, a more complex narrative configuration does not necessarily amplify the sense of presence and emotional involvement in a narrative, while the opposite is true: a clearer and less saturated distribution of narrative layers makes it easier for the viewer to process visual and narrative stimuli in the context of haptic Call to Action and 3-DoF.

The concept of hCtA is linked to recent studies in neuroscience that have suggested that the hippocampus shows neural activation even when individuals are only at the planning stage or mentally interacting with virtual spaces (Morie & McCallum, 2019). Hence, the Thesis introduces the phenomenon of hCtA to characterize a strong desire to explore the implications of story sequences, which remains present even when individuals lack interactive control over the characters' actions. Its close designation is **immersive tactility**, a strong haptic desire to touch virtual objects in space without the ability to move. The difference between hCtA and tactuality is ontological: the former is more of a cognitive act, while the latter is experienced viscerally. Because hCtA can lead to an impulse to amend the situation, and despite the detachment inherent in cinematic experiences compared to real-life events, the presence of hCtA is a fundamental element of a compelling narrative, especially in discerning narratological categories conducive to fostering such a state in 3DSC, as is the case in *The Starry Night* (2016).

The 3D aspect of the visual encounter *The Starry Night*, created by Brooklyn animator Mac Cauley as part of Oculus' Mobile VR Jam competition and based on an oil canvas 1889 painting by Vincent van Gogh, extends the sunrise from the east-facing facade of the artist's bedroom window at Saint-Rémy-de-Provence asylum. The video is rather short but immensely effective. It opens with a swoosh into a painting; as one enters the canvas frame, the frame dissipates, and one immediately becomes an actant in the house where the tension between classical narrative canons and experientiality is reduced to almost zero. Due to the perfect geometrical calculus of the distribution of spatial objects that one is very eager to touch, Vincent van Gogh's house also becomes the viewer's house, bedroom, and objects: it is an immersive tactuality of the viewer's storyworld. Any codes that emerge from the viewing experience, anchored in surging movement such as **haptic urgency, spatial fidelity, immersive fidelity**, and **empathetic immersive situation**, are all but a reflection of the ever-increasing **platial experientiality**.

With regard to key narratological categories in the initial coding processes, "space" and "Perspective" emerge as pivotal to the narrative typology of 3DSC. 'Platial experientiality' is at the crux of the dynamic between the two, where the role of space and perspective can furthermore redefine "cinematic chronotopes" in cVR. This is in contrast to those in literature and film, as it emphasizes duration. Because stereoscopic cVR closely mimics real-time presence, it differs from verbal storytelling, where concepts like pause and scene better capture

the live experience of the addressee. Hence, one can claim that the stereoscopic narrative in cVR transpires inherently in the present tense, with "stretch", which the Thesis has designated to be called a slowed-down **audiovisual cognitive time** (**AVCT**), becoming a natural state in cVR and 3DSC.

4.2. Re-focused Coding Phase: cVR and 3DSC artifacts

Comprised of two parts, "axial" and "focused", the re-focused coding stage addresses the emerging concepts from the earlier stage of data analysis checked against the reality by sampling incidents that may challenge or elaborate its developing claims (Urquhart, 2016, p. 787). Axial coding may be regarded as the first step, where the codes have a provisional character (Böhm, 2004, p. 271). Focused coding, or otherwise "selective" coding, in turn, is a parallel process to axial coding but at a higher level of abstraction to flesh out any categories that are incomplete and to synthesize large segments of data so that a selection is chosen with the most analytic power that captures a number of initial codes (Bryant & Charmaz, 2019, pp. 175–176).

4.2.1. Data Collection Methods at Re-focused Coding Phase

The consecutive phase in coding with respect to the second research questions as to "space" and "focalization" prospectively being the most significant narratological categories in 3DSC to affect the narratorial functions of a narratee (i.e. the audience/viewer) who is geospatially placed at the "bull's eye" of 3DSC and exists on the intradiegetic plane only was addressed by means of face-to-face, on-site "semi-structured narrative progressive comprehension interviews", which were used right after the field tests, on-site IF questionnaires, field notes and memoing.

During axial coding, redundant or less pertinent codes were eliminated; of 201 codes, 157 remained for analysis. During selective coding, the axial data was merged or refined to represent key narratological categories, for example, **deputy active focalizer** and **deputy participant immersive** designations merged into "deputy focalizer", later abstracted to **non-CtA-presence.** Then, out of 157 codes, 65 were prioritized, and some were revisited using theoretical sampling. The constant comparative analysis introduced new codes through sampling cVR samples from known cVR films and a few personal 3DSC prototypes (e.g., *Ascenseur Pour L'échafaud 2014* (2017), *Departure* (2018), *New Force* (2018)). Thus, a very important category *a set of loci*, a form of focalization exclusive to 3DSC environment, is introduced and tested out in the field, followed by IF questionnaires to test various immersive states, while those codes that are not directly linked to space and perspective are further merged and reconceptualized at a higher level of abstraction.

4.2.2. Analysis of Results at Re-focused Coding Phase

The immersive experience in 360° stereoscopic film is fundamentally "platial", with the viewer deriving meaning from the spaces they inhabit as well as carrying the psycho-physical and contextual attributes of narrative engagement, linking the narrative structure with particular cultural, political, and ideological proximities of the audience. While both space and perspective dominate in 3DSC, space is more significant than perspective in 3DSC, as it is continuously reconstructed as a chain of spatial frames that acts as a binary cluster, encompassing ontological, operative, cognitive, and politico-ethnic planes, while also serving as a catalyst for the phenomenological experience of cVR spectatorship. The core element of this experience is the spatial orientation of the visual field, allowing the audience to reconstruct themselves in each subsequent spatial frame as it connects space to perspective. In this equation, the *deputy ocularizer* is an important typological element in 3DSC whose geospatial position amplifies self-other differentiation and "platial experientiality". This is evident in the *Invisible VR* (2016) miniseries, where the story follows Tatiana and her boyfriend Grey as they escape from her uncle Gordon. The low-angle opening shot used in the 3DSC creates uncertainty within shifts between "participatory" and 'surveillant story-spaces', showcasing how oscillating perspectives within 3DSC narratives can lead to disorientation, especially when self-other differentiation is not well accounted for.

Oscillating ocularization on narrative levels is common. For instance, in *Home Sweet Home* (2020), homodiegetic narratives oscillate between different perspectives. The heterodiegetic narrator addresses the viewer in a "betwixt state" (**aRIL**) between **REL** (general "you") and **RIL** (specific "you"). The viewer's perspective shifts between internal perspective, REL, aRIL, and deputy ocularization, depending on the spatial frame. Oscillating narratives are controlled by an overarching narrator to maintain coherence and must be tied to "narrative voice" to sustain presence. For instance, in *The Weekend Soldiers* (2019), the main narrator, Renaud Labarde, oscillates between REL and a plural "we-narrative" form when speaking for his group, all the while exemplifying shifting perspectives on both hetero- and homodiegetic levels.

Current techniques often reduce immersion by relying too heavily on oscillation in both perspective and narration. **Optical and narratorial synchresis** rarely occurs with oscillating narration, but immersion may still be achieved when framed by an "apex narrator". For instance, in NYTVR's *Predicting Antarctica's Fate by Studying the Ross Ice Shelf: A Shifting Continent* (2017), the narrative is delivered homodiegetically by Kristy Tinto and Nick Frearson, both part of the expedition team. Here, the homodiegesis oscillates between the two, addressing the audience as "you" in both instances. However, the narrative occasionally falters when multiple speakers are introduced without corresponding visual cues in the spatial frame, leading to narratorial disorientation, which alludes to the fact that the alignment of homodiegetic elements with the spatial frame is critical in 3DSC, as the audience's immersion depends on maintaining coherence between voice and visual perspective. Fludernik (2009) critiques the conflation of narratorial perspective and narration. She points out that in complex stories like Charles Dickens's *Great Expectations*, the narrative can shift between extradiegetic-

homodiegetic perspectives, as seen in the older Pip narrating his childhood from an extradiegetic vantage point while still maintaining first-person internal focalization.

It should be noted that an extradiegetic-homodiegetic or homodiegetic-heterodiegetic narrator is an oxymoron according to orthodox narratological canons, as such narrative flows are mutually exclusive. However, some narratology theorists, such as Herman (2011, p. 66), indicate that such dogmatic boundaries have become blurred, as "narrators can be extradiegetic-homodiegetic...extradiegetic-heterodiegetic, [or] intradiegetic-homodiegetic, [or] intradiegetic-heterodiegetic." Therefore, the 3DSC format introduces its own form of narrative positioning characteristic of immersive media, where the viewer's physical presence within the story's spatial framework (intradiegetically) is maintained while preserving the narrative distance traditionally characteristic of heterodiegetic narration. For example, in the film *Limbo: A Virtual Experience of Waiting for Asylum*, the narrative oscillates between the female narrator's direct address to the viewer and first-person narratives, creating what could be termed a *spatially integrated binary narrative*.

When these complex narrative hierarchies are applied to 3DSC, they can lead to the loss of immersion, such as in *My Brother's Keeper* (2017), where the narrative alternates between two estranged brothers, Ethan and Jackson, fighting on opposing sides during the American Civil War. The second-person perspective is used throughout, with the brothers addressing each other as "you." However, this narrative device, combined with the non-linear sequence of events, contributes to spatial and temporal confusion, especially since the timeline is not clearly delineated. Conversely, when voice and optical perspective clash, they can still effectively maintain immersion, as demonstrated in *Surviving 9/11: 24 Hours Under the Rubble* (2021), despite the narrative oscillating between various levels of focalization.

The film follows Genelle Guzman-McMillan, the last survivor rescued from the rubble of Ground Zero, as she recounts her memories of the September 11 attacks. Her account is delivered through a first-person voice-over, with Guzman-McMillan reflecting on her experiences. The split between Guzman's offline mentation – her memories of the event – and the audience's experience of it creates a layered narrative structure, a delicate balance between first-person narration and the audience's simultaneous identification with, and detachment from, the protagonist's experiences.

In many instances, the protagonist's experiences in 3DSC are channeled through the second-person perspective. Once a rarity in cinema with early examples such as *Peeping Tom* (1960) and *Lady in the Lake* (1946), it has made a resurgence in cVR with films like *Leader Dog* (2019), *Nowhere* (2017), and *First Impressions* (2017), where the viewer becomes a "deputy focalizer" or "implied audience" directly addressed. Traditional cinema generally avoids second-person narration due to the "cutting-off" performed by the frame (Chatman, 1980, p. 96), which separates story space from discourse space. However, in 3DSC, "story-space" and "discourse-space" merge. Hence, the Thesis introduces the ***set of loci*** ("**locus**" as singular) derived from the audience's physical position and focalization to capture the unique spatial and optical attributes of 3DSC. The "locus" concept focuses on "who sees from which loci?" as opposed to the classical "who sees?" Five types of ocularization, or loci, are introduced: **negative locus (NL), external locus (EL), internal locus (IL), reverse external locus (REL)**,

and **reverse internal locus (RIL).** These loci define the immersive capacities of the viewer as a deputy focalizer, ranging from passive observation to active participation. NL refers to the viewer's position as a reclusive bystander with no active role in the story, as seen in *Fifty Shades Darker* (2017) and *The Leader Dog*. EL, common in documentaries like *10 Shots Across the Border* (2016), involves non-immersive storytelling where the narrator is external to the diegetic space. IL, semi-immersive in essence, shifts between third-person consciousness attribution and first-person consciousness enactment, as seen in *The Click Effect* (2016). Reverse loci are exclusive to 3DSC: REL addresses the viewer as a general "you," as in *6x9: A Virtual Experience of Solitary Confinement* (2016), while RIL addresses a specific "you," fully immersing the viewer as an undeniable actant. The latter is considered the most immersive form of focalization in 3DSC, as evidenced by the 3DSC prototype *New Force* (2018) shot by the author of the dissertation for re-focused coding to combine a second-person perspective and spatial presence.

The film is set in a bleak concrete housing complex in Latvia, where a young girl exploring the building encounters an unsettling man. The narrative initially focuses on the girl's perspective as she wanders further from safety, but as the story transpires, the perspective dramatically shifts to the man as he manipulates and assaults the girl. A pivotal moment comes when the man directly addresses the audience, breaking the fourth wall and implicating the viewer in the girl's tragic fate. Finally, it is important to note that when the story is told from a second-person perspective along with a first-person narratorial "voice", such a narrative constitution should not be conflating with the presence of the cinematic narrator or FCD. Under such a schemata, it would be best to describe here the presence of an "auxiliary to apex" (*subaltern*) narrator addressing the "apex viewer" to enhance the immersive states, In order to resolve the dissonant instances in ocularization and auricularization and to minimize the inherent friction between implied and authoritative narrators, the Thesis puts forth the "apex narrator" as the chief regulator of 3DSC dynamics. Since sound behaves differently in cVR, "voice," central to the act of narrating, may distract the audience from the sense of presence and conflict with the narratorial functions, while the soundtrack, curiously enough, is more immersive than an off-screen narration; in traditional cinema, off-screen narration is a part of the diegesis, but in 3DSC, it negates immersion.

CHAPTER FIVE: THEORETICAL CODING – RHIZOMATIC PROTOTYPES IN 3DSC

5.1. Theoretical Coding Phase

Bryant and Charmaz (2019, p. 79) stress that theoretical concepts do not simply arise from the data alone but require *theoretical coding*, a procedure that continues through a constant comparative approach until the point of *theoretical saturation* (Kenny & Fourie, 2015, p. 1271). Here, Bryant and Charmaz (2019) suggest a recursive process where theoretical coding and saturation interact cyclically, in a back-and-forth movement, to serve as the pivot for building explanations firmly situated within a narratological context.

A number of dominant categories from the re-focused coding stage whether it be **auricularization as orienting device, experiential facet in perceptual affinity, experiential facet – psychological affinity, experiential facets as signifier, gaps in viewing time, platial extensions as accurate proxemics, rhizomatic viewing in potentia,** or **summarized spatial frame container as setting**, to name a few, have been moved and merged into the "code groups" to form a basis for the final narrative typology to be tested via artistic process.

5.2. Artistic Process

5.2.1. Impetus for Rhizome of "*Gaslight*" *Narratives Neo-Noir* (2022): Socio-Economic Landscape and Austerity in the Baltic States

The 3DSC rhizomatic installation "*Gaslight*" *Narratives Neo-Noir* (2022) originates from a synthesis of narratology and immersive technologies that challenge spatial and cognitive realities, particularly emphasizing how virtual platforms dismantle objective narrative perception (Ceplitis, 2021). Rooted in the thematic coda of the post-2008 Baltic economic crises, it uses the immersive technologies of cVR and 3DSC to expose the undermining of the critical faculties of the audience through misdirection, contradiction, and cognitive programming, both in terms of content and form, where Latvia's proclaimed "economic success" is unraveled as a façade. The "success" chief beneficiaries are foreign banks at the cost of the Latvian domestic public welfare, with public debt skyrocketing post-2008 (Blyth, 2015, p. 224), where the EU/IMF bailout, shadowy at its core and entrenched in bifurcated labor markets (Woolfson & Sommers, 2016), has created a post-socialist "nomenklatura" that profits from EU fund distribution (Woolfson & Sommers, 2015, p. 8). The wider implications of their deeds are ominous; "in terms of the demographic balance, Latvia's survival as a nation is in doubt" (Sommers & Woolfson, 2014, p. 38). Even though, the tragedy is that, in defense of neoliberal policies, the former Prime Minister of Latvia, Valdis Dombrovskis, had famously exclaimed, "people are ready for sacrifice" (Åslund & Dombrovskis, 2011, pp. 118–119), to which Nobel Prize laureate economist Paul Krugman just as famously had replied, "They have

made a desert and called it adjustment" (Krugman, 2011). The Rhizome of "*Gaslight*" *Narratives Neo-Noir* is a daring ode to the latter's stance.

5.2.2. The Apparatus in Production and Exhibition of "*Gaslight*" *Narratives Neo-Noir* (2022)

Audio delivery option of spatial sounds video delivery option

In view of the high resolution and availability requirements set forth in the Thesis, the 3DSC prototypes produced for field experiments are captured using an Insta360 Pro camera at its maximum resolution of 6400 × 6400 pixels in 3D, with playback recorded at 60 frames per second and exhibited via Samsung Gear VR and Oculus Quest 2 at 5700 × 5700 pixels in 3D and 29.94 frames per second.

Audio delivery option of spatial sounds

To replicate the sonic experience of standing in a 360° spherical space at a specific geospatial location, "positional audio recording" was deployed using both the onboard audio capture system of the Insta360 Pro and the tetrahedral microphone by Sennheiser AMBEO VR. For panning control in the final mix during the post-production stage, three easy-to-use plug-ins were utilized within the Reaper software: Facebook 360 Spatial Workstation, dearVR Pro, and dearVR Micro with the final output in AmbiX B-format used to manipulate the audionarratological parameters of sonic "situatedness" and "auricularization".

5.2.3. Production Process: Making of the Rhizome of "*Gaslight*" *Narratives Neo-Noir* (2022)

"Gaslighting", traditionally seen in psychology and politics as manipulation to make individuals question their reality, becomes a *modus operandi* of narrative devices in "*Gaslight*" *Narratives Neo-Noir* in order to present an apocalyptic warning about the current media environment. The installation consists of six short 3DSC prototypes, directed and shot by the author of the Thesis, with each prototype lasting approximately five minutes and taking the form of vignettes that provide viewers with the experience of "gaslighting" through experimentation and metaphor. While nine prototypes were initially produced for the installation, only six were chosen to limit the total viewing time to 32 minutes so as not to exceed VR simulation fatigue. These short films test immersive narratological categories within various "gaslight" scenarios where films like *Taxi Driver* (2019), *Departure* (2018), and *Ascenseur Pour L'échafaud 2014* (2017) toy with the audience's cognitive perception and point of view.

In *Taxi Driver*, viewers are compelled to become passive listeners to a cab driver's life advice, whereby, at some point, the driver gets out of his cab and commits a murder in broad daylight, all while the passenger is forced to watch with a powerful sense of complicity. *Departure* critiques Latvia's neoliberal economic and social policies, immersing viewers in the

unsettling scene of a Latvian family's emigration liked to a metaphoric insect-like image on the camera lens that literally disturbs, while in *Ascenseur Pour L'échafaud 2014*, a political allegory, where a Latvian detective stumbles upon a crime referencing back to the 2014 parliamentary elections. The psychological impact of witnessing is achieved by viewing the unfolding events from different vantage points but being unable to intervene. The use of ambisonic sound design, done with Reaper and DearVR Pro technology, amplifies the immersive shifts between auditory and visual layers of 3DSC, often with unsettling and creepy effects. The same approach is repeated in the 3DSC film titled *Experience Something Different* (2020), a 3D simulation that helps viewers understand how an autistic child perceives the world in the second-person perspective. Other works, such as *Peeping Tom* (2019), explore voyeurism and the psychological effects of "Stockholm syndrome", where viewers become passive participants, switching between internal and external viewpoints of complicity and psychological disturbance. The oscillating perspective used in *Peeping Tom* is further enhanced and tied to "geopsychic exploration", blending time and place in *Opportunities* (2021) that focus on disparate physical spaces merging into one consistent setting, where the main characters' lives are depicted through rejected and dejected environments. Finally, in *Once Upon a Time in Bolderaja* (2022), the audience is confronted with a chilling retelling of a rape and murder from 1977 through the voice-over of the killer and the absence of any characters, creating a disturbing oscillation between various layers of internal and external auricularization and ocularization. The production process ultimately raises questions about the role of virtual reality in distorting facts and perceptions where, by means of the rhizomatic distribution of the six 3DSC viewing stations, the installation offers a more immersive setting to experience the manipulative essence of "gaslighting".

5.3. Data Collection

Abductive reasoning offers a balance between the data-driven approach of inductive reasoning while still considering existing theoretical knowledge in conceptual refinement and integration in a continuous back-and-forth movement (Conaty, 2021). At this stage, the Thesis deploys analytical techniques such as diagramming, memo-writing, and deep coding to visualize the final 3DSC typological elements and prepare the core narratological categories for saturation phase testing. In the process, ATLAS.ti was used to significantly narrow coding tree elements that could be effectively integrated into the emerging theoretical structure while remaining open to new insights and modifications as needed around a central phenomenon or core category, be it **kinaesthetic aspects of place** or a **deputy flânerie**, to name a few.

5.4. Analysis of Research Findings at the Theoretical Coding Phase

The Greek word "κινεῖν" (kinema), denoting movement, highlights the importance of "kinaesthetic" experiences in spaces (Koeck, 2013, p. 5). The kinaesthetic phenomenon in 3DSC renders the platial stereoscopic 360º cinema physically static but experientially kinetic,

perceived as an internal cinematic movement, by means of the first-person perspective in which their socio-cultural practices correspond to the bodily-perceptual level of one's own experiential background. Without this movement-based element, the 360° experience remains hypothetical because, unlike traditional 2D film that reduces three-dimensional space to a two-dimensional frame, 3DSC already exists as a three-dimensional environment where spatial frames convey narratives through both haptic and spatial states. **Immersive Stasis** (pause for 3DSC) is the key. For a child, his mother is "his essential shelter", his primary place of existence (Tuan, 1977, p. 29), expressed by a pause in movement becoming a place. Likewise, the pause becomes a core attribute of spatial frames in 3DSC environments, devoid of temporal extension. While one certainly can manipulate space according to the filmmaker's visual style and purpose, where one might emphasize the historical and sociological aspects of a cityscape, another might stress the textures, surfaces, materials, and patterns of a modern city, as seen in classic cinema (Andrews, 2014, p. 18), the actual pause of 3DSC space is narrativized by the viewer's geospatial position, grounded in both literal and **experiential proxemics**.

When discussing "proxemics", the author of the Thesis does not use the term in reference to social interactions within a given environment, as defined by Hall (1966), these being intimate, personal, social, and public, with a total range of approximately zero to eight meters (Hall, 1966, as cited in Dooley, 2021, p. 100). The Thesis uses "proxemics" in terms of the precision of the objects in 3D space to affect various narratological factors that are in play.

In 3DSC, this precision directly affects the viewer's sense of belonging to a place, morphing the narrative into a participatory or surveillant experience depending on the context. As a result, the place in 3DSC is not a landscape to be observed passively but a sequence of spatial frames that communicate with an emotional and sociocultural slant. Furthermore, oscillation is a part of the matrix, a shifting nature of one's point of view between "exocentric" and "egocentric" views, "ocularization" and 'locus', "auricularization" and "situatedness", all the while the set of proximities enhance or decrease the sense of presence on site. For instance, in *Opportunities* (2021), the three different "places" are framed by one consistent **spatial frames summarized container**, a type of narrative setting to create a range of proximities with different texture, scales, and densities. The opening spatial frame with St. Jacob's Cathedral in front of the barricaded parliament building, narrated by the former prime minister, suggests an acknowledgement of the sacrifices the society has fought for to create opportunity. As the audience moves from the exterior to the interior, from the public to the private, the gaze of the deputy actant is nevertheless "exocentric". Here, the triptych offers an opportunity to intrude into the intimate living quarters of the main characters, combined into a series of assorted spaces, each with a specific past guided by the type of social significance attached to each character. Through an ethnographic exploration of these places, the *flâneur's* movement becomes a method of experiencing embodied space, where 3DSC's spatial frames take on deeper meaning through their narrative context. In such places, the designation of an "apex narrator" is most useful, as this concept more precisely regulates the shifts in narrative layers and ocular perspectives: unlike traditional filmic techniques, where an implied author subtly guides the audience's experience, the apex narrator in 3DSC directly aligns the viewer with a specific narrative level.

Opportunities are predominantly "exocentric" (landscape), gazed upon by a deputy actant but in an extruding ("**spear**") mode due to the very confined spaces the audience experiences. By contrast, *Once Upon a Time in Bolderaja* is experienced as mostly a structurally rich and visually evocative "egocentric" (cityscapes) gaze, even though that gaze is **sequestered** (reclusive). Its narrative structure is somewhat complex as it contains an oscillating perspective that is a layered "offline mentation"; the heterodiegetic offline mentation of a killer recounting a rape he committed is homodiegetic in terms of auricularization (the audience hears his recount on the extradiegetic level, something other characters do not), but his precise recounting of events during the killing is auricularized by all, or to put it differently, his voice-over is auricularized intradiegetically, where his narration is carried out hetero-homodiegetically. The presence of the killer is, thus, sketched by the audience based on the spatial attributes of platial experientiality with its roots in the perceptual and psychological "natural" affinity that the shabby, working-class milieu provides, in a kind of metaleptic jump. This has a divergent effect, depending on the cultural environment one is exposed to, the ideological and perceptual proximities, and the cohesive structuring of narrative levels, preferably regulated by the "apex narration" itself.

CHAPTER SIX: SATURATION – FINALIZING 3DSC TYPOLOGY

6.1. User Testing in the Rhizome of "*Gaslight*" *Narratives Neo-Noir*

The installation, set in the RISEBA Architecture and Media Centre H2O6, employs six cVR stations with a rhizomatic design plan, allowing narratives to build endlessly until they fragment, giving the viewer the freedom to choose and reconstruct the story, shaded by their own ideological, perceptual, and psychological facets. The installation not only invokes perceptual shifts but also redefines how audiences engage socially with both the self and others through the digital space. Inspired by Lombardi's *Narrative Structures* (2000), it taps into rhizomatic connections, dynamically interacting across spatial-temporal axes (x, y, z) in a 360° environment. Such a design emphasizes multiplicity over linearity, turning viewers into shapeshifting participants within the narrative matrix, creating a collective intelligence form for an era defined by communal spectatorship and neuro-visceral immersion. The rhizomatic approach, with no clear start or end, invites endless reconfiguration, presenting viewers with different scales, densities, and narrative levels that challenge pure linear progression.

6.2. Measurement

The simulation commenced with participants signing a "Virtual Reality Release of Liability" form, ensuring compliance with state laws and regulations regarding human subject research. The study involved 32 minutes of total viewing time followed by 35 minutes of semi-structured interviews aimed at validating the proposed typology for 3DSC environments.

Initially, nine 3DSC prototypes were produced to be used for the installation, but due to the potential VRISE effects and the limited scope of the Thesis, six were chosen as the most optimal for prolonged viewing, totaling 32 minutes. On the narratological level, each particular prototype addressed and tested the "episodic neuro-visceral" immersive aspects of a particular narrative category that the author of the Thesis considered crucial in substantiating the emerging typology in 3DSC: **apex narrator**, auricularization, situatedness, focalization, **oscillating ocularization**, RIL, and "space". "Theory-generating experts" completed the INFQ questionnaire by using a Likert scale to assess the immersive factor for each of the previously mentioned narratological concepts. With respect to the advantage of the rhizomatic installation as an experiential viewing platform, most experts agreed that it worked as a proof of concept because it allowed sufficient time to process the information and can provide a more social interactive experience than the solitude-driven HDM platforms generally impose.

6.3. Finalizing Narrative Typology in 3DSC

During the saturation phase semi-structured "theory-generating expert" interviews, used right after the field tests and processed with "deductive reasoning" (referred to as top-down logic) methods (Walliman, 2021) within the "abductive reasoning" container (Walton, 2014), confirmed or refuted particular dominant narrative categories in 3DSC, and, thus, had provided a blueprint for the key typological elements in narrative constitution to support an "episodic neuro-visceral immersion" in 360° stereoscopic cinema, and if deployed under a rhizomatic spatial configuration. The takeaway is that 3DSC predisposes the format to be primarily the domain of the viewer, where "narrative space" takes precedence over other narratological categories in terms of importance.

For Genette (1983), space does not play a significant role in his typology, unless interpreted to be a part of his "narrative levels" grouping. His chief contribution is on the issues of point of view, whereby he has grouped his "narrative perspective" under "narrative instance", the actual moment and context of the narration, a temporal setting of the enunciation in narration. While Genette (1983) primarily discusses "extent" and "reach" in relation to anachronies (analepsis and prolepsis) under the category of "narrative time", the author of the Thesis codifies the terms as **chrono-perceptual scope** and **chrono-spatial radius**, respectively, for 3DSC environments under the category of "narratorial perspicacity", a part of "narrative distance".

Since the structuralist view is that "narrative distance" refers to the physical and chronological distance, relationships, or emotional investment of the narrator to the events or characters of the narrative (Hogue, 2019, p. 100), a more accurate, updated alternative is to use 'chrono-spatial radius' that describes the range of narrative duration accessible to the viewer

from his or her current physical, optical, and cognitive position in virtual space. Likewise, **chrono-perceptual scope**, in lieu of narratorial "reach", incorporates the temporal dimension of 3DSC narrative elements the viewers may perceive across both space and time beyond the immediate moment, encompassing past, present, and future elements in a multimodal sensory acquisition.

With respect to "narrative time", the dynamics of **audiovisual cognitive dissonance** in 3DSC environments are taken into account. In lieu of a "narrative pause", the Thesis considers using the designated **immersive stasis** to compensate for any stops in narrative time whenever the viewers explore the 360° space on pause, or an apex narrator does this for them with commentaries or other narratorial techniques. The macro categories governing the most immersive states in 3DSC are therefore "narrative space", "narrative perspective", "narrative coherence", and "narrative distance", where the first two are the most essential. Similarly, the 3DSC narrative typology formulates **oscillating intradiegetic** and **oscillating extradiegetic modalities**. The main distinction between oscillating intradiegetic and oscillating extradiegetic modality lies in their relationship with the story space and the audience's geopositioning. While oscillating intradiegetic modality operates within the diegetic space, where the audience is inside the spatial frame, rather than outside as when reading a book or watching a film, in transition from being passive observers to active participants, the oscillating extradiegetic modality, in turn, operates outside the primary narrative frame while maintaining influence over the story experience.

The 3DSC typology also clarifies the confusion of terms that exists in Genette's (1983) and Jahn's (2021) models of focalization regarding verbatim and a purely optical perspective. To avoid perplexity, the 3DSC typology includes **narratorial mentation** as part of the "narrative space" analytical category, rather than grouping it with "narrative perspective", since the narrator's recount is spatialized and conveys personalized experiences that are unavailable to the narrator. Equally, "narrative levels" that is a separate analytical category for both Genette (1983) and Jahn (2021) is a mere but important element of "narrative coherence" in 3DSC. Jahn (2021, p. 24), in his matrix on hyponarratives, which act as the third-order or third-degree narrative embedded in a second-order narrative, employs Genette's formula for the intradiegetic to be called "metadiegetic". And correctly so, as narration cannot be called metaleptic but metadiegetic or intradiegetic in text-based media, while it is literally metaleptic in 3DSC due to the oscillating aspect of perspectives the narrator can have on all narrative levels. Furthermore, **metaleptic auricularization**, which appears in the 3DSC typology, represents a paradoxical transgression of narrative boundaries specifically related to sound and perception in storytelling. This occurs when there is a transgression between the narrative world and the world of the told, such as sound perception transgression between different narrative levels and sound elements that cross diegetic and extradiegetic levels, as demonstrated with *Once Upon a Time in Bolderaja.*

The spatial dynamics created in 3DSC environments also rest on the binary of "sociopetal" and "sociofugal" spaces that either draw people together or push them apart. The communal rhizomatic spectatorship fostered by these spaces encourages a shift towards the exploration of

neuro-visceral immersive states in a collective intelligence era, ultimately creating an ideal aesthetic form for engaging with narratives beyond traditional viewing experiences.

CHAPTER SEVEN: CONCLUSIONS AND RECOMMENDATIONS

The advent of 360° stereoscopic spherical cinema can be traced back to Eisenstein's foresight in 1948, where he asserted that doubting the future of stereoscopic cinema was akin to doubting the future itself (Eisenstein, 2004). Although virtual reality has developed a natural extension of cinema, the universality of 3DSC's narrative structures remains an area of active exploration. All the while, research into 3DSC's screen grammar remains insufficient, leaving much to be desired in terms of understanding its makeup and functions. To resolve the impasse of narrative grammar, this Thesis asserts that the answer to the issue can be found through a narratological approach. Therefore, it provides the first ever comprehensive analysis of narrative design used in 360° stereoscopic spherical cinema to define specific narratological categories and how they are configured in 3DSC space to deliver varying levels of neuro-visceral immersion. Grounded in the author's case studies and his own virtual reality artifacts, the research identifies how narrative structures can optimize immersive characteristics in ways that purely technical mechanisms cannot. Instead of viewing narratology merely as a discipline and theories of narrative, the Thesis deploys a rigorous methodological pipeline concerned with the universal characteristics of narrative media and narrative genres, its wide gamut of the well-known forerunners, the theoretical frameworks by Gérard Genette, Manfred Jahn, Monika Fludernik, Seymour Chatman, Edward Branigan, Eleanor Andrews, Amadeo D'Adamo, Marie-Laure Ryan, Marco Caracciolo, to name just a few. The core of this work rests on the terms derived from the coding procedures as defined by the constructivist grounded theorists, namely Charmaz and Bryant, their established initial, re-focused, and theoretical coding, resulting in the saturation of the final typology in support of narrative theories and philosophical positions adapted to 3DSC.

The first research question, matched to the initial coding phase, looks into the degree at which one can effectively assess narrativity in light of interactivity and coherence and the most prevalent components of narrative constitution currently used in cinematic VR (monoscopic and more general) and 3DSC (stereoscopic and particular). Noteworthy among the prevalent narratological categories in the emergent narrative typology for 3DSC at this phase are "space" and "perspective," with **platial experientiality** being a pivotal element driving the interplay between the two. In their dynamics, spatial frames in 3DSC are seen as succinct spatial constructs, loosely intertwined yet heavily associated with a sense of place. Individuals who interpret these spatial frames as "places" tend to exhibit a heightened cognitive engagement within the cVR environment and demonstrate increased affinity with its subjects and objects. A key factor in enhancing the sense of presence in VR lies in balancing low interactivity with high narrativity, as proposed by Nae (2022), but narrativity in the 3DSC milieu is less important than coherence. Coherence, while substantially overlapping with narrativity, which varies from

being very low to medium high, is stringent upon the logic of narrative levels and the superiority of narrative setting, as the audience traverses from one spatial frame to another. Whenever the structures in narrative layering are baffling, ocularization disorienting to the audience, or the facets of focalization askew, coherence is negatively affected; and the other way around: when homogeneity of a setting is maintained and sequentiality of spatial frames remixed, coherence is hardly lost, even in cVR samples with low narrativity.

The dynamics of space and perspective within 3DSC also present an opportunity to redefine *cinematic chronotopes* in cVR, diverging from conventional constructs inherent in literature and film save for a pivotal distinction: cVR operates within the realm of the present tense, with the concept of "stretch", denoting a decelerated **audiovisual cognitive time**, representing a predominant characteristic of immersive states in cVR and 3DSC. Instead of "narrative pause", the author of the Thesis uses the term **immersive stasis** to compensate for any interruptions in narrative time when viewers explore the 360º space during a pause, or when the main narrator does so on their behalf through comments or other narrative techniques.

The second research question delves into how space and perspective, being the most significant narratological categories in 3DSC, affect the narratorial functions of a narratee (i.e., the audience/viewer) who is geospatially placed at the "bull's eye" on the intradiegetic plane only. Here, the expression of platial experientiality comes into play before any other in narrative constitution. Its core element is **spatial orientation**, which, from a narratological angle, follows a similar pattern in each subsequent spatial frame: when a shot changes, the audience reconstructs itself in a new place. But the audience not only wants to see and feel this new stereoscopic spherical place but also to act in it, with an eager desire to move with characters in the unfolding process of a narrative between *I can* and *I cannot*, which inevitably predisposes the geospatial position of the audience and its emotive state to a peculiar binary of homodiegetic status in 3DSC.

On one hand, this homodiegesis is directly tied to "self-other differentiation". This differentiation serves as a visual reference for geopositioning of the viewer's perspective, such as in the *Invisible VR* (2016) series where oscillating perspectives within 3DSC narratives may lead to disorientation whenever self-other differentiation is not present. On the other hand, homodiegesis is regulated by the bodily-perceptual level of one's own experiential background expressing itself through ocularization in the first person but prone to the **set of reverse loci**, i.e., intensified or decreased by the presence or absence of the set of second-person perspectives concealed as homodiegesis, a **hypermodal narrative situation**, with **locus** at its core. Therefore, in 360° stereoscopic spherical film, there can be a first-person narration, but there can be no first-person perspective, as would be the case with first-person shooter (FPS) video games. Instead, the 3DSC frame inevitably exposes the audience to a variety of second-person scenarios, i.e., an oscillating perspective between a third-person witness and r**everse internal locus (RIL),** addressed with "you". Rooted in Fludernik's (1994) interpretation of Leon Perkins' *Second Person Point of View in Narrative* (1981), the ontological distinction accommodates "a variety of 'you's'" and a variety of "I's", and as the Thesis shows that what once was a rather rare narrative device during the Golden Age of Hollywood, has been deployed with frequency in 3DSC (Ceplitis, 2018). The rationale is obvious.

First, in the 360º spherical frame, story-space *is* discourse-space instead of being merely a spatio-temporal unit. Not only is the viewer a part of a diegetic space with a propensity towards internal focalization addressed as "you", automatically triggered due to the very existence of a first person as a narrative agent, but it also accentuates the cognitive and biological aspect with which one engages in the world. Second, the set of second-person perspective variations – REL (general "you"), RIL (specific "you") – where a narrator or a character, while having no access to the viewer's thoughts, is fully aware of the audience being present in the 360º virtual space (Ceplitis, 2018). In addition, the findings of the Thesis reveal that the immersive properties of RIL, positioned on the intradiegetic narrative level, contribute to the kinetic quality of the 3DSC narrative by navigating and morphing spatial frames into personal places through a movement that is physically static but viscerally perceived as a continuous and uninterrupted "kinaesthetic" experience. Mentally, such an experience is both haptic and platial: haptic due to the presence of hCtA(s), and platial due to space orienting the narrative act as a succession of pauses stringent upon various levels of "natural" proximities, literal and experiential, contained within **egocentric flânerie**, a kind of ethnographic exploration of "embodied space".

Hence, with respect to the third research question as to which variables of the key typological categories in narrative constitution are most effective in supporting episodic neuro-visceral immersion for longer durations, besides 'platial experientiality', RIL, and **spear auricularisation** (reconfigured aspects of space and perspective in 3DSC), the judicious use of **oscillating voice** (in oscillating and fixed narration), "narrative layers", and **apex narrator**, all to support coherence, comes to the fore.

The distinction between the extradiegetic and apex narrator reflects a significant hierarchical separation in narratological frameworks. The extradiegetic narrator operates outside the story world, maintaining narrative distance while employing either omniscient or limited knowledge perspectives. In contrast, the 'apex narrator', while essentially also extradiegetic, regulates multiple intradiegetic narrators and an extradiegetic narrator while maintaining ultimate control over the entire narrative architecture.

With respect to the **oscillating intradiegetic modality** and **oscillating extradiegetic modality** that appear in 3DSC typology, the main distinction between both lies in their relationship to "place" and the viewer's geopositioning. The oscillating intradiegetic modality operates within the diegetic space, where the audience exists within the spatial frames of the narrative rather than outside them, as it is when reading a book or watching a film. The intradiegetic modality keeps the audience neuro-viscerally immersed through spatial-narrative techniques such as ocularization and auricularization shifts rather than camera movements. Meanwhile, the extradiegetic modality creates a meta-narrative situation that contextualizes or comments on the primary narrative without directly participating in it.

The macro categories that govern the most immersive states in 3DSC, in turn, are "narrative space", "narrative perspective", "narrative coherence", and "narrative distance", with the former two being the core, i.e., if space and time are primary structuring principles of film, then, space and perspective as primary structuring principles in 3DSC. Furthermore, the spatial dynamics created in 3DSC act as binaries of "sociopetal" and "sociofugal" spaces that either

draw the audience and objects closer or push them apart, the residual of which creates a matrix of "exocentric" and "egocentric" views, modulated by the "apex" narrator.

In the 3DSC typology, "narrative coherence" regulates **narrative strata**, which, in turn, regulates "narratorial levels" and **narrative planes**. Unlike traditional cinema, where narrative levels can be clearly separated through editing and framing, 360° video creates unique challenges as all levels must exist simultaneously within a succession of spherical places, where the viewer's ability to look in any direction at any time means that narrative planes and narratorial levels must be carefully aligned for coherence. This distinction has ramifications vis-à-vis Genette's (1983) typology, where "narrative perspective" is clustered under "narrative instance", the actual moment and context of the narration, a temporal setting of the enunciation in narration, whereas in 3DSC, due to the audience being a part of diegesis, **narratorial perspicacity** is not viewed in conjunction with "perspective" but rather grouped with the attributes of "narrative distance".

The 3DSC typology presented in the Thesis clarifies the confusion surrounding some of the latest narratological categories under discussion, such as Jahn's (2021) distinctions between online and offline perception or primary mentation. The typological matrix shows that the narrator's recollections, flashbacks, or temporal digressions do not always result in an experiential state for the viewer.

In conclusion, the focus of this Thesis, its findings, and its limitations still leave many opportunities for future research. The rhizomatic installation of "*Gaslight*" *Narratives Neo-Noir* (2022) has been an ambitious attempt to investigate experimental narrative design with the aid of immersive technologies. First, it attempts to offer the concept of the rhizome as a practical application for new immersive environments, even though any narrative whose structure is argued to be rhizomatic has yet to fall into a well-recognized subcategory of narratology. Second, although there have been a few case studies attempting to develop a rhizomatic typology in cross-media, transmedia, and new media art domain, they are still at the investigational stage. This difficulty can be partially explained by the fact that narratology addresses categories such as the "implied author", "focalization", and "narrator", to name a few, while the rhizome is evaluated based on an entirely different inventory of terms. Hence, the act of applying the mechanics of the rhizome to 3DSC is a test, but, as Wallin (2010, p. 83) elegantly put it, "creating a rhizome is an experiment that must be risked." The Thesis concludes with a call for further research into new vectors of narratological research with AI and volumetric cinema. Though technical challenges remain, 360° stereoscopic spherical film stands out as a unique format with the capacity for high-fidelity photorealistic documentation at 12K and beyond. Hardly any other formats may permit this, and its narrative potential will only continue to expand. It will survive the test of time as technological innovations evolve.

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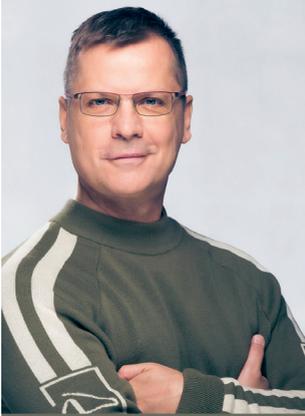
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