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Framework for the analysis of immersive storytelling.

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IMMERSIVE STORYTELLING

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Мамі, за те, що допомагаєш робити мої мрії реальністю

to Jorge, for making me feel like everything is possible

FRAMEWORK FOR THE ANALYSIS OF IMMERSIVE STORYTELLING

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ABSTRACT

In recent decades, digital information technologies have revolutionized communication methods and introduced new media formats. Cinematic virtual reality (CVR) has emerged as a novel language, still in its early stages of development. This study This study seeks to address the relevants investigates the key elements that characterize CVR as a new medium, exploring its unique cinematic language through an in-depth analysis of eight case studies. To understand the emerging cinematic language in CVR, traditional cinema tools must be reevaluated and adapted. Unlike traditional cinema, position of the camera in CVR becomes the viewers themselves, requiring a shift in the use of camera techniques and tools for guiding their attention.

Guiding the viewer's attention is a crucial aspect of content in CVR. Various formal resources, including sound, environment, and motion cues, can be used in combination or separately to guide the viewer's attention, depending on the storyline and level of interactivity.

The study employs case studies to examine how all components of the CVR environment function in real scenarios. Schematic drawings representing points of interest in case study were proposed and found applicable in most instances. From the case study analysis, it can be found that CVR experiences has some repeating tendencies considering the user integration methods.

This research defines cinematic virtual reality and presents a method for the schematic representation of CVR space. The analysis of eight non-fiction VR experiences illustrates the need for a new approach to transform traditional cinema language into the grammar of cinematic virtual reality.

KEY WORDS:

Cinematic virtual reality · immersive storytelling · experience · interactive guiding viewer´s attention · new cinematic language

RESUMEN

En las últimas décadas, las tecnologías digitales de la información han revolucionado los métodos de comunicación y han introducido nuevos formatos audiovisuales. La realidad virtual cinematográfica (Cinematic Virtual Reality, CVR), ha surgido como como un nuevo lenguaje, aún en sus primeras fases de desarrollo. Este trabajo tiene como propósito estudiar los recursos formales claves que caracterizan a la CVR como nuevo medio, explorando su lenguaje cinematográfico único a través de un análisis en profundidad de ocho casos de estudio. Para comprender el nuevo lenguaje, es necesario reevaluar y adaptar las herramientas cinematográficas tradicionales. A diferencia del cine tradicional, la posición de la cámara en la CVR se convierte en la de los propios espectadores, lo que exige un cambio en el uso de las técnicas de cámara y las herramientas para atraer la atención.

Dirigir la atención del espectador se convierte en un aspecto esencial en el desarrollo del nuevo lenguaje. En función del argumento y del nivel de interactividad, pueden utilizarse diferentes recursos formales, como el sonido, el entorno y las señales de movimiento, combinadas o por separado, para dirigir la atención del espectador.

El presente trabajo analiza casos de estudio para entender el funcionamiento de los componentes del entorno CVR en escenarios reales. Se proponen dibujos esquemáticos para representar los puntos de interés en los casos de estudio, comprobando que son aplicables en la mayoría de los casos. Del análisis de los casos de estudio se desprende que las experiencias CVR algunos patrones que se repiten configurando así la nueva gramática.

En resumen, este trabajo analiza los recursos que definen la CVR y los aplica al estudio de ocho casos de estudio obteniendo conclusiones que contribuyen al avance y consolidación del nuevo lenguaje.

PALABRAS CLAVE:

Realidad virtual cinematográfica · narración inmersiva · experiencia interactiva · dirigir la atención del espectador · nuevo lenguaje cinematográfico

RESUM

En les últimes dècades, les tecnologies digitals de la informació han revolucionat els mètodes de comunicació i han introduït nous formats audiovisuals per als espectadors. La realitat virtual cinematogràfica CVR, ha sorgit com un llenguatge nou, encara en les seues primeres fases de desenvolupament. Aquest estudi investiga els elements clau que caracteritzen a la *CVR com a nou mitjà, explorant el seu llenguatge cinematogràfic únic a través d'una anàlisi en profunditat de huit casos d'estudi. Per a comprendre el llenguatge cinematogràfic emergent en la (CVR), és necessari reavaluar i adaptar les eines cinematogràfiques tradicionals. A diferència del cinema tradicional, la posició de la càmera en la CVR es converteix en la dels propis espectadors, la qual cosa exigeix un canvi en l'ús de les tècniques de cambra i les eines per a atraure l'atenció.

Dirigir l'atenció de l'espectador és un aspecte crucial del contingut en la CVR. En funció de l'argument i del nivell d'interactivitat, poden utilitzar-se diverses eines, com el so, l'entorn i els senyals de moviment, combinades o per separat, per a dirigir l'atenció de l'espectador.

L'estudi empra casos pràctics per a examinar com funcionen els components de l'entorn CVR en escenaris reals. Es proposen dibuixos esquemàtics per a representar els punts d'interés en els casos d'estudi, comprovant que eren aplicables en la majoria dels casos. De l'anàlisi dels casos pràctics es desprén que les experiències CVR presenten algunes tendències de repetició tenint en compte els mètodes d'integració de l'usuari.

Aquesta investigació defineix la realitat virtual cinematogràfica i presenta un mètode per a la representació esquemàtica de l'espai CVR. L'anàlisi de huit experiències CVR de no ficció il·lustra la necessitat d'un nou enfocament per a transformar el llenguatge cinematogràfic tradicional en la nova gramàtica de la realitat virtual cinematográfica.

PALABRAS CLAVE:

Realitat virtual cinematogràfica · narració immersiva · experiència   interactiu · captar l'atenció · nou llenguatge cinematogràfic

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INTRODUCTION

Although the fundamental characteristics of non-fiction narratives remain the same when translated into virtual reality, the manner in which the story is presented is significantly changing. Research on the question what is the cinematic virtual reality (CVR) and how it is functioning is still on a level of development.

Indeed, virtual reality is a relatively new medium for storytelling, and with the increasing affordability of content creation technology, a lot of filmmakers are willing to try it. The story told using the traditional cinematic language but created with 360° camera will not work the same way, as it will rather be unclear and confusing for the viewer as we would give the freedom of the view, but not give any tools for where to focus attention, what is important in the scene or why the spectator should be "present" in that place in order to understand the story. Cinematic virtual reality is not limited only by the concept of 360-degrees video, but includes many other features that should be investigated in order to become close to the understanding of the new cinematic language and how filmmaker should use it in order to achieve desirable results.

Showing and telling are two ways to narrate a story, which can be used by the cinematic language. With cinematic virtual reality, rules are changing, and now we need to learn not only how to show the story but how to let the viewer *experience* it. From our understanding of cinematic content, no matter whether traditional or VR, the beginning of everything is the story. For this reason, *the objective* of this work is to investigate the characteristics that should be considered while creating the CVR contents and to provide the analysis of the case study to understand how these elements are used on practice.

Before starting the creation of non-fictional CVR content, we should clearly understand the answer to a few questions. Why this story should be told using virtual reality, and what it can give us more compared to traditional storytelling? How applicable is the traditional cinematic language and how we should change it in order to translate into new CVR grammar? How to make the viewer experience and understand our story? Answering these questions can be the first step for the creation of cinematic virtual reality content.

The *goal* of the research is to investigate the question of how the language of traditional cinema can be transformed in order to meet the requirements of new CVR environment.

The primary *question of this investigation* is how to convert the traditional language of cinema into the language of cinematic virtual reality, in order to enhance its effect and impact on the viewer. The work is focusing on the change of the narrative for it to face the requirements of immersion as well as new cinematic grammar.

METHODOLOGY

For research purposes was chosen the two-step model, that first includes the study of the theoretical frame of the question by exploring existing literature. The research was made by using the main keywords, that are usually used to describe virtual reality space and the connection to it concepts. Keywords were connected with choosing the specific categories of the search, to narrow down the results of the search. Research areas included: Communication; Imaging Science Photographic Technology; Art; Cultural Studies; Film Radio Television. By employing a search approach that progressed from general to specific keywords, the review included more detailed searches. As a result, detailed searches have a higher level of inclusion in the research. The search results were mainly assessed by reviewing the abstract of the resource, ensuring that the included works met the relevance requirements, given the rapidly evolving nature of the research field. The source discusses content for 360-degree space and delves into the concept of immersive storytelling. Briefly, the search results, with the keywords, used for the search, are described in a Table below. The detailed table with the results of the scientific research can be found in Appendix 1.

№	Key words	All	RA	included
1	360; production	6,648	46	20
2	360; production; storytelling	28	8	5
3	360; video; storytelling	108	24	13
4	Cinematic virtual reality	87	14	12
5	Cinematic; VR; interactive; experience	13	6	5
6	Experience; empathy; virtual reality	324	50	36
7	Narrative; VR; non-fiction	5	2	2
8	Omnidirectional; VR; attention	47	11	6
9	Social; VR; narrative	157	30	8
10	VR; cinematic; interactivity	5	2	2
11	VR; empathy; interactive	48	8	7

After the review of the literature and definition of the theoretical framework, as second step of our methodology, this was applied to the analysis of eith case of studies. The analysis helps us to use on practice proposed method of representing the points of interest in cinematic virtual reality space. For the purposes of this research, we chose eight different cases. These non-fiction VR experiences were chosen to represent the wider range of different tools, that was used for their creation. The chosen content varies in terms of technology used (360-degree video and CVR), narration structure, different interactivity levels, and tools for directing attention. These characteristics help to provide deeper analysis with the comparison component, to perceive all of the VR experiences apart and in connection with each other.

CINEMATIC VIRTUAL REALITY

DEFINITION

Even though the term of cinematic virtual reality (CVR) is widely spread among the academic research, the definition of it is still being developed. The most common definition is taking the CVR through the perspective of 360-degree video. For example, For example, according to Mateer (2017: 3) propose the following definition: "Cinematic virtual reality, is an immersive virtual reality experience where individual users can look around synthetic worlds in 360, often with stereoscopic views, and hear spatialized audio specifically designed to reinforce the veracity of the virtual environment". Rothe et al. (2019: 1) notes, that "in Cinematic Virtual Reality (CVR) the viewer watches 360 movies using a Head Mounted Display (HMD) or other VR devices". The same simplified definition is proposed by (Rothe et al., 2021), who states that in CVR viewers watch 360° movies via Virtual Reality (VR) devices. We consider this approach simplified, as it does not give any understanding of characteristics that CVR includes, neither not considering narration as an important part of the cinematic virtual reality. As well, the definition above is not considering CVR rather as a way of watching 360-degree videos using virtual reality devices, than a medium in creation the content with its own grammar and language.

Another approach can be made by the point of narration as a key, for example, "Cinematic Virtual Reality is the art of explaining a story by making the audience telepresence it with Virtual Reality" (Martinez et al., 2016: 67). The definition of cinematic virtual reality as an art is alike with the traditional definition of cinematography —the art of photography and camerawork in film-making (Oxford, 2016). In this case, the cinematic virtual reality is perceived as a new medium, that, in our opinion, can reflect the nature of CVR with its complicity better.

Reyes (2018) asserts that the term CVR has been used to name the kind of immersive experiences in which the story unfolds in a traditional linear way with the novelty of the 360° environment. We argue that linear way of storytelling can be considered as one of the features of the CVR, as mostly the way of narration depends on the story and filmmakers' decisions. Having the definition like this is significantly limits the art behind CVR and closes a lot of opportunities for the filmmaker of how to create the immersive experience. This approach can be compared with statement of (Matay & Bayar, 2023: 5), "there is a distinction between VR and CVR; in CVR, the viewer watches 360-degree movies using a HMD. ...CVR experiences rely on a 360-degree view, and there is no interaction between the subject and the viewer, as opposed to interactive VR games or stories". Even though originally cinematic virtual reality does not involve interactivity, it is being argued that virtual reality space cannot combine both cinematic image, as can be done in traditional cinema, with the interaction, that is typical for interactive VR content. The interaction in VR documentaries should serve to understand and follow the story but not interrupt from the main narrative. Well combined together, usage of both CVR and interactive VR can provide filmmakers with a powerful tool, that at the same time will tell the story in the more usual cinematic way, while interaction will help to create immersive film experience. Matay and Bayar, 2023: 2) also mention that "As opposed to real-time flow in VR, CVR offers non-interactive, pre-rendered pictures as well as sound". Even though CVR does not offer real-time flow as VR, it is hard to agree that it cannot have any interactivity. It reminds about the traditional cinema, where "pre-made" meant "non-interactional", which was also proven to be wrong in a interactive film Black Mirror (David Slade, 2018) that allows the

viewer to have an active role and affect the story even without being placed within it. It proves, that even in traditional cinema creation of the interacted, but still pre-made content, is possible. In CVR space, filmmakers have much wider field of investigation and implementation of interactive elements.

An important part of this research is the case study, which helps us to apply the knowledge gained by the literature research as well as to use on practice proposed method of representing the points of interest in cinematic virtual reality space. For the purposes of this research, we chose eight different cases. These non-fiction VR experiences were chosen to represent the wider range of different tools, that was used for their creation. The chosen content varies in terms of technology used (360-degree video and CVR), narration structure, different interactivity levels, and tools for directing attention. These characteristics help to provide deeper analysis with the comparison component, to perceive all of the VR experiences apart and in connection with each other.

CORRELATION WITH VIDEO GAMES & THEATRE

Zhang (2020: 49) believes that "in terms of spatial narratives, CVR can be seen to take its cues from video games and theatre". Video games can be the best example of interactivity inside the "borderless" space with the freedom of movement. At the same time, theatre can teach us how to use real-world space for interaction with the actor, inviting the viewer inside the story. When staging the performance of the story in CVR is closely aligned to the traditional theatre, creating longer takes, rather than quick cuts, it helps to avoid the viewer's disorientation (Dowling et al., 2018).

VIDEO GAMES

According to Barbara and Haahr (2021: 5), "in games, prologues find their equivalent in tutorial missions. Due to their interactive nature, games most often use tutorials to guide the player-narratees in their participation of the narration through their gameplay. Such players are addressed using voices whose diegesis depends on the game's genre". Typically, as the video game space is open for the user's exploration, there are used a lot of guiding techniques in order in order to avoid that players miss relevant plot details. The major characteristic, inherent in video games, is "rewatchability", which is also an emerging concept in CVR films (A. Zhang, 2020). It allows the user to have the opportunity to explore the space around coming back as many times as needed in order not to miss relevant information. Interactive VR can learn a lot from video games, as it is an area where the playbook of the interaction and narration within 360° world is already written, even though is still developing. In games, the user has the freedom of movements, choices and interactions both with the environment and with the characters, having a direct influence on the storytelling as only the user is choosing with what part of the world to have interaction at any point of time. Even though the world in video games is imaginary, it can show interactive VR documentaries some tools for interaction and directing the viewer's attention for the user to act in a way, predicted by the director.

THEATRE

Talking about VR films and theatre, both are trying to create a sense of presence within the story being told. On the other hand, theatre performances are also more realistic than traditional flat films. Both theatre and VR, cleverly done, are giving the viewer an immersive experience. Theatre can also "teleport" the viewer to a different time or a whole new world. A. Zhang (2020) noted, that the expertise of the theatrical performances lies not only in the presentation of the story using spatial cues but in the relationship between stage actions, the audience, and the narrative of the world of the play. All these characteristics combined can help with the creation of immersion inside the story.

Even though traditionally the audience plays a passive role of observer, there are some forms of theatre, such as immersive or interactive theatre, that encourage audience participation and engagement. Similarly, VR provides opportunities for audience interaction. VR can incorporate these theatre-like features by using live action to reenact events of the story that is told for giving the viewers the opportunity to become a participant of the events instead of being the passive observer.

MAIN CVR FEATURES

Some of the main features of cinematic virtual reality such as 360-degree space, spatial audio and interactive elements can also be found in the video games or in interactive theatre, even though they are functioning differently because of the virtual reality environment.

- **360-Degree Video**: CVR uses 360-degree video to capture real world or computer-generated environments. The main advantage is that the viewer can look in any direction and explore the virtual space, providing a sense of presence and immersion with the story itself. At the same time, it is creating the disadvantages – directing the viewer's attention is becoming the real challenge for the filmmakers, in order at the same time to tell the story without missing any important narration details.

- **Spatial Audio**: CVR incorporates spatial audio technology to empower the immersive experience. The main advantage is that spatial audio can provide a sense of depth, while also being a tool for directing attention, allowing viewers to hear sounds coming from specific locations within the virtual environment and look for the source of the sound. This type of audio adds to the realism and sense of presence of the experience. Disadvantages can be the complexity of implementing spatial audio in VR, especially in real-time environments. It requires from the filmmaker to have a lot of specific knowledge to make the sound work in the way expected. It requires precise synchronization to ensure that the audio corresponds accurately with the viewer's movements and position in the virtual space.

- **Interactive Elements**: as CVR follows a pre-made narrative, it can incorporate interactive elements to varying degrees. Main advantage is that viewers can have the ability to interact with the virtual world, objects or characters. The main disadvantage is while having interactive parts, it is hard for filmmaker to create at the

same time strong story while having good level of interactivity that will not interrupt the main narration, but help to follow the storyline.

The feature that is specific only for cinematic virtual reality is immersive storytelling. CVR can immerse the viewer inside the story through virtual reality experience. Main advantages: helps to create a sense of presence, allowing viewers to feel as if they are physically present within the story world and enhances the emotional impact from the narrative. The disadvantage can be the fact that to create truly immersive narration, a lot of things should be considered in order to achieve wanted result. To understand more about how the immersive storytelling works, and what elements are included into it, it is necessary to investigate the question in more detail.

IMMERSIVE STORYTELLING

The narrative is a type of discourse that connects events and places, which typically form a whole event with a beginning and an end (A. Zhang, 2020). VR documentary is forming a new industry, but immersive storytelling is still in the early stages of development. According to Mu (2018: 181), "the storytelling structure of interactive documentary deviates from the traditional linear storytelling structure and change to nonlinear structures such as tree structure, mesh structure, parallel structure, and instant generated structure". It is necessary to notice that linear storytelling is becoming less and less used and one of the reasons for that is that CVR documentaries are striving not only to show the story but also to give the viewers the opportunity to have a new experience, often through interactivity.

With respect to the length of the production, Dooley (2017: 164) points out that "while the screen grammar of narrative virtual reality is still very much in the process of being developed, one can observe a trend in regards to the typical length of VR narratives. These tend to be short; generally, around 10 min or less". This characteristic of VR storytelling is also important, as filmmakers should find a way not only to tell the story and find the balance between the narrative and interactivity, but also accommodate the story to a certain extent of a documentary short film. This means that the story also strives to have a different, non-linear structure, in order to combine all the needed characteristics for creating the VR experience. According to Joan Soler-Adillon (2022: 352), "scripting for VR storytelling is scripting a choreography of graphic elements and their timings, sounds —many spatially placed—and the story itself, along with the assumed position and direction of focus of the interactor at every given moment". It highlights the idea that VR narratives are very complex, and a lot of characteristics should be considered while telling the story. Even though scriptwriting for documentaries usually really differs from the CVR, it is giving the filmmaker even more of a challenge how to create the VR experience for the viewers and keep their focus on the narrative.

According to Taborda-Hernandez (2022: 23), "360° VR narrative videos are not based on the interactive or immersive experience but are built with the need to tell a story". It is argued that this statement is fully applicable to VR documentaries. It is true that the story is essential; even though, immersion and interactivity are playing important roles in creating a well-thought viewer's experience. Without paying attention to immersion as such, there appears a question: why the filmmaker chose CVR space for telling the story instead of the flat film? If the needs of the CVR environment and differences in cinematic language will not be considered, "the need to tell the story" can be more effectively fulfilled in traditional cinema. As Zhang (2020: 46) suggests , "the stories don't change, but the way we tell them in CVR will change". This highlights the existence of

the necessity toto take into consideration not only telling the story but also the way how the story will be told. Therefore, the CVR, needs to be understood taking into concideration the specifics of this environment and immersion as one of the main characteristics of it.

In view of the foregoing, we want to highlight the connection between immersion and narration in CVR and address what is making the viewer involved in the story. For this, we will discuss the main classifications of elements connected to immersion and narration as such, combining them into one system for defining the main characteristics that should be considered while creating the non-fiction VR content. According to Matay and Bayar (2023: 2) "cinematic storytelling, particularly in mainstream narrative films, relied on the illusion of reality". From this it follows, that narration is having a constant connection with immersion, as for the creation of the illusion of reality the viewer should have deep mental involvement in the created virtual reality space. Ryan Bengtsson and Van Couvering (2022) propose a model, which is defining immersion as a combination of three main aspects: presence, interactivity, and plausibility. Each aspect will be analysed individually to explore what elements are connected to each of them.

PRESENCE

Presence as the illusion of a virtual body being one's own. Ruiz-Poveda (2023: 112) considers presence as "a defining element of the relationship between the viewer and the virtual world because of the impact that physical immersion in the synthetic environment has on the story". Sense of presence is important for the viewer to feel engaged with the narrative, as sense of presence can ease the integration of the user in the virtual reality. It is also was proven the connection of presence as a mediator of cognitive, affective, and associative empathy[1] (Cummings et al., 2022). On presence are influencing a lot of different factors, including psychological but technological, narrational and sociological (Hammed&Perkis, 2018). According to Cummings (2022: 3), "presence relates to the user's psychological state: namely, the degree to which they perceive the mediated reality as the one they are physically occupying".

However, the feeling of presence, except of the physical parameters, is strongly connected with the integration of the user into the narrative, about which we will talk in details in the next paragraph.

INTERACTIVITY

Interactivity as the ways the constructed context responds to the actions of the user. According to a series of experiments done by Ryan Bengtsson and Van Couvering (2022), interactive features added to the ability to take on different perspectives, introducing a dimension of intimacy and control to the experience.

Ruiz-Poveda et al. (2023: 112) notes that "the character's inability to engage with the environment hits the core of a classic narratological discussion: the relationship between character and action". In order to understand this relationship better, we should investigate the question of the integration of the users in the virtual reality environment. There are a lot of different classifications of which role the viewer plays in the film. Gödde (2018) points out existing of two options:

- **The viewer is only an observer with no connection to the scene**. Main characteristics of this type of interaction are pas-

1. The mediating role of presence on empathy is important factor in creating the needed effect on the viewer, helping to experience the VR content. Nevertheless, empathy is not a focal point of this investigation, and therefore, it is not discussed in this work.

sive experience, absence of interaction, and the control belongs to storyteller.

- **The viewer is part of the scene**. This type characterizes by active experience, existing of interaction, and control mostly belongs to the viewer.

This classification can be named as a general one, without counting with specifications and not taking into account the way the viewer appears relatively to the other characters.

Detailed classification of how the user can be integrated to the CVR was made by Ruiz-Poveda (2023):

- **Immobilized protagonist**: the user can only choose where to look.

- **The observing ghost**: their presence in the diegesis needs no narrative justification, the viewer stays "invisible" for the characters or the environment.

- **The companion**: "being the passenger in a car", the spectator feels the part of the scene.

- **Multifaceted user**: it combines multiple subjectivities and points of view through the editing of the piece.

As the classification was made for the cinematic virtual reality, it does not include the interaction with the characters or the world around the spectator. Because of the fact that we consider this classification the most precise, for adapting it to interactive virtual reality it needs to be modified in order to include the ability of the characters to interact with the VR space. In the classification of interactions of Devon Dolan and Michael Parets (2016), they take into account two factors: existence and influence, includes: active observant, passive observant, active participant, passive participant.

If combined, adding to the classification made by Ruiz-Poveda (2023) the characteristics not only of existence of the viewer but also influence (adding to each of the types characteristic of active/passive), can help us to fully explain the nature of integration of the users into the story.

Nevertheless, in most of the cases, interactive VR is characterized by giving the spectator few "roles" at the same time, creating the multifaceted user, when viewer can be able to interact only in some parts of the story, while being an observant of the others. In Chapter IV we will discuss the role of the user analysing already existing VR documentaries.

PLAUSIBILITY

Plausibility as if the logic of the narrative seems likely to be true, or possible to believe. This characteristic does not refer to the realism, as many VR productions exist in unrealistic environments (Ryan Bengtsson & Van Couvering, 2022). It is more connected to the logic of the story itself, then from the other factors like VR environment. According to Taborda-Hernandez et al. (2022) the components of significance of the story are:

- **Virtual landscape**: the actual environment that hosts all other

components.

- **Virtual atrezzo**: The set of components found in the environment to place the film in context.

- **Plot key objects**: objects that actively participate in the plot.

- **Plot key actions** : the actions relevant to the development of the plot.

- **Parallel stories or side stories**: stories or micro-stories that occur simultaneously with the main plot.

- **Main plot**: the main story. The rest of the components depend on it.

If the virtual landscape can be compared with the role of the location in a traditional cinema, then virtual altrezzo will reflect all the objects, that exist withing this space. Props, as much as a traditional cinema, are playing important role in the creation of the atmosphere that will help us to understand the story better. It can give the viewer cues about when or where the story is happening or to tell something about the characters, existing in this space, even when they are not there. Plot key objects are necessary only if they already exist in the story and are crucial for the viewer to understand it. If they exist, for the viewer to notice them, it is important to highlight it using the tools for guiding attention and definitely repeat their appearance in the story to make sure they were not missed. On the other hand, plot key actions will always be the part of the story, despite of narrative structure or the story itself. The story cannot exist without the action.

In interactive VR usually the spectator by oneself can be the one who should perform the plot key action. Actions and props can be used as a powerful tool of giving the viewer plot cues that will have the viewer to better understand the story. Existence of side stories is also not necessary, even though quite used, tool in VR storytelling. Because of the nature of 360° space, a lot of actions can appear at the same time. In traditional cinema, having two different stories in the same frame is hard to achieve because of the limitation of the frame, but in VR environment a lot of different events can appear around the viewer, as well as it is happening in the real world.

NEW FILM GRAMMAR

We should clearly understand the main characteristics of traditional non-fiction movies, to further transporting it into the language of virtual reality. First, non-fiction movies, also known as documentary films, aim to show real events, people, and facts rather than fictional stories (Merriam Webster, 2008). Usually, but not always, documentaries use real footage, archive materials, and interviews providing the most objective coverage of events possible. At the same time, non-fictional film usually uses reenactments as a tool for dramatizing or if the other way to show the story is impossible (for example, biographical films). It is important to understand that documentary films are following cinematic narrative rules, so the story cannot be one hundred percent objective. We decide what events to include, how to show them with accuracy but also, nevertheless, how to tell the story the way it will get to the viewer in the way we expect. While documentaries focus on objectivity, at the same time they are a reflection of the filmmaker's perspective of the story, as well as their vision of how to show this to the spectator. It is important to include cinematic language and visual techniques for the story to be understood. Non-fiction films are usually made not only to inform or educate but also to rising awareness and promoting social changes by creating compelling and thought-provoking narratives.

While transferring conventional documental films into the virtual reality environment, we need to understand what are the main differences that we need to take into account for the narratives to become stronger. VR documentaries should still follow the main rules of the traditional non-fiction narratives as using factual information and aiming to show the story the most objective way possible. Cinematic virtual reality technology is becoming more and more spread and can become a "new normal" as a new immersive media. The primary difference between CVR and traditional cinema is that instead of watching a movie through a 'window,' viewers can become a part of the scene (Vosmeer & Roth, 2021). Manovich states that the viewer must fully concentrate on events inside the window to focus on the representation but not on the space outside the window (Manovich, 2001). In CVR space it works as the opposite —the viewers do not have any screen frame limitations, and, besides concentration on the narrative, a considerable part of attention should be paid to all the space around them. This way, the main change in cinematic virtual reality is the ability of the viewer to choose the viewing perspectives in the 360 CVR environment (Figure 1) (Ko et al., 2018).
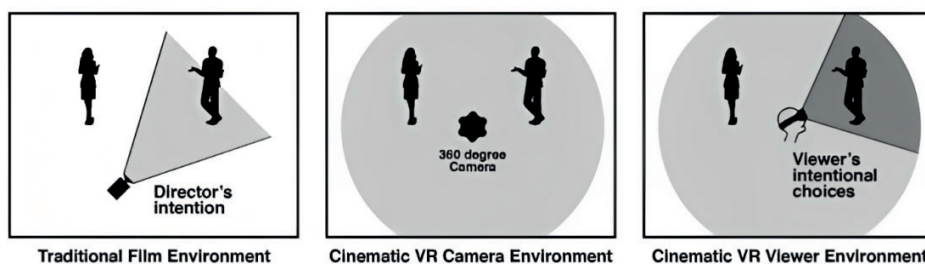

Figure 1. Film and Cinematic VR environment (Source: Ko et al., 2018)

By cancelling the limitations of the screen, we will have a lot of new possibilities but, at the same time, challenges. When producing content for CVR, it is crucial to take into account and understand the storytelling

methods that set it apart from traditional storytelling in a flat film. To understand what challenges we can face, firstly we need to investigate the differences in cinematic language and filmmaking methods of traditional cinema and CVR.

CINEMATIC LANGUAGE

The CVR environment differs significantly from the conventional cinematic space, so it cannot be directly translated into traditional film grammar. According to (Ruiz-Poveda et al., 2023), "CVR must examine traditional narrative paradigms to articulate its own storytelling conventions". The traditional cinematic language was developed for years and years, while constantly changing, finding new ways of storytelling and improving not only technological affordances but also the way of telling the stories using new filmmaking techniques. Conversely, CVR is really new technology in the early stages of developing its own language, that can learn valuable lessons from its older brother on how to show the story to the viewer.

Yu Zhang notes that the first difference between cinematic language is the role of the camera, as in traditional cinema the camera becomes the eyes of the audience, while in CVR the decision of where to look fully belongs to the viewer (A. Zhang, 2020). While in traditional cinema camera becomes the eyes of the audience, in CVR the audience is the camera (Matay & Bayar, 2023). In conventional cinema, by using the picture frame, the director really has more power in showing the audience exactly what they need to see. In contrast, in CVR the role of the director seems to be not that notable. The grammar of the shot is built differently, as in the traditional cinema it is following the strict rule, according to the story logic, where shots are creating the scenes, and scenes are creating the movie. The CVR film is much more usual to have a number of long takes (Ko et al., 2018), as well as the shot is not one frame, but the whole 360° space (Figure 3).

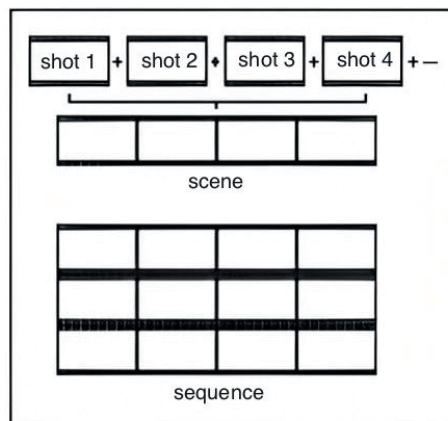**Figure 2.** Left: grammar of the shot in Traditional Film. (Source: Ko et al., 2018)
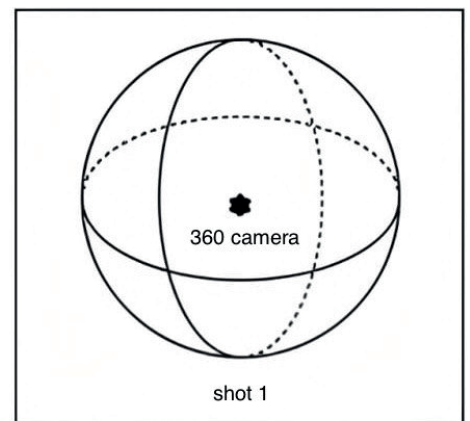
Figure 3. grammar fo the shot in Cinematic VR. (Source: Ko et al., 2018)

Considering the cinematic grammar differences, it is necessary to understand how effective or suitable can be the traditional tools for using them in a CVR environment, such as distance of framing, camera movement, camera placement, and shooting angle.

FRAME

In VR does not exist such thing as a frame as we are used to understand it. Cinematic virtual reality is more the environment, than a frame with borders and clear composition inside of it. In traditional cinema frame is the language filmmakers are talking to with the audience. Shots are logically organized due to the story, visuals, and the decisions of the crew where to guide the viewers' attention. Yu Zhang, describing the role of frame in traditional cinema, notices that "the camera and lens work together to record the real world inside a rectangular frame". It is important that the real world is truly being captured through the lens, and if the camera is our eyes, it will be the director's eyes. Combining different shot types (such as close-up, medium shot, long shot, etc.) director creates a storytelling model, that is always specifically made for the particular movie. Framing, and especially shot types, can be truly considered to be one of the ways of guiding the viewer's attention in traditional cinema. While working on the visuals of the future film, especially if we have strict scenarios and the actor's performance, we can decide, what parts are important and crucial for the viewer to see. We can highlight all the elements that are important not to miss by using close-ups (for example, for better understanding of the character's emotions) or details (to show objects that are important to the storytelling). All the information from the frame can also be strengthened by using the correct composition.

Yu Zhang divides the frame from the composition into two separate characteristics. It is argued that composition should be considered without taking into account the correlation with the frame. Composition can't exist apart from the frame within which it was created; every composition decision is applied taking into account shot sizes, the content of the shot, storytelling, etc. It is true that composition decisions can be applied to the whole movie, creating the style of the piece as a whole. Even in those cases, composition can't exist without the frame, as it is not the characteristic that can be applied apart by itself while creating the movie. Ward (2002) highlights the main reasons why a shot's composition should be organized:

- Guide the audience's attention to one part of the frame to highlight the important element.

- Create the atmosphere of a shot or a location identity.

- Provide essential or new information.

Taking into account these reasons for creating the composition, we can see that in this sense it is existing within the frame, but not apart from it.

Trying to implement the conventional shot types into VR, Yu Zhang proposes the system of "translating" traditional shot types into the shooting zones, as "an effective way for the VR director to position actors in scenes in lieu of traditional framing" (A. Zhang, 2020: 70) (Figure 04).

This approach is made from the understanding of the shot types as shooting zones with a defined range for each of them:

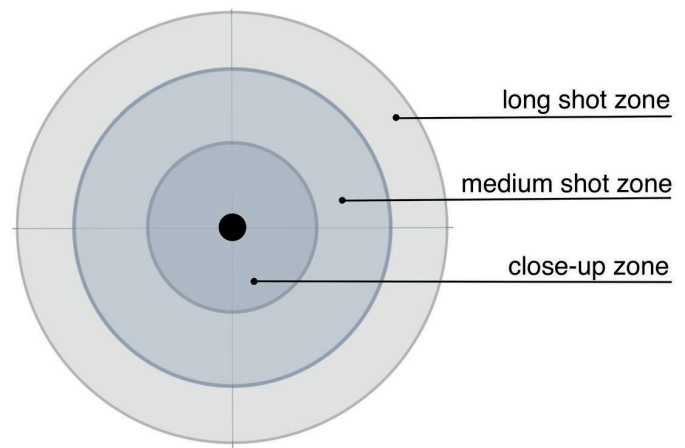- **Close-up zone**. Distance to the camera within 0.5-1m; if the

Figure 04. Shooting zones. Prepared by author based on Yu Zhang, 2020.

character is staying in the close-up zones for an extended period. It is recommended to keep the distance not less than 1m from the camera. This shot distance, as in traditional cinema, serves to show detailed facial expressions, that can highlight the emotions of the character.

- **Medium shot zone**. Distance to the camera is approximately from 2 to 10 meters. In this zone, contrary to conventional cinema, we can see the entire body of the actor, but it is fulfilling the needs of the medium shot.

- **Long shot zone**. Distance to the camera is between 10 to 20m. Exist to show the location and the characters, introducing the space to the viewer.

- **Extreme long shot zone**. Everything is located at a distance beyond 20 meters.
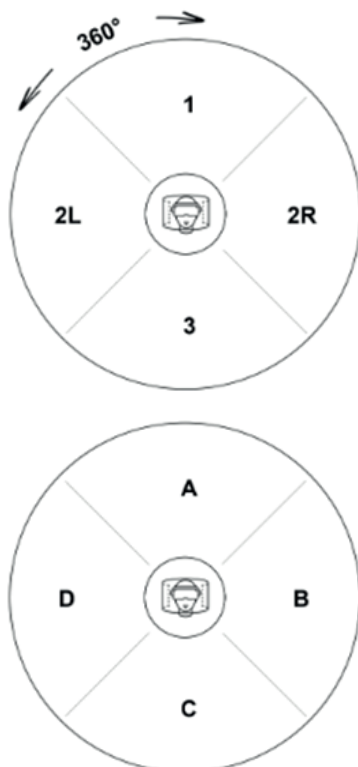
In our opinion, this system of implementing the shot types can be effective, as it is using already habitual for us terms, translating them into the new CVR language. This approach can ease the director's decision making about the placement of the characters and objects within the cinematic virtual reality space.

Another perspective on the question of translating a frame into the cinematic virtual reality is the proposal made by Kvisgaard et al. (2019), who divides the space into four zones of mise-en-scene. If in the model of A. Zhang (2020) shooting zones depend on how far from the viewer the action/character/object/etc. is located, mise-en-scene zones are rotating with the viewer. The primary zone is where the point of interest (POI) is located (Zone 1), two secondary zones to the left and right of the user (Zone 2R and 2L), and the tertiary zone behind the user (Zone 3) (Figure 5). (Kvisgaard et al., 2019) are also dividing the VR space into four User-Centered (UC) Zones around the user: Zone A (front), B (right), C (behind), and D (left). The aim of creating two differentiation is to ensure that POI Zone 1 and user-centered Zone A are aligned. We consider that in CVR space the point of view should not always be located in front of the viewer, and it is rather considered to be one of the ways of guiding the viewer's attention, than a rule the filmmaker should follow while creating the story. As a tool for guiding the viewer's attention, combination of POI Zones and UC Zones can be considered as one of the ways of schematic representation of how the point of interest can change within the virtual reality space.

Figure 5. POI Zones (up) rotate around the user, so that the POI is always in Zone 1, while UC Zones (down) refer to the local space of the scecene around the user. (Source: Kvisgaard, 2019)

CAMERA MOVEMENT

Camera movement is a tool that is spready used in traditional cinema for various reasons, starting with panoramic pictures of the location, to creating dramatic effects by following the characters or the objects. Camera movement is also used as a way of in-frame editing, for example, moving the camera from one actor to another during the dialog. In contrast, in CVR space, movement of the camera can be perceived as forced, because the viewer will be deprived of the opportunity to control it, which can cause motion sickness. According to (Fearghail et al., 2018: 319), "camera motion was accepted when it was clear to the viewer along what track that the motion would be taking place". In the experiments with camera movement (Y. Zhang & Weber, 2023), it was found that unstable movement of the camera caused dizziness. The same idea was highlighted by A. Zhang (2020), who states that the CVR camera movements should be done in a slow are stable manner, in order for the viewer to have enough time to keep the focus in the main narrative. In our opinion, even though the camera movement is one of the crucial tools for traditional filmmaking, in CVR it should be used only on the cases when it is required due to the story and the movement is predictable to the viewer to avoid dizziness.

CAMERA PLACEMENT

In traditional cinema, camera placement is important as it defines from what point the viewer will see the scene; camera is the eyes of the viewer. In cinematic virtual reality camera is the viewer. Camera placement in CVR defines the role of the viewer within the space. For example, if the camera is located at eye level with other characters, it notably eases the self-determination of the viewer as a part of the scene. In contrast, if the camera is placed way higher than other characters (if it is not justified by the story), the position will not feel as realistic one, so defining oneself as a part of the scene can be considerably more complicated. As (Ruiz-Poveda et al., 2023: 117) notes about one of the case studies, "the camera placement, along with the casual and relaxed conversation, serve to facilitate the feeling of belonging to the group". This way, we can state, that the camera placement should be made due to the narrative and the integration of the viewer filmmaker wants to achieve.

SHOOTING ANGLE

Shooting angle in the traditional cinema serves to dramatize the shot and show the attitude of the character or to the character, for example, seeing an actor from the lower angle highlights one's pressure, giving this character a "power", while the actor shown from the upper level will be perceived as a "victim". According to (Dowling et al., 2018: 360), "with VR the viewer takes control of the camera and can look in any direction so angles become less effective narrative devices while camera position and movement become more critical to the viewer's perception and level of comfort". Perception and level of comfort can truly rely on the shooting angle, as the viewer will have less freedom of choosing where to look and it will be more complicated to self-determine as the

character. Nevertheless, if a specific shooting angle is chosen to show the point of view of a particular, already known to the viewer, character, it can have a dramatizing effect close to the one that is reached in traditional cinema.

If in traditional cinema shooting angle is connected with the hierarchy of characters comparatively to each other, in CVR shooting angle doesn't exist as such, because it can be transformed into the camera placement and the height of the camera, as viewer can chose the angle of view by themselves. The closest to the camera angle in CVR is the question of the camera height. The viewer is watching the movie from inside the story and the camera level is the viewer's perspective in the virtual world according to Rothe, et al. (2019). The filmmakers should choose the position of the viewer by the height of the camera considering, firstly, the story. According to Rothe et al. (2019), most viewers are able to adapt their sitting posture to a camera height on a standing level, as much as on a sitting level. This means, that assuming the viewer will watch the VR film while sitting, filmmaker can use both sitting as well as standing position. The important while choosing the height of the camera is trying to avoid quick change of position or not narratively justified position, as it can result in the viewer feeling disoriented and can lower the level of immersion.

FIELD OF VIEW (FoV), REGION OF INTEREST (RoI) AND POINT OF INTEREST (PoI)

In the cinematic virtual reality language are adding few new, not used in a traditional cinema, terms – field of view (FoV), Region of interest (RoI), and point of interest (PoI). As in traditional cinema exist the concept of the frame, there is no clear translation for it in the cinematic virtual reality, as the limitations of the screen does not exist.

The field of view (FoV) is the section of the VR space, that the viewer determines visible (Figure 6). It is essential in CVR, as in 360-degrees environment users have the freedom to adjust the orientation of their field of view, by choosing the direction of their gaze (Speicher et al, 2019). In turn, point of interest is determined not by the viewer, but by
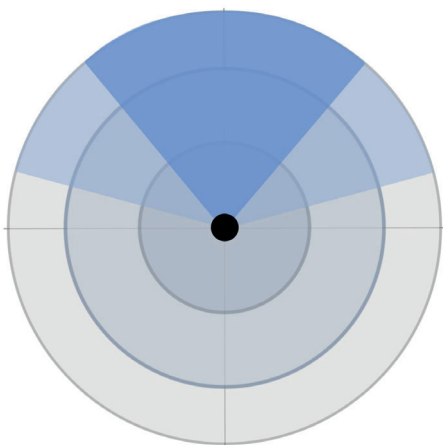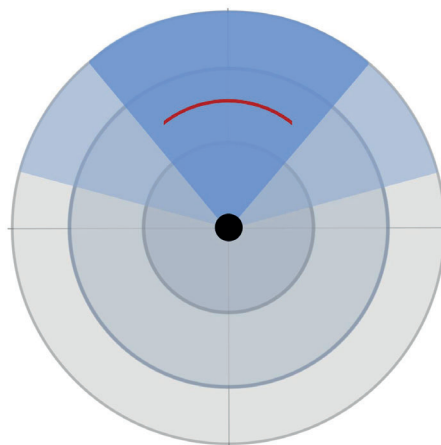

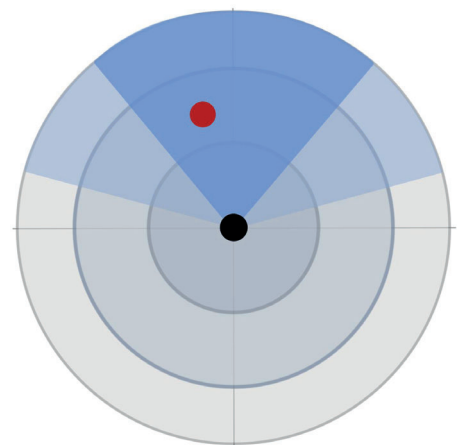**Figure 6.** Field of view.   **Figure 7.** Region of interest.   **Figure 8.** Point of interest.

the filmmaker, and one of theirs challenges is to keep POI in the viewer's field of view.

Region of interest (RoI) is the area of the 360-degree space that is of interest of the fi lmmakers for the viewer to pay attention (Fearghail et al., 2018; Rothe, Buschek, et al., 2019). This area includes the main action of the scene, or, for example, is the scene does not have particular point of interest –like if integrating 2D videos inside the VR space, where all the video is of interest, and not only one particular point of it (Figure 7). Region of interest is used in terms of guiding the viewer's attention, when the orientation of the virtual body is faced to the area of a CVR space that is of interest in every particular scene, and includes the PoI.

Point of interest (PoI) is the part of the virtual space, where the filmmaker wants and expects to keep the viewer's attention. The POI is not connected with the FoV and can be located in the part of the space that is out of the viewer's field of view that can result missing out important for narration information or events (Figure 8).

FILMMAKING METHODS

PRE-PRODUCTION

The absence of the limitations of the screen is significantly changing filmmaking methods. As now we don't have a frame, which is one of the essential cinematic components in traditional cinema, the pre-production phase should be throughout rethought. Talking widely, pre-production is the process of planning or designing something prior to production(Merriam-Webster, 2008), but, of course, this definition includes any type of pre-production, not only the one in filmmaking. What makes film pre-production special? In my opinion, Steve R. Cartwrigh gave a full and correct definition in the book "Pre-Production Planning for Video, Film, and Multimedia" (Cartwright, 1996:2): "…planning starts with the problem, idea or communication need and continues through the distribution of the program to the intended viewer". The traditional pre-production phase, widely speaking (except for the crew, and talent selection and preparation), usually consists of two main parts: work on the story and work on the visuals.

The story is essential and primary for any type of cinematic content. The work on the visual part in traditional cinema is always based on the story, as all the visual decisions should be adequate to the storyline and serve to make it as clear as possible.

VISUAL REFERENCES

Visual references constitute a big part of the visual preparation for the process of shooting. It can serve a lot of different purposes and noticeably make a pre-production process easier and well made. Finding the references can help for:

- Inspiration and composition decisions.

- The communication between crew departments to have an understanding of the visuals.

- Finding a unique style for the future film.

- Help with the creation of the storyboard.

Having references to particular shots will ease the creation of the storyboard by making a shot close to the one you are using as a direct reference. Sometimes these shots can be a clear reference, when you can tell where the original idea came from (for example, an exact recreation of the shot from a movie), or, in other cases, just using some tips from the shot such as light pattern, composition, the position of the camera, etc.

As the CVR environment does not have a frame in its classical sense, the reference search is not limited by 2D images. The references can include not only visuals but also usage of the particular technology, the position of the camera or camera angle, as much as the way of guiding the viewer's attention. Considering the nature of the CVR environment and the ability of the audience to choose where to look, visual references can include also colour palette, the overall atmosphere of the space, or the character's placement relative to the camera.

STORYBOARD

The storyboard is visualizing the shots of the future film, which will help to see how the shots fit together before the production phase. It serves not only to help to prepare for shooting but also for editing. The creation of a storyboard is a great investment for the whole film production process, from the begging to the end. Having a storyboard also helps with the further development of the light patterns, that also can be shown on your storyboard.

Storyboards can include a lot of parameters, from very simple stick figures (Figure 2), detailed light patterns, or fully worked camera movement and shot details (Figure 4). One of the most important uses of storyboards is creating a map of the frame length throughout the script, which is one of the essential traditional filmmaking techniques.

As much as a storyboard in traditional cinema is usually done as a series of 2D images to represent the framing for every shot, the storyboard for CVR should represent all the spatial narrative. According to Yu Zhang (2020), "to effectively portray the CVR screen, a storyboard would need to be designed to represent the CVR spatial narrative. In practice, using 3D animation software in CVR space can be effectively represented in the form of a 3D previs [previsualisation]" (A. Zhang, 2020). One of the examples of 2D storyboards for CVR films was made in (Ko et al., 2018) (Figure 9). In this case in particular, the storyboard is made as a part of the 360° space, and the main attention is paid to the man and where he is looking; at the same time, it has the lines of the actor that are to be said at the moment. We can presume, that this storyboard will be mostly useful for the actor, as it includes his main action of this part

Figure 9. Storyboard of the CVR (Ko et al., 2018)

of the scene – smile while telling the text and shifting the gaze to the photo on the floor. But what information is it giving to the crew? The main function of the storyboard is to create the visuals of the film while helping the crew members to understand the frame and composition of the particular shot. As much as a frame as a component of cinematic language does not exist in the CVR, the aim of creating the storyboards should also change. In the example above, we can presume, that the aim of the storyboard was to show where the attention should be drawn in the scene and to help the actor to better understand his actions.

VOICEOVER

In VR documentaries, the use of voice in narration plays a crucial role in guiding and improve the viewer's experience. In traditional films, the main purpose of the voiceover in documentary films is providing the viewers with factual information about some events or people. Important task the voiceover can complete is introducing the subject matter, while guiding viewers through the virtual environments or reenactments. The voiceover acts as a storytelling element that can help to put together different scenes and provide continuity of the story, making the structure easier to understand for the viewer. In VR space, especially in interactive content, the usage of the voiceover as a source of narration is significantly expands. As now the space is not limited by the frame, it can be confusing for the viewer to stay within this space without having guidance, which usually can be solved, except for visual tools, by using the voiceover.

The usual classification of the usage of voiceovers in the narratives divides it in two groups: first-person and third-person narration. This approach seems to be not fully explaining all the narration options that are available within the virtual reality space. While describing the usage of the narrator's voice in the context of fiction, Mitchell (2021) notes that it can free the author from using the first-person narration, which gives new options for narrating the plot: as the protagonist (autodiegetic narrator), as a non-protagonist character diegetic to the story (homodiegetic narrator), or as a non-diegetic, unrepresented, character (heterodiegetic narrator). Even though his classification originally was made concerning the fiction, it is safe to say that it is fully applicable in a documentary films as well. The only difference would be the fact, that non-diegetic narration is much widely used in documentaries, as it is expected to hear the voice that will give the context of the story or deliver the information. When the viewer in the narrative is addressed in the second person "you", it is giving to spectator a role of co-creator (Alex Mitchell, 2021). We believe, that this can be a promising tool for engaging the viewer in the story, helping them to have a feeling of immersion and actual presence in the VR environment.

It is also important for the voice to have spatialisation effects, as much as understand where the sound is coming from, especially if the voice is coming from diegetic character. This can help the viewer to feel more integrated in the environment, as much as will make the experience more true-like. Voiceover can also be a powerful tool for guiding the viewer's attention.

REENACTMENT

Reenactment is a filmmaking method that is real events playback using actors. This method is widely used in documentaries creation, as in a lot of cases there are no archive recordings or any visual material that can be used, as much as if the character needs to be played by the actor due to the circumstances. Even though in documentary films it is preferable the usage of real footage, we consider that reenactment can be used as a powerful tool, especially in a VR environment.

Except for the main purpose of the reenactment – showing the events that can't be covered otherwise, there are a few other reasons to use reenactment as a tool in VR documentaries. First, shootings with actors are always more predictable. Having a pre-made script can help to prepare for the shooting and think about all details more precisely. This way, the director has more control of the shooting environment and interaction between the actors. Reenactments in VR documentaries provide filmmakers with the opportunity to go from the traditional narrative structures and help with dramatizing the story if it is needed for a deeper understanding of the story. It can also help to show the story from multiple perspectives, for example, the viewer can become the protagonist of the story.

VR reenactments can transport viewers directly into historical scenes or events, creating a sense of presence and allowing them to experience the story from the first-person perspective. VR reenactment also allows filmmakers to add interactive elements directly with the characters, not only with the VR environment. This tool can help to break the fourth wall and create the feeling of full immersion in the story.

When performers act on a stage within a narrative and suddenly address or acknowledge the audience through the proscenium, it is often referred to as breaking the fourth wall (Kudra, 2019). Even considering the fact, that originally this term is borrowed from a dramatic theory (Vosmeer & Roth, 2021), it is widely used in terms of cinematography and within VR spaces. In the cinematic world, breaking the fourth wall refers to the elimination of the border between the character and the audience, usually by eye contact. Due to Ko et al. (2018), direct eye contact between the acting person and the audience has been tabooed in traditional film grammar. It is partially true as in a cinematic tradition eye contact wasn't used for many years, but lately, it is more spread and is used as a specific tool for creating the feeling of "realism". Nevertheless, eye contact in VR documentaries can be used for deeper immersion of the viewer to the story and feeling as a participant in events.

It seems to be promising the usage of reenactments will let the viewer not only interact with the world but also make decisions that influence the outcome of the reenactment. Reenactment can be used as a new strategy of creating the CVR experience that can include at the same time deep level of immersion and the interactivity. This model is complicated to perform, especially to create a form of narration where all the possible results will have the expected response from the viewer. Reenactment in a form of an interactive VR experience with the opportunity to change the story can be a topic for future investigation.

SCHEMATIC REPRESENTATION OF THE CVR SPACE

The question of the purpose and the possibilities of uses of the storyboards for cinematic virtual reality need to be discussed in detail. While using 3D animation software can be represented in the form of a pre-visualization, it is not that effective for creating a simple storyboard, as it needs a lot of use of specific technological appliances. Talking about 2D storyboards for CVR, it can be made as the example above (Figure 9). But we would like to propose alternative ways of creating the storyboards for CVR using only 2D images.

a.   Option one is more alike to a storyboard suggested in (Ko et al., 2018), as it takes into account only one part of the CVR environment, as shown in Figure 10. It can be the area where the primary action, secondary action, or tertiary action takes part. In this case, our "frame" will be the action of the scene and the area where it takes place. These storyboards can include not only the main action of the actor, but main movements around the scene, and the "length of frame" will be defined by how far or close the characters and objects are located compared to the camera (or cameras). In this case, one scene can be shown by a series of images created for the main storyline and, if needed, for the secondary ones. Except for the main information about the scene and the distance from the camera, these storyboards can show the movement of the characters, the movement of the camera, and shooting angle, as well as it can be done in traditional cinematic storyboards. This method has its disadvantages, as the shooting environment is being understood in terms and grammar of traditional cinema, adding so-called framing. Even though it can truly become the easiest way of creating a storyboard for cinematic virtual reality, it can lose specifics of the approach in which CVR should be understood.
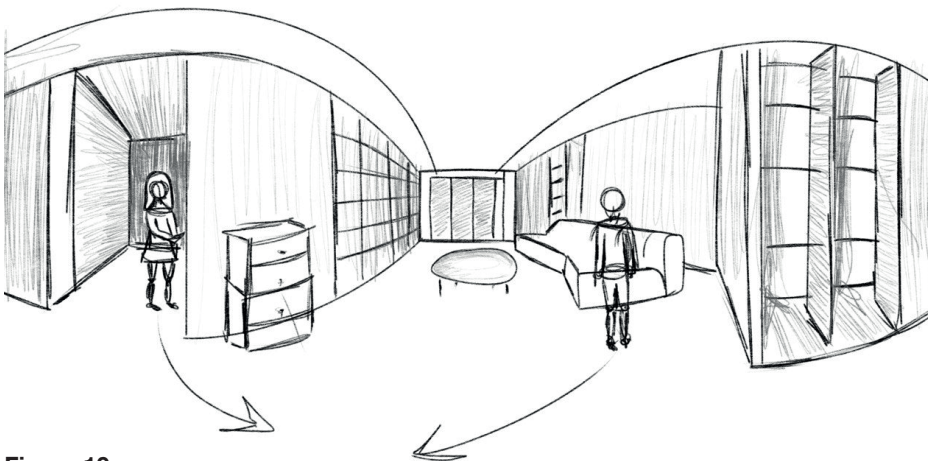
Figure 10.

b.   Option two is understanding the CVR environment in the way purposed by Yu Zhang (A. Zhang, 2020), by dividing CVR into the shooting zones: close-up zone, medium shot zone, long shot zone, and extreme long shot zone. This method covers the shooting area from a top view, allowing one to see all the shooting zones at the same time (Figure 11). This way the CVR environment exists taking into consideration the specifics of the 360° space.

This way we will lose the details like a glance of a character or small movements, but all this information should be written in the script. Also, as much as we are talking about non-fiction CVR, the actors can mostly appear during reenacting, so the need for a detailed storyboard is not as essential as in a feature film. By creating a storyboard from a top-down perspective, we can effectively illustrate, as well as in the first option, the primary movements of the scene, positions of the cameras, and, importantly, positioning comparatively to the camera due to a shooting zone (Figure 11). This approach serves as a substitution for the length of the frame. We can presume, that the viewer's attention will be triggered more by the action in the closer zones of the shooting, rather than in the furthest ones. If the action takes place in different zones, it can also be effectively shown in a top-view storyboard. This way we have the opportunity to see all the CVR space at the same time, perceiving it as a single whole, and not miss any main or secondary narratives we want the viewer to experience.
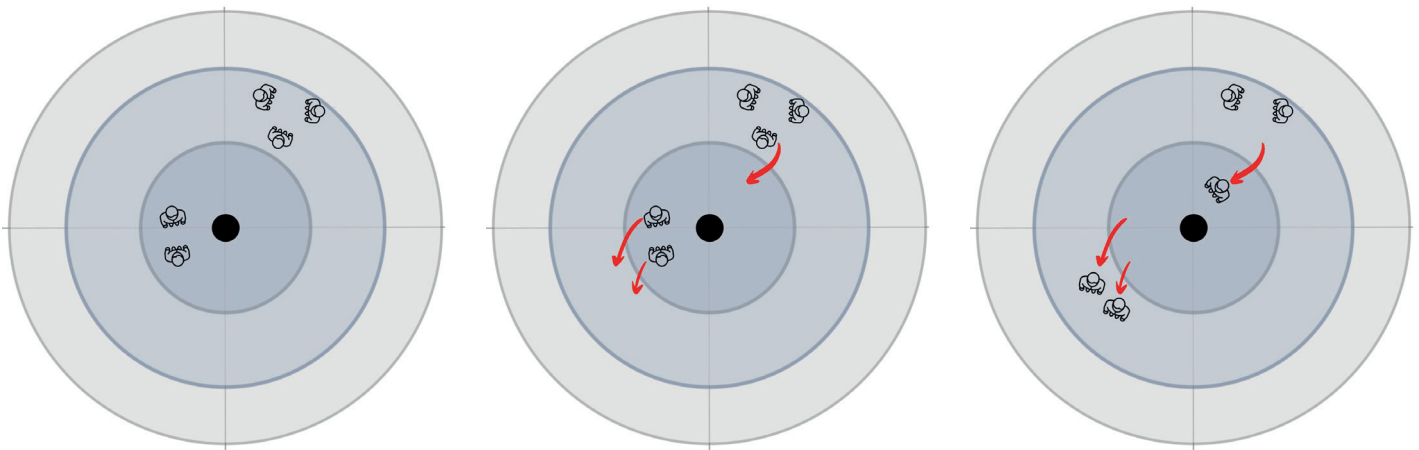
Figures 11-13. Storyboard examples

The same way of schematic drawings can be used for creating analysis of the CVR films. The aim of creation schematic drawing of VR space (based on shooting zones (A. Zhang, 2020)) is helping with analysis of CVR space. This method will be used for analysing already existing non-fictional VR experiences (Chapter 4). The schemes will be made for the case study analysis, answering the next questions:

- Where are located the main PoI in the movie (in which shooting zone and where comparing to the direct view after the cut).

- If we can see all the VR space around us, or part of it is in blind zone (for example, as in You destroy. We create, when not all the area is visible), or if some part of space remains "empty" (like in "On the morning you wake").

Answering these questions is crucial for understanding, how the filmmakers were using the VR space in order to let the viewer experience the story. It can also help to compare different CVR documentaries with where were the points of interest apart of taking into account a storyline, to understand the tendency, if they exist, of how placing of the main points of interest correlate with the ways the attention of the viewer was directed.

For clarification of the visual part of the drawings, we add Figures 14 and 15 with explanation of the positioning the elements within the virtual reality space from the top view.
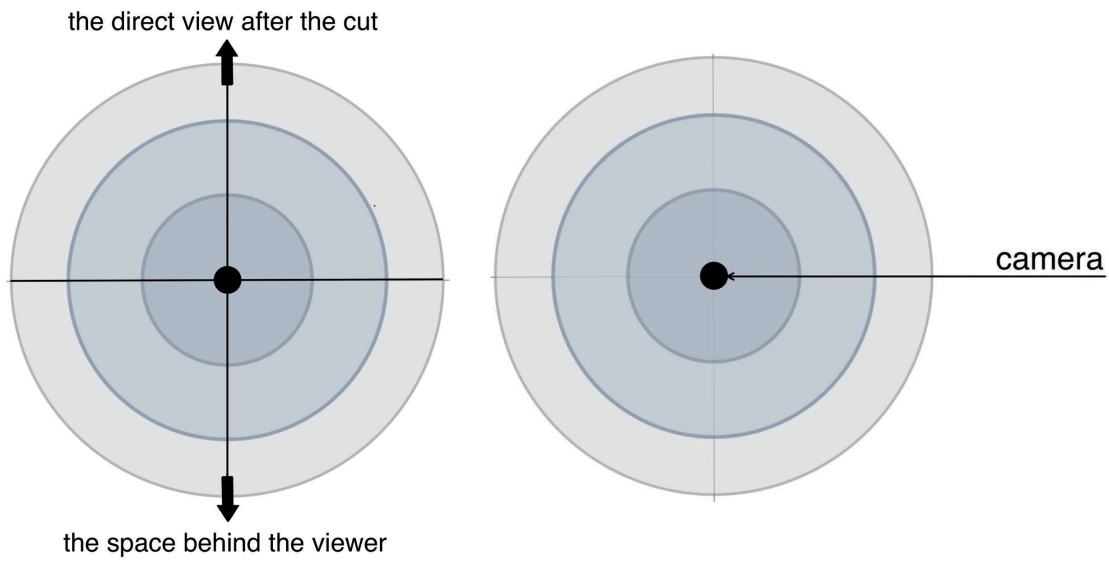
the direct view after the cut

the space behind the viewer

camera

Figure 14 and 15. Explanation of the viewer/camera position in proposed representation of CVR space.

GUIDING THE VIEWER'S ATTENTION

LEVELS OF VIEWER'S ATTENTION

The director's task of guiding the viewer's attention in omni-directional environment is significantly changing. If in the traditional cinematography ones of the main tools for guiding attention are framing and composition, in the VR, space is not limited by the screen, so this tools cannot be used in directly the same manner. Regarding the changes of the space and the possible opportunity of interaction with virtual reality environment, methods of guiding viewer's attention should be re-considered.

The question of guiding the viewers attention in VR space in undoubtedly one of the biggest challenges that filmmakers are facing while creating virtual reality documentaries. This question was investigated by many researchers, including, but nor exclusively, Ruiz-Poveda (2023) Fearghail (2018), Joan Soler-Adillon (2022), Speicher et al. (2019), Tong (2020), Marã (2020), Rothe and Hußmann (2018), Dooley (2017), Dehart (2021), Tong and Clifford (2022). Despite of the wide area of the research, guiding attention still does not have a "magic pill" that would work in every case without exceptions.

As Joan Soler-Adillon (2022: 352) noted, "spatialized sound will make them [viewers] turn—or so we can assume for most interactors—towards a certain direction, and a voice-over talking about an object on the floor will make them look down. All these elements are in place and, if well crafted, will create an experience where the interactor feels free to look and move at will while, as storytellers, we know where most of them will be focusing at any given time". As the results of questionaries, made by Fearghail et al. (2018: 319), are showing, "viewers prefer to have their attention led rather than forced".

This can be a real task for all the filmmakers, creating VR experiences, to achieve this deep level of understanding how to connect possible elements together in order to give freedom of decision making and gently leading the viewer through the story at the same time. For becoming closer to achieving this on practise, first, we should clearly understand the tools we can work with to guide the viewer's attention.

According to Speicher et al. (2019), the freedom of point of view (PoI) can distract viewers and makes it difficult to show what is essential to the story. They note that for maintaining immersion, it is crucial to guide the viewer's attention to the important parts of the story, while also acknowledge the possibility of motion sickness. Nevertheless, the story in omni-directional environment can have, except for the main plot, also secondary important elements existing withing the narration. Ruiz-Poveda (2023) divides the user's attention in three levels by order of importance: the main narrative interest, the secondary narrative context, and the environment.

MAIN NARRATIVE INTEREST

The main storyline is where we expect to concentrate out viewer's attention the most not to miss important narration, events, actions etc. According to Ross and Munt (2018), because of the reason that we can't control the way the

user will look, the audience can ignore the main storyline. Some researchers suggested to give up on having all the action in one part of the scene (Amy Pavel et al., 2017). This approach is not the most effective in term of CVR, as having a micro narration except for the main one is pretty common, it needs to be considered the question of how to lead the viewers attention in order not to miss the crucial parts of all the narratives existing within the VR environment. While talking about VR documentaries, micro stories are usually following one another, adding to the main storyline, instead of existing all at the same time.

SECONDARY NARRATIVE CONTEXT

It is necessary for a viewer to understand the context where the story is happening. The secondary narrative context in VR documentary refers to an additional layer or storyline that completes the main narrative. It is important to notice, that secondary narrative context is not the same as a secondary storyline. It can be compared with virtual atrezzo – as much as props are helping us to add context in the space, secondary narrative is helping us to add context to a story itself. It provides additional information or perspective that enriches the overall documentary experience for the viewer, making the story to feel more complete and helps to understand the context of the story. It adds depth and complexity to the storytelling in VR documentaries, helping the viewers to understand and engage with the main narration.

ENVIRONMENT

The attention, the viewer is paying to the environment, is crucially important to consider while creating VR documentaries. When the viewer is getting into VR space, it is important to give a time to look around and evaluate the overall environment. If the scene is starting right after the cut, without giving the time to the viewer to understand their position and space around them, it can lead not only to lack of attention on the story, but also disorientation. Interesting experiments, can relate to the topic of environment attention, was made by Pivik et al., (2002). The experiment were made to teach disability awareness among school age children, who were told that they are to travel in a "virtual wheelchair" and discover the "building" and "bad attitude" barriers in the school. The environment was open to the exploration, and no guidance or methods of guiding attention were used. As a result, in providing a totally unstructured environment, the children focused on exploration instead of the task they had of identifying the barriers. According to Barreda-Ángeles et al. (2021: 156), "some VR users tend to spend time exploring the space around them, even at the risk of diverting attention from events that might be key to the main narrative". It means, that we should give the viewer enough time to explore the environment around them, before jumping into the plot. Besides, we can suppose that we should pay attention at the correlation of how many directional cues should be located on other levels of the viewers attention in order for them not to miss any important part of the storytelling.

Even though the user's attention has main focus on the primary narrative interest, but all the three levels are equally important to incite the user's immersion (Ruiz-Poveda et al., 2023). It helps the story to be more complete, and if the attention of the user will be paid on all the levels, it will make the narrative more immersive and true-like.

TOOLS FOR GUIDING THE VIEWERS ATTENTION

As much as the viewer's attention has its levels, director's cues has their own classifications, that affects the way they will be integrated inside the CVR space. (Rothe et al., 2019) proposed a classification considering the main attributes of guiding the viewer's attention that helps to find the most relevant and qualified characteristics for guiding methods in CVR:

- **Diegetic/non diegetic:**

  Diegetic. Advantages: high presence; disadvantages: depends on the story.

  Non diegetic. Advantages: noticeable to the viewer, easy to use; disadvantages: can interrupt the VR experience.

- **Visual/Auditive/Haptic:**

  Visual. Advantages: easy to integrate; disadvantages: depending on the field of view.

  Auditive. Advantages: works for off-screen; disadvantages: complicated to distinguish between diegetic/non diegetic.

  Haptic. Advantages: novel experience; disadvantages: complicated to implement and needs additional devices.

- **Direct/indirect:**

  Direct. Advantages: fast; disadvantages: lasting for a short time.

  Indirect. Advantages: sustainable; disadvantages: must be interpreted by the viewer, hard to predict the response.

All the tools can be characterized in limits of this classification, while having different combination of characteristics above.

Director's cues are important as besides helping to attract attention as expected to the story, it will also lead the viewer and make the experience more pleasant. We need to understand, which tools exactly can be used in order to achieve a positive experience. Wang (2021) points out three resources for guiding the viewers attention: light, sounds, and movements. In addition, in a Fearghail (2018) defines other three groups of directional cues: sound, environment, motion/action. As in this definition by the environment cues the author means all the visually visible cues, such as brightness, contrast, colour, visual effects elements, etc., light from the first classification can be considered as a part of it.

SOUND

Sound can be undoubtedly called one of the most widely used way of guiding the viewers attention. It is important to consider also the spatial characteristics the sound can have for it to feel more realistic. Wang et al. (2021, 2) suggest that "some viewers were induced by new sounds to search for the source of the sound". This means, that placing the sound in the particular part of the space can attract the viewer's attention. Nevertheless, even without using the spatial characteristics, sound can be a helpful tool for guiding attention, especially when the source of the sound is non-diegetic. Non-diegetic sound is mostly used for overall narration, when the presence of the narrator inside the virtual space is not necessary, or if the voice of narrator is associated with the viewers themselves from the first person, as typically is made in video games.

a. VOICE

With spatial audio technology in VR, music can be positioned and synchronized with the visual elements to create directional audio cues. This helps guide the viewer's attention towards specific points of interest or important elements within the virtual environment. (Alex Mitchell, 2021).

The voice can be used for easily implementing the direct cues. For example, Fearghail et al. (2018) note, that in some examples the voice-over can be used such as "look around you" in order to encourage exploratory behaviour from the viewer, or by telling the viewer to "take a look to the right". These cues can be both diegetic and non-diegetic, for example, coming from the actor in the scene or from the narrator's voice on the background. The same tool can be used with indirect cues, that are made to make the viewer think and after to take action, but in this case, as the cue will depend on the interpretation of the user, it might not have the expected result.

The possible indirect way of guiding the viewer's attention by using the voice is adding diegetic character into the scene by first hearing their voice. For example, if the character is entering in the scene from the off-screen and the first thing the viewer hear is the voice, and only after the character is appearing in the scene, putting the face to the voice.

b. ACCOMPANYING SOUND

Accompanying sound is connected to the noises, existing withing the scene, there are not connected to the voice. For example, it can be sounds of steps, noise from the car, or any sound from the object inside the scene. Cues from accompanying sound are usually used together with visual ones. It is expected, that spatialized sound is encouraging the viewer to look for the source of the sound. As Cameron et al. (2023: 62) point out, "If the sound is coming from one side – say a door closing – then, like in real life, people will turn to look at it". This approach is build on creating the environment, that is the most close to the real life, and trying to use the sounds from our everyday life that is connected with some particular actions or events. For example, mentioned sound of opening the door is associated with someone coming inside the space or leaving it, as much as it can be a possible invitation to come inside the space, which door was opened.

Rothe et al. (2019: 13) note, that "sounds motivate the user to search for the source of the sound and therefore to change the viewing direction". Nevertheless, according to (Rothe & Hußmann, 2018), objects connected with sounds truly attract more attention than without sound, but can guide the viewing direction even if the sound is not spatial or is coming from another direction. It proves that even is the sound does not have a particular source it is coming from, it will still attract the viewer's attention, which can ease the use of non-diegetic audio cues.

ENVIRONMENT

Environmental cues can be found within the virtual reality space and are visually visible to the viewer. For example, according to Fearghail et al. (2018), there are two main methods of guiding the viewer's attention in a VR short film: 1) the orientation of the virtual body is faced in the region of interest; 2) the viewer's attention is guided by the use of implicit diegetic guidance. Both of this methods can be considered as environmental cues. Dooley (2017: 169) suggests that: "some effective ways of attracting the audience's attention might include a sudden flash of light, a bright colour, or a loud sound". From these, a sudden flash of light and a bright colour are considered as environmental cues. Environmental cues are not connected to any character or object in specific but reflect how 360-degree space can be used in order to direct the viewer's attention.

a.   LIGHT

According to Wang et al. (2021: 2), "a still light did not draw more attention than other objects, while a moving light could significantly change the direction of gaze". According to Rothe and Hußmann (2018), non-moving lights had no effects in their tests, but, at the same time, moving lights can guide the viewing direction even without any sounds. This means, that light can be used in order to attract the viewer's attention, but it is preferable for the light to have motion. Another way the light can be used is by adding the light to the objects or areas inside the CVR space that can be interacted with.

b.   VIRTUAL FRAMING

Virtual framing is used as a scene design. By using physical structures within the scene set-up (for example doorways, windows or corners), as virtual frames, it can help to guide the viewer's attention (Zhang and Weber, 2023). This way of creating frame within the virtual space can be familiar to the habitual for the viewer frame of the traditional cinema.

c.   BLUR

As Fearghail et al. (2018: 311) notes, "blur was also evaluated as a method to direct the viewer within a virtual environment". Blur can be used in a various ways, but usually it serves to "hide" one part of the visual space to highlight the other. Rothe et al. (2019: 7) notice, that "the viewer tends towards regions with little or no spatial blur if the rest of the image is more blurred. This approach is very similar to methods used in traditional filmmaking". It is necessary to note, that in traditional filmmaking blur exist mostly not as the way of attracting attention, but because of the particularities of the camera lenses characteristics and the depth of the field. This term is not applicable in the CVR space the same way because of the technological specifics of the 360-degrees camera. VR cameras like the Google Odyssey often rely on small sensor arrays with little to no DOF (Dowling et al., 2018). But, effectively, blur in virtual reality space performs another function – guiding the viewer's attention to the areas that has no or less blur.

d.   ORIENTATION OF THE VIRTUAL BODY

Orientation of the virtual body is faced in the region of interest. In traditional cinema, after every cut the viewer can see only the region of interest of a particular frame. The same approach can be used in CVR, where after the cut, independent of previous field of view, the user will be directed to the region of interest of the scene (Rothe, Buschek, et al., 2019). This method of guiding the viewer's attention is widely used in the VR content creation and is the fastest way of guiding the user's FoV to the needed area of VR space. One of the di-

sadvantages of this method is if having these transitions too fast, it can lead to the viewer's disorientation in space.

MOTION/ACTION

Motion and action are the most common ways of guiding attention in traditional cinema, as there is no story without the act. The

a.   MOTION

Camera movement

Camera movement, such as zoom in/zoom out, travelling or panoramic movement etc. is widely used in the traditional cinema as a way of attracting attention. In cinematic virtual reality, the movement of the camera should be used only in the specific cases, as it often cases the motion sickness. Camera movement in the virtual reality environment where the viewer can choose their own field of view can feel as forcing the attention rather than guiding it. Acording to Fearghail et al. (2018: 319),"camera motion was accepted when it was clear to the viewer along what track that the motion would be taking place". Mostly, we should note that guiding the viewer's attention in CVR space by changing the distance or the position of the objects/characters inside the shot could work more effective not by moving the camera (the viewer) inside the VR space, but by moving the objects/characters closer to the viewer.

Object motion

Object motion can be divided by motion of stationary objects (like swinging), or locomotive objects (the movement with changing of position) (Rothe & Hußmann, 2018). The object's movement can be the effective way not only when the attention should be guided to this particular object (for example, if it is plot key objects), but also if we need to guide the viewer's attention through the VR space. As an example, the viewer can follow the movement of the car that will end in needed for the director region of interest. The movement of the objects is also usually combined with the accompanying sound, that can make the effect from this method more noticeable.

b.   ACTION

The action of the actors, usually used only as direct pointing to the PoI, is one of the widely spread diegetic director's cues. The results of the experiments showed that there is no significant difference between using big actions (arm pointing) and small actions (head pointing) for guiding the attention of users, but they also significantly degrade user experience (Wang et al., 2021). In relation to this, it is important to consider other actions of the character that, at the same time, will be clear for the viewer, but will feel more real like without depravation of the viewer's experience.

According to Ryan Bengtsson and Van Couvering (2022) based on their practise oriented research, the viewers noticed, that the characters were disagreeing with the situation in the scene based only on their body language, as it was in conflict with their verbal expressions. It means, that in CVR space viewers are still recognizing body language and take it as more realistic, which proves that director's work in case of having the scenario is still really valid and important to improve the viewers experience.

Tong et al. (2020: 277000) introduced the concept of action units (AUs) based on the similarities between the narratives in virtual reality and the conversations

in the real world. They state that "in a typical conversation, people use social cues to attract attention or convey intentions. We believe those social cues can also be used by the storyteller as tools to direct viewer attention in 360-degree videos, as she addresses the viewers directly in the scene, same as a daily conversation". This model seems to be really promising not only in a sense of guiding the viewers attention, but, at the same time, making it the most realistic way possible, deepening sense of immersion.

It is important that all of the tools listed above can be used in combination with one another, depending on what will be logical due to the storyline. Even though there is no direct answer of what of the director's cues work the best, it is considered that cinematic virtual reality is already developing its own grammar of tools and combinations of how to make the viewer not to miss the important narration parts. It is still challenging to guide instead of forcing the viewer's attention. There should be a balance between diegetic and non-diegetic cues in order not to overload the story with not needed director's cues.

CASE STUDY

In this chapter we will exemplify the analysis of already existing VR experiences. The analysis includes eight study cases, ordered by the level of interactivity from the lower to higher. We will talk about characteristics such as: narration, visuals, sound and integration of the user, which includes the question of interactivity and guiding the viewer's attention. All the parts of analysis are structured by the topic of the question, listed above. Every section consist the wide information about each case study in particular, as well as overall comparison and short conclusion at the end of each section, that can be understood apart from the detailed analysis.

The chapter serves to deeper the understanding of how different element of the CVR experience work together and influence each other. How (if) the traditional cinema elements are used, and if the convention documentaries have impact on the non-fictional VR content.

For analysis purposes is used the framework proposed in the Chapter 2 (see: Schematic representation of the CVR space) method of representing the main points of narration interest of the VR experience, to understand to what cases this method can or cannot be applicable. Also, the drawings can help to see the positioning of the points of interest (or regions of interest) without needing to acknowledge the context of the story.

NARRATIVE

1. YOU DESTROY, WE CREATE

↑ **Figure 16.**
↓ **Figure 17.**

↑ **Figure 18.**
↓ **Figure 19.**

↑ **Figure 20.**
↓ **Figure 21.**
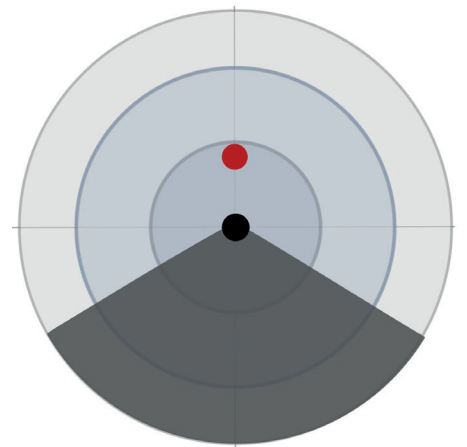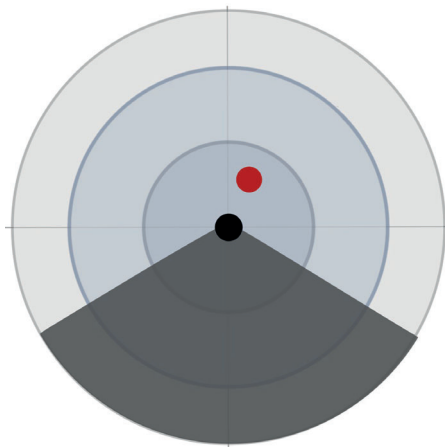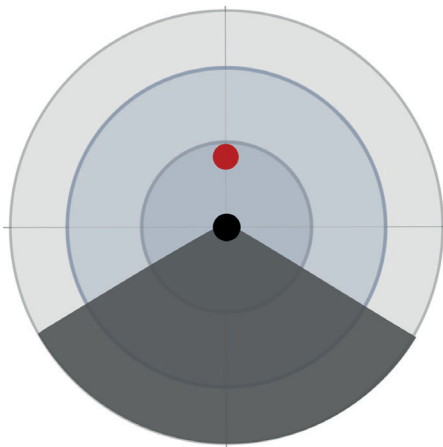
The VR documentary consists of three interviews with the people in area of art: museum worker, street art artist, and the musician. The interviews are recorded in three different cities: Odessa, Kharkiv and Kyiv. Each character are telling their experience of how their art work changed due to the war start, and what they are still creating to keep the artistic life going, while Russians, except for the cities, are purposely destroying cultural monuments, museum and everything that is connected with Ukrainian culture.

All the interviews are shown in the same, alike to the traditional documentary style, manner. We see the character sitting on the chair in front of the viewer. The stories are told by the direct diegetic narration of every character. While the character didn't yet appear in the environment, the story is told by using the text that is not followed by the voiceover.

The story includes the information of how the cultural heritage is being saved during the war, how the ruined places can become a canvas for the street artist and how the war can became an inspiration for creating the music. All of the parts are inspiring in a sense of seeing the people who, no matter what, are trying to give this world something beautiful despite of the circumstances. The name of the VR documentary is highlighting the main message of it – when some destroy, we still create.

2. ON THE MORNING YOU WAKE (TO THE END OF THE WORLD)

The film consists of three chapters, that are all the part of the story of one day. Chapter one is telling us about the characters receiving an emergency alert about ballistic missile thread. Chapter two is about how the nuclear weapons can affect the world and what destruction it could cause. Except of the real people stories, Chapter 2 is also telling about the consequences nuclear weapon could have is the strike was real. It is also consisting general information of the nuclear weapon and how existing of it can affect all the planet and destroy the life in this world. The chapter three is telling us about receiving the message of false alert – what people felt and what was happening after. Every chapter is starting from the words "on the morning you wake". This narrative structure lineal and is usual for the viewer; every part can be understood by it's own or in connection with other ones. The narration it Is held through the voice of the numerous narrators, who are telling the story about their own experience, thoughts, and concerns.

The narrative structure is giving the viewer the information not only about the emergency alert, that the residents of Hawai'i received on January 13, 2018, but also showing the story from different perspectives from people with individual background. This approach is making easier to relate yourself to, at least, some parts of the story, that could be told by the people with alike life experience. The story structure is alike with the traditional documentary films, which makes it easier for the viewer to understand the main narration. As every chapter duration is around 10 minutes, it is also the characteristic that makes the overall impression of the story easier to perceive.
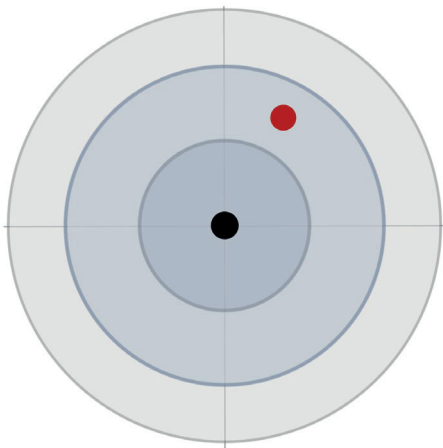
Figure 22.

Figure 23.

3. TRAVELLING WHILE BLACK

↑ **Figure 24.**
↓ **Figure 25.**

↑ **Figure 26.**
↓ **Figure 27.**

↑ **Figure 28.**
↓ **Figure 29.**
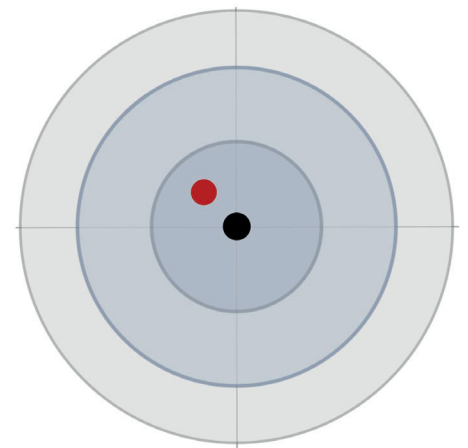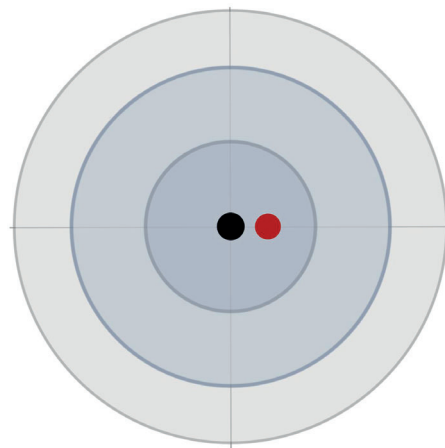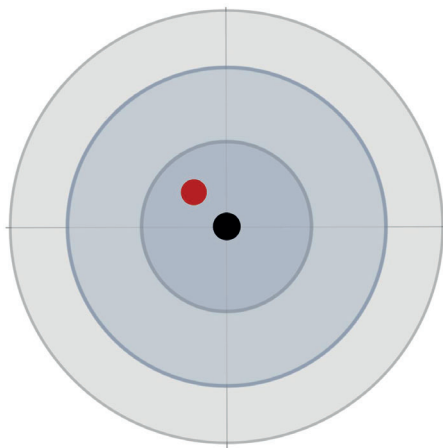
This VR documentary has three characters, who is having direct narration of the story. The main part of the storytelling with all the characters is made the same way – as a conversation at the table in a cafe, while sitting with them at the same table, but all of them have their own specifics.

1. Sandra Butler-Truesdale (Figure 4.09.). She is appearing as a narrator not only while siting at the same table, but also when she is alone in a cafe. One of her stories is also shown in a form of reenactment – while we are sitting at the same table but with her as a little girl (Figure X). When Sandra is telling the main part of her story, we can see her sitting on the opposite side of the table, telling the story to a woman, with who she is keeping the constant eye contact.

2. Courtland Cox (Figure 4.11.). In this case, we are sitting nearby him at the table, so the point of view of the viewer is changing. As well as in a first case, he is having the conversation with the people, who are sitting on the opposite side of the table; but, in this case, two people – a man and a little boy. The story of Courtland about travelling on a bus is also shown in form of reenact (Figure 4.16.).

3. Samaria Rice (Figure 4.13.). While in the first two cases the characters are telling the stories of their childhood, Samaria is talking about the events that took place in 2014, and are connected not with her directly but with her son, who was shot by the policemen.

Another important difference is that with previous narrators, the conversation took place only between the people, sitting at the same table. In contrary, the story of Samaria were listening everyone, who was in a cafe, including our previous narrators sitting on the bar stools behind.

The storytelling structure is clear and lineal. The stories of the character are connected by one topic and the narration is following the chronometry of the events – from the ones in a past to the more recent one. This makes the story and the message of the virtual reality documentary really clear. The main message is highlighted at the end of the film: "Travelling while Black in America is still happening. ... I wonder when does it end".

Figure 30.

Figure 31.

Figure 32.

Reenactment

In "Travelling While Black" are used three different by visual and meaning reenactments. First one is showing the scene of the past of one of the characters, Sandra Butler-Truesdale, while she was a little girl. The main aim was showing that "Ben's chilli bowl" was truly the save space where kids could fell like themselves enjoying the time in a company of friends. The video has different colour palette, as much as different props in the cafe and clothes of the visitors, to show us that the events took place in the past.

Second one, the reenactment of the memories of Courtland Cox, is showing us the back of the almost empty bus. This shot is connected to the story about travelling by bus and being forced to seat only at the back. This reenactment has absolutely different from the first one mood, as it is showing us not a pleasant experience of the character.

Third reenactment was connected with the story of the son of Samaria Rice, who was shot by a policeman. This reenactment is not showing the realistic picture, it is dramatized in order to highlight the injustice that is taking place in relation to the black people. And the place, that should be safe, now is surrounded by smoke, while a person was pushed to the café's window.

The usage of reenactments has different purposes, but in every case, by using different tools, the aim was achieved. Reenactments helped to understand the story and the characters better, which added interest to a chosen narration form.

4. THIS IS NOT A CEREMONY

Figure 33.

Figure 34.

↑ **Figure 35.**
↓ **Figure 36.**

The VR experience narration is made as a show, that is hosted by two Indigenous men. They become the main narrators, leading the viewer through the main parts of the story. The hosts present the main character – matriarch that rules this virtual world together with the buffalo Inii – Lillian Howard. She is talking directly to the viewer, thanking them for excepting the rite, where they will be the Human Ledger. The VR experience consists of two main stories, that are connected together by the topic of discrimination, that exist against Indigenous community.

First story, told by Adam North Peigan, is lead by his voice, that is told as a voiceover on the reenactment footage of him as a little boy. The characters does not have the direct communication with the hosts, but the hosts are discussing the events, that are the main topic of the narrator's storyline, while, at the same time, communicating with the viewer. Second character, Robert Sinclair, is telling the story not of his own life but about family member. The story is starting from him telling the story how he find out of the death of the Brian, his cousin. The story is lead the same way, as with a previous narrator, by voiceover over reenactment of events that lead the death by not providing the medical attendance.

After both story, the viewer is coming back to the main studio with the hosts giving more information about the existing situation with discrimination, as well as their own perception of the story. At the end, Lillian Howard is telling the viewers that they have to carry this knowledge and speak about what they have heard during the rite.

Reenactment

The narration consists two reenactments, first is telling us about what Adam North Peigan went through as a kid. It shows us different time, as well as specific location on the farm far from anything around. It is created for visualising the story that is told and letting the viewer become the witness of it, while seeing the memories of the character. We can't hear the actors talking inside the reenactment but hear the voice of the main character leading us through all the story. Second reenactment is told not about the character itself but about his cousin. As the narrator was not present when the events took part, the reenactment is made based on the stories of other people. It serves for the viewer to see how it can look like when the person is waiting in the hall of emergency room for hours and hours without anyone paying attention to his existence. It has importance not only for showing the storyline, but for teaching the viewer how important it can be just to pay attention to the people around you and not to be indifferent while seeing not rightful attitude to any person.
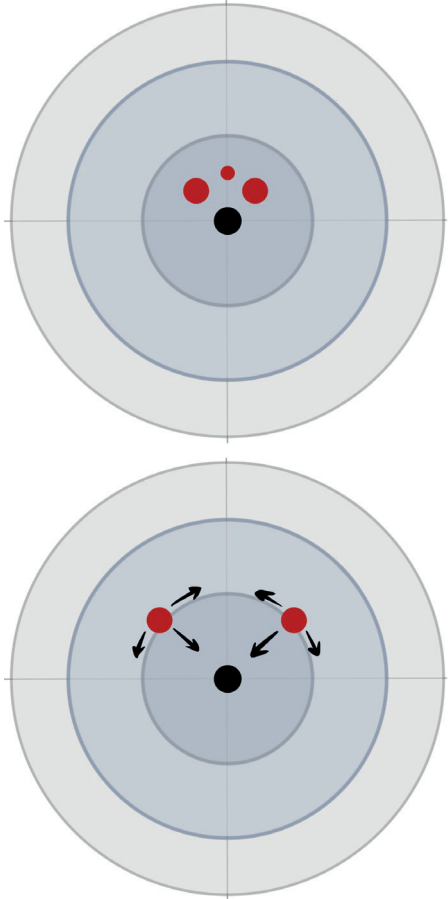
Figure 37. Movement of the hosts.

Figure 38.

Figure 39.

5. HOME AFTER WAR

The story is told by the main character, Ahmaied, who is the only narrator. He is telling about experience of his family about the war in Iraq directly to the viewer. The story is starting with the voice without the picture. Subtitles, that we can see inside the VR space, has a different information than the voice and does not have a voiceover. The viewer is invited to explore the house of Ahmaied as he tells what happened when he returned after the war. The story is about the life of only one family and is told by inviting the viewer inside their house and how it was affected after the beginning of the war. The story is continuing while the user is moving around the house, where in every space Ahmaied is telling the part of the story that relates to it.

The narration includes the footages of the family having food, inviting the viewer to feel as a part of it and understand the reality this family was existing in. Also, the narration includes the information of how the government was informing the people about the danger the war can have, what objects to be careful with and what to avoid. Also, the spectator could see the overall atmosphere of the place where people were living, which helps to understand not only the conditions of one house, but also an overall context. All this footages are available to the viewer but are not the necessary part of the storyline as the user can skip them.

The narrator story does not include a lot of facts about the war itself, it is more connected to a war in a sense of how it affect the people and the houses they are living in. The story is conditionally divided into two main parts before and after explosion, as this event truly changed the life of our main character.

By having a narration directly from the character, it creates more trustful environment because we can see true emotions of the man, who lost his children to the war and trying to keep living his life.

Figure 40.

6. WE LIVE HERE

Figure 41.

Figure 42.

The story is about Rocky, the woman, who lost her home and now is forced to live on a street. It consists of few parts: the footages from the tent the woman was living in, and the interactive part, that is helping the viewer to discover Rocky's story.

The main narration is made by the Rocky herself, but also this VR experience has a non-diegetic voice of the narrator explaining how to interact with the objects inside the space and is guiding the viewer from story to story, giving the cues what objects the used can interact with. Every object is opening the story abouts the Rocky's life. The journal is telling us the story she could never forget: how she, while being a kid, wrote about her impression from the home-less man, and how now she became one of them. On the radio we hear a story about that being homeless is their fault. The jewellery box has a lot of pictures, each of them is describing the part of the Rocky's past. A postcard with the motorcycle is telling the story of her marriage. The music box in a form of the house is explaining, how just the sound of the door closing can become an unreachable luxury, and what Rocky misses the most of having the real house. From the phone, that was hidden in a jar, we hear the man telling Roxy about finding the book she wanted to read. The book is telling the story of how she was gaining the trust with the horses she was working with.

All the stories serve to give the viewer the understanding about the life story of the main character and how did it changed after she lost her home in a sense not only of her personal feelings, but also through the eyes of the people.

Reenactment. The footages from the police officers forcing the people to leave their temporary homes serves to see from the inside how it can feel to have the permanent need of changing the place of living and loosing things that was creating the feeling of home.
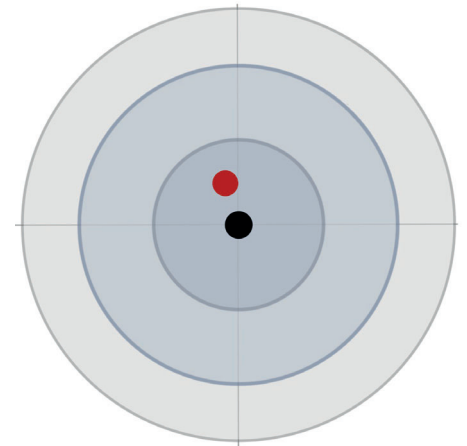
7. MLK NOW IS THE TIME

The story has one main narrator, the non-diegetic voice that is leading the viewer through all the story. This digital recreation gives the viewer the feeling of marching among thousands of people who came to protest in Washington, D.C., and witness Dr. King delivering his speech. The narration consists of four parts. Part one: Housing, is telling the viewer the differences of getting your own house between white and black people. The story is shown in a way of a board game, when the user is playing for the black piece. Narrator is explaining the rules of the game, the meaning of the cards we are taking from the deck and the difference between all the board areas. While the loans for buying the property is easily approved to white people, black people are considered to be too risky for approving the same house loans. As result of the game, Black people need to deal with higher tax rates, worse living conditions, and unsafe environment.

Part 2: Policing. The viewer is sitting on the driver's seat in a car, pulled by the police officer. Narration of this part is held by two voices: first, the woman telling how she is trying to raise her son with the realisation that in some time he will be perceived as a thread. Second, the man's voice talking directly to the viewer, explaining how to behave to stay safe while dealing with the police officers. First rule is always keeping your hands on the wheel.

Part 3: Voting. Two narrators hold the story: the archive audio recordings of the speech by Martin Luther King Jr. and the main narrator of the VR experience, who is telling the viewer about the right to vote and how historically it was hard to get this basic human right. The voting Ballot seems to be close – but you cannot catch it.

Part 4: Now is the time. It is shoving the viewers the footages of protests for having equal rights throughout the history, starting with the speech of Martin Luther King Jr., and combining the archive, black and white, videos with most recent videos showing that the fight is not over.

The structure of the story is showing the viewer the main points of the MLK speech "I Have a Dream", highlighting the fact of how many people he inspired for fighting for their rights, and how this fight is still going on. The story is taking the viewer to experience how it feels to have no right for the save environment, house, or voting, and how prejudices are affecting the everyday life of black people on example of the scene with the police.

In this model of storytelling, even though we have only one non-diegetic na-

Figure 43.

rrator, it is considered that Martin Luther King Jr., through the footages of his speech, is becoming one of the narrators. Exactly through his words the overall information is given, and through him the viewer can understand the context and the scale of existing problem. Through the narration, his words are becoming alive again, inviting the viewer to feel the part of the story that is going on for years.

8. THE KEY

The narration is created in a form of a guided VR experience. From the very beginning, the viewer can hear the non-diegetic voice who is telling the story that they do not remember the past, and all the memories disappeared. The narrator is telling us about the key, and ask the user to help to find out what the key is opening. The viewer gets to explore the virtual realm that looks nothing like the real world. The story is told in the way of investigating the world around.

First location is the house in the clouds, that often appears in the narrator's dreams. There is the mirror, where the viewers can see themselves in the mirror with a full avatar. The pictures on the wall are showing us a family, but the Narrator does not remember who these people are. Opening the box, we get to meet the Companions, who are the narrator's friends, and colour the grey world into bright colours. All the story is accompanied by the music and the direct conversation with the narrator, who is guiding every user's step and commenting the space around the viewer.

Next locations are transferring the viewer to the different parts of the virtual world, showing other people, who lost their close ones, and monsters, who are taking everything good, that was left. There is no understanding between past, present and future. The world is grey, and is full of grief and sorrow. By opening these emotions, the narrator is starting to remember.

The key is opening the memory of the narrator's past, and the fact that there is no home because of the war. The narrator's is opening their memory, telling the story that most refugees still have the key from their house, even though they will probably never see it again.

The way of the narration, chosen for this story, make it really personalised and reflects the real feeling of the people, who were forced to leave their home owing to war. As the story is told by the narrator in first person, it helps to feel more empathetic and to figure out what the key opens.

Figure 44.

COMPARISON

DIEGETIC/NON-DIEGETIC NARRATION

Diegetic narration is prevailing in the studied cases, as it was used (at least ones in the VR experience) in 7 cases (1, 2, 3, 4, 5, 6, 7), while the non-diegetic narration was used only in 4 (2, 6, 7, 8). Even though the existence of the non-diegetic narrator is widely used in documentaries as such, as it is an easy way of giving the viewer the context and overall information, as we can see from the analysis, it is preferable to use at least as a part of the story diegetic narration. Usually, it implies the story told directly from the character considering their own experience or the story of their relative. It is interesting,

that only diegetic way of narration was used in 4 cases (1, 3, 4, 5), while only non-diegetic was used in one – case 8. The reason for such a difference could be the fact, that in VR space it is easier for the viewer to comprehend and feel included inside the story while the narrator is visible and exist like a character within the space.

ONE/TWO/MULTIPLE NARRATORS

The story was told by only one narrator in the cases 5 and 8. Another specific of these cases is that in both of them the storyline was personalized and the viewer heard the story of only one person, through their perception and their narration.

Two narrators were found in a case 6. Even though the case 6 also tells the story of only one person and her experience, because of the interactivity part there were used another narration, which was guiding the viewer through the space, encouraging them to interact with the objects.

The most spread method in the studied examples is existing of a multiple narrators, which were found in cases 1, 2, 3, 4, and 7. These VR experiences have the less interactivity as well as are more alike by the narration structure to the traditional documentary film, where narration is usually made in a form of the interviews. Case 7 can be contradictory, as it was explained in the analysis above, Martin Luther King Jr., in our understanding, can be considered as a narrator, even though this narration wasn't created specifically for the VR experience. It is important, that exactly the narration from the speech is used as a base for all the experience, which is the main reason MLK should be also considered as a narrator of the story.

PERSONALIZED/NON-PERSONALIZED STORIES

Mostly, all the cases included personal stories from the character, except for the case 7, that included non-personalised story about the fight of black people for equal rights and a decent life.

Personal stories of the life of one character (and their family) were included in the cases 5, 6 and 8. At the same time, personalized stories, but from the few characters can be found in cases 1, 2, 3, 4. In few cases (3, 4), part of the storytelling was not about the characters themselves, but about their deceased relatives. In case 3, the woman was telling the story of her son, who was shot by the police officer. In case 4, the man told the story of his cousin, who was left unattended in an emergency room for more than 30 hours, which lead to his death.

The general information, in different amounts, considering the topic of VR experiences, were found in all the case studies, except for the 6. The case 6 is telling only about the personal experience of the character, and aims for the viewer to understand, how the character's life feels like.

Overall, we can note, that the personalized stories are much more used, as a non-personalized (7 out of 8). The preference is given to the stories of the real people, who are telling about their own life experience. Moreover, the general information about the topic of the VR experience is widely used in a narration to give the viewer more context of the problem.

THE CONTINUATION OF THE STORY

The stories can be divided into two groups considering the question of continuation of the events of the narration. First, the story took place in a short period of time or during one day (cases 2, 5, 8). Generally talking, story of the

case 2 is about one day Hawaiians received the emergency alert about missile attack danger. The story of the case 5 is telling the viewer about one day the life of the character changed forever – the rocket strike into his house that leads to the consequences of the death of two of his sons. Case 8 – the interactive experience where the viewer is helping the narrator to find what the mystery key opens.

Other cases (1, 3, 4, 6, 7) are telling the stories that wasn't happening in one day, but for the long time, or still keep on going on.

The overall tendency strives to tell the stories about more global pro-social problems, that are created through listening to the personalized stories of different characters. This approach is, at the same time, giving the overall context while also showing the real people examples that can help the viewer to feel more compassionate.

SECOND PERSON/IMPERSONALIZED NARRATION

In this question cases split up into two equal groups: cases 4, 6, 7, 8 are using the narration in second person ("you"), while cases 1, 2, 3, 5 are using impersonalized narration. As the order of the cases is made from the less to more interactive VR experiences, we can follow the main tendency, which shows that more interactive pieces are striving to have second person narration rather than the impersonalized one. It is caused by the fact, that interactive pieces are more commonly directed right to the viewer, for them to feel as a part of the experience but not only a passive observer.

REENACTMENT

Reenactment as a tool was used in cases 3,4, 6. All of them were created for showing the past of the characters or people related to them. In one case (last re-enactment of the case 3), re-enactment was made in dramatized way, not to show the events themselves but rather the overall atmosphere.

None of them included the interactivity inside the reenactment itself. It shows, that for now the question of using the reenactments to put the character in the middle of events as a participant is not yet explored.

VISUALS

1. YOU DESTROY, WE CREATE

ATMOSPHERE

The overall atmosphere is based on making a contest between destruction of the war and creation of the art. The visuals of this documentary film are mostly solved as a real-life footage, incorporating 2D archive videos and footages from drone. The events of the film take part in three cities, and as you change from one to the other, you can see the map of Ukraine with a dot marking the city where the footages were made.

The interviews, even though are shown in a more traditional-like style, have their own particularities. More precisely, while seeing the interviews, the viewer's field of view is limited —we can see more than 180 degrees around, but not 360, so part of the space is closed to the viewer. This allows the filmmakers crew to be at the same place with the character, and, moreover, putting the illumination in a manner more alike to the traditional cinema without it being visible to the viewer. The same method is used at some footages that were taken on the streets of the cities.

Figure 45.

The atmosphere while talking to the characters is friendly and informal. In contrast, it is edited together with the images from ruined houses and streets. It combines together the idea of creation and destruction, reflecret in the title of the VR documentary.

INTEGRATION OF 2D

Figure 46.
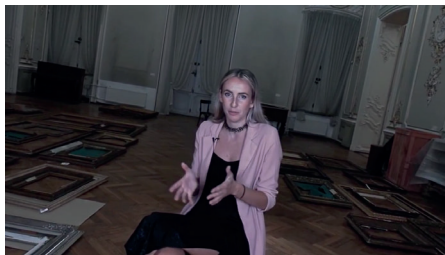
Figure 47.

Figure 48.

In this VR documentary a lot of the footages made by traditional cameras were integrated as a part of the story. Mostly, these videos has visually the same borders as a limitation of virtual reality while we are seeing interviews (Figure 4.XX.). This videos include some amateur recordings of the events, connected to the war, such as explosions or the emergency alerts going off. Other footages are made from the drone camera, showing the destructions of the cities.

Almost all the videos were integrated in the same manner as described above, except two of them (Figures 4.XX. and 4.XX.). Their integration was decided in

Figure 49.

Figure 50.

Figure 51.

the way without having the same design of the frame.

CAMERA/VIEWER PLACEMENT AND CAMERA ANGLE

The camera was mostly located on the eye level with the characters inside every particular shot. In one case, with the scene nearby the bus (Figure 4.XX.), the position of the camera was higher than the people around, which was confusing, as the viewer could still see the hands of their avatar but at the same time the position was much taller than everyone around, without any explanation of it from the narration.

TRANSITIONS

Almost all the transitions inside each of the parts in the film were made as a typical fast cut that is used in the traditional cinema. While transitioning from the one city to another, fast fade-in/fade-out in a black were used.

Figure 52.

2. ON THE MORNING YOU WAKE (TO THE END OF THE WORLD)
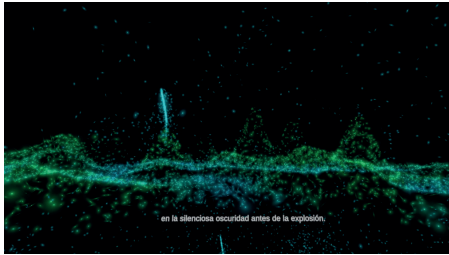
Figure 53.

Figure 54.

Figure 55.

ATMOSPHERE

The world of this VR documentary is created using CGI and has three main visual appearances: the one created from small "pieces" that are generating the world around the viewer without having particular shape or creating only an overall relief (Figure 4.38.), the one as well created from "pieces" but shaped as a recognizable environment (Figure 4.39.), and the one that looks more realistic (Figure 4.40.). The text was integrated into the image in a two different ways: as a subtitles and as a first-person message receiving (Figure 4.41.).

The appearance of the film is inspired by atomic science, that is the reason the world is coming together from thousands of pieces and at the transitions is falling apart to transform into something new. The world around doesn't feel as a real one, creating truly virtual reality that, at the same time, is enough for the viewer to understand the context of the story but also to experience it in a special way. The connection of all the narrative instruments with the visual decision of the VR documentary feels like the viewer can see not the real world that was surrounding the characters, but their feelings from what was happening around. For example, on the Figure 4.39. we can see the character sitting at the table, while her thoughts start having visual appearance — we can see the explosion of the missile, and the character's gaze directed to it. In the same manner we are seeing the memories of the woman while talking about her daughter (Figure 4.42.). The world inside the VR film was falling apart as much as the reality of the people, who have lived through the event, described in a movie, who thought that it can be truly the last day of their lives. The music is empowering the feeling of anxiety and the pressure, with not understanding what can be possibly done for avoiding the catastrophic consequences that would come after receiving the emergency alert.

Figure 56.

Figure 57.

INTEGRATION OF 2D

The whole VR documentary is created using CGI technology but nevertheless it has a part with integrated 2D videos, that were representing the memories of the narrator who was telling how she was calling her daughter to say goodbye.

CAMERA/VIEWER PLACEMENT AND CAMERA ANGLE

The position of the viewer in the story is changing from scene to scene. Some shots were made from the point of view of a standing person, others from the higher level over the land or world (figure 4.43.). In some scenes the position of the viewer is decided by creating the feeling of being the part of the scene, while the spectator is located on the level with the character, especially in action scenes. In other cases, while the narrator's avatar is in sitting position, the viewer's position is from the level of a standing up person.

The viewer (except of one scene while characters are holding hands together) is located far from the characters. The story is told from afar, that is not giving the opportunity to feel full empathy to the character.
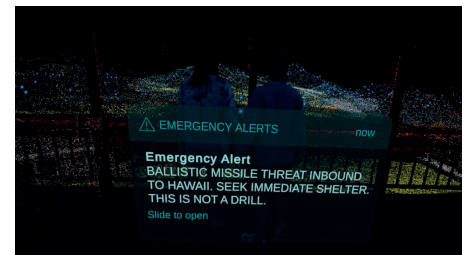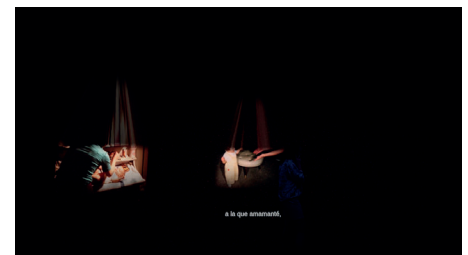
Figure 58.

While the camera is changing position from a particular person height perspective to the one "in the air" above the world, these change seems to be confusing, as the point of view is not tied up to any explanation nor the storyline.

TRANSITIONS

The tools used for the transition are mainly two: the 'disintegration' of the particles that are creating the picture and re-shaping them into the forms needed for the next scene and fade-in/fade-out.

3. TRAVELLING WHILE BLACK

Figure 59.

Figure 60.

ATMOSPHERE

The atmosphere wasn't the same during all of the film, and it can be divided into two main parts:

1.   Save, friendly atmosphere while being at the cafe with people. It is important how the creators of VR documentary highlighted that "Ben's chili bowl" was and remains a save space for Black traveller. The overall atmosphere is being created mostly by people, who are around us in the cafe. They are smiling, having nice time and seems to be enjoying being there. The conversation at the table is being faced by the people around with support and understanding; for example, while Samaria Rice was telling her story, all the people around were carefully listening, and the woman on the background was crying because of the story she heard.

2.   Absolutely another atmosphere is created at the same place but when it is empty — the red lights are adding pressure and dramatizing the storyline together with the music on the background. Cafe without people, together with the light decision, creates the feeling that something is wrong. It creates the sense of loneliness of the character in the stories that were told.

Also, films has another part, outside the cafe – the cinema hall, which carries rather neutral atmosphere, as it is usual for the viewer way to watch the videos, in this case – archive materials. Therefore, the mood is being created not through the location itself but by the narrative and the videos shown on the cinema screen.

INTEGRATION OF 2D

The film had three different ways of integration of 2D videos:

1.   On a screen in a cinema hall (Figure 4.46.), while the viewer feels the part of the audience. This was felt familiar and realistic, as this is usual for everyone way to watch the movies.

2.   As a projection on the walls and the ceiling (Figure 4.47.) in a cafe without a character in the shot but with voiceover narration. It is interesting way of combining VR space and flat video, as it let the viewer experience new location while watching archive videos.

3.   As a projection in the cafe with the character in the shot (Figure

Figure 61.

Figure 62.

Figure 63.
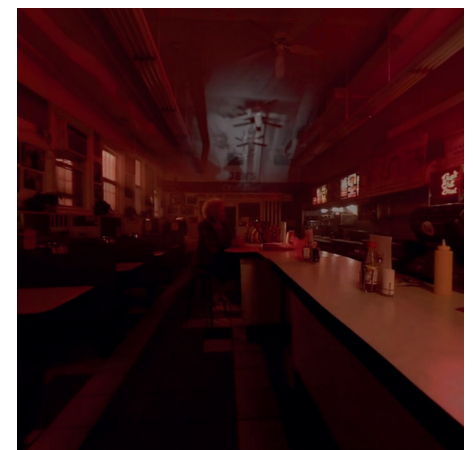
4.48.). This way is alike with the previous one, but has different point of view, putting as the main point of interest not the 2D videos but the character.

CAMERA PLACEMENT AND CAMERA ANGLE

The camera angle during all the VR documentary is pointed directly straight and perpendicular to the ground, it's a 90-degree angle. Camera is located on the eye level of the narrator in the shot.

TRANSITIONS

All the transitions in the film are resolved the same way —fade in/fade out of a black, that seems to be comfortable such as it reminds of closing and opening the eyes. The transition feels a little slow but, at the same time, it gives the viewer time to switch from one shot to another and to understand where the next scene takes place. Another factor that is helping to create smoother transitions is the sound (see Sound).

4. THIS IS NOT A CEREMONY

Figure 64.
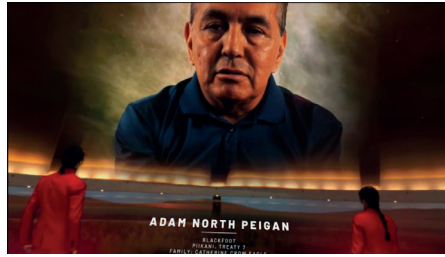
Figure 65.

Figure 66.

ATMOSPHERE

The visual decision of the piece is mostly far from how the world looks like in the real life. The story is taking us into another reality that connects past, present and future together, for showing the flow of the time. All the images, except for the second reenactment and the end of the piece, are distorted (Figures 4.49. and 4.50.). We can clearly tell that we are in the virtual reality because of how different it looks, even though there are used real footages of the hosts. The visuals are combining at the same time real-life footage and CGI, using special effects to introduce the narrators. Hosts are located on the same level with the viewer (Figure 4.49.), while the characters appear in the air out of nowhere, also having different proportions comparing to the hosts (Figure 4.50). The piece is made with using bright colours, unusual shapes, and lights. The big part of the viewer's experience relies directly on the visual choices of this VR film.

The visual decisions of the first reenactment is completely different from all the other film. It is shown as a classical cinematic virtual reality, with clear realistic picture and the actors. The reenactment had two points of view: closer to the main interest of the scene shown by actors, and second one further from the action – for the viewer to look around and understand the context and environment of the scene. First reenactment was the only footage without the use of special effects.

Second reenactment was more alike to the overall style of the VR piece, but, nevertheless, looked a little different, as the image was not still but dynamic, creating distorted picture of the world, but not the character oneself (Figure 4.52.). Second reenactment appeared not only while taking all the space around the viewer, but also as a part of the studio, where, at the same time, we can see the hosts, the character telling the story, and the part of reenactment, this way connecting the flow of time together in one space.

After existing in this virtual realm, the matriarch and the characters of the VR experience are coming down to the level of the hosts, while, at the same time, transporting into the real world asking the viewers to carry the story with them.

INTEGRATION OF 2D IMAGES

In the piece were integrated 2D images. They appeared visually alike way as the characters appear, in a cloud between the hosts, but in a format of photos of the people, who suffered through the alike experience as was told directly in the story.

Figure 67.

CAMERA PLACEMENT AND CAMERA ANGLE

The main part of the story, at the host's studio, the position of the viewer was located right over the bonfire. This decision is not anyhow explained in the story, but it gives rather uncomfortable feeling. Mostly, the hosts were located

in a medium shot zone, but, a few times they were moving closer, to the camera, relocating into close-up zone (Figure X).

In the reenactments the camera was located into the eye level hight, but still on the greater distance from the action itself, varying from the medium to a long shot zones.

In the first reenactment, was used the tool as in traditional cinematography, when the camera was placed inside the suitcase and the viewer could see the actor packing. It interrupted the feeling of presence, that was existing in the previous shots, as all the perspective and self-location suddenly changed, without having the narration justification.

TRANSITIONS

Most of the transitions were made by using special effects through dissolving the previous images. In the first reenactment was also used traditional cinematic cut.

5. HOME AFTER WAR

Figure 68.

Figure 69.

Figure 70.

ATMOSPHERE

The visual part of the VR documentary has two main options: first, the 3D model of the house and the main character appearing within this space (the main storyline that connects as a part of the one whole), second – real footages of the house and the city (which is not necessary to watch and also can be skipped by the viewer). The ability to teleport around the space is giving the viewer the opportunity to see all the house and walk around it helps to understand the overall context of the environment the narrator is living in.

The visual decisions in the main narration part is a 3D model of the Ahmaied's house, where the user can move throughout the play area to explore every available parts of the location. The image of the narrator appears in different locations of the house and is integrated into it as a separate image (Figure 4.53). It is confusing that the character appears standing not on the floor, but on the "cloud" that is giving the feeling that he is not there. The same is happening because the size of the narrator's avatar is changing size and is not true-like. The narrators image is turning together with the viewer if they decide to change the position in the room, that gives a feeling that the footage of the main character is flat.

The footages of the city is made by using 360 degrees camera, and does not have a narration of the character inside of it, we can only hear the voiceover of the narrator telling what exactly the viewer is seeing and how it is connected to his everyday life.

INTEGRATION OF 2D IMAGES

In the VR documentary the only 2D images, that were integrated into the story, were the pictures of the Ahmaied's sons, who died because of the explosion in their house (Figure 4.56.).

Camera placement and camera angle. In the main narration part, the viewer placement is not permanent, as the users can change their position within the play area space. The view is located on the eye level at the height of a standing person. While seeing the footages, in one case the camera is located on the eye level with the people, who are having food sitting in the floor, so the height is changing. In other footage images, the height of the viewer remains the same as in the main narration.
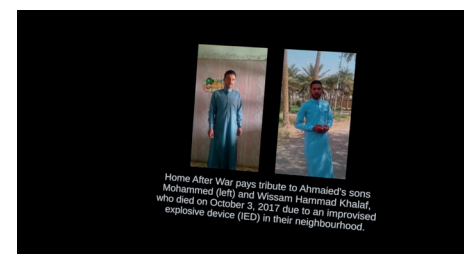
Figure 71.

6. WE LIVE HERE

Figure 72.

Figure 73.
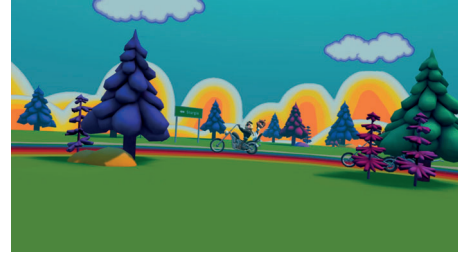
Figure 74.
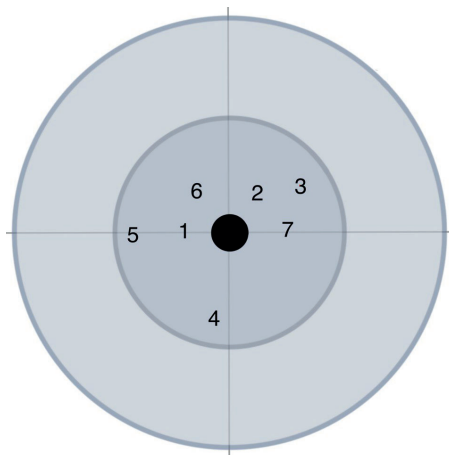
Figure 75. Location of interactive objects: 1. journal; 2. radio; 3. jewellery box; 4. postcard; 5. music box; 6. phone; 7. book.

ATMOSPHERE

The visual part of the work differs greatly from one part to another. The only thing, that wasn't really changing – is the footages from the campsite and inside of the tent itself. The interaction part of the story has different visual decision for every micro-narration. The journal, while opening, has the poem on the right side of the page. On the left side appeared the animation, showing the poem as a cartoon, which further became the animation on both pages of the journal (Figures 5.58.). The jewellery box has inside a lot of pictures, and, while taking each of them, the user can turn them around and see the text on the back. One of the photos has an animation of the moving hands. Next, the postcard with the motorcycle on it, opens the story, shown as a 3D animation, going all around the viewer (Figure 4.59.). And, lastly, when opening the book, it shows us the world as a pencil drawing, telling the story of how Rocky was gaining the trust of the horses she worked with. The schematic drawing of the location of all the objects within the space is represented on Figure 4.60.

INTEGRATION OF 2D IMAGES

The 2D images were integrated in a few ways during the narration. First, as a photographs saved in the jewellery box, and as a using of 2D footage for the titles.

CAMERA PLACEMENT AND CAMERA ANGLE

The position of the viewer was not changing during the story. At the beginning of the story, the camera had slight movement, while showing the outside of the campsite. The position of the camera was located on the eye level with the characters. While having scenes inside the tent, the field of view of the spectator was from the seated position. The same approach was used while having the interactive part of the VR documentary. After transitioning back to the real footage of the tent, the position of the user is changer from the sitting to a standing up. The camera no longer change it's position or height.

7. MLK THE TIME IS NOW
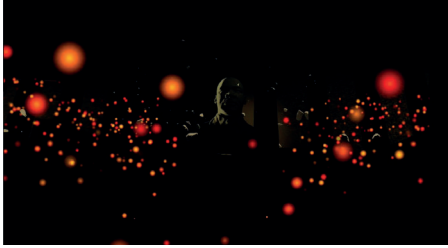
Figure 76.

Figure 77.

Figure 78.

The VR journey is created by using CGI with the integration of 2D archive recordings and integration parts. We start with seeing the archive recording of the speech by Martin Luther King Jr. The image is changing adding the CGI images around the 2D videos (Figure 4.63.).

The world does not strive to be realistic, the world around seem to be approximate, giving the viewers the overall understanding of the world around and the context, but without loosing attention from the main part of the narration.

After seeing the archive recordings, the viewer is invited to become one of the people, who came to listen to the speech, and raise a hand, clenched into a fist, as a sigh of protest. All the parts are created in the same stylistic and are interactive. At the first part the all we can see is a table the viewer is sitting at, the chair nearby the table and the board game. The play area is changing when adding cards on the play board. The user has one playing zone, that is surrounded by the fence because is considered not safe. With more cards, it becomes darker and darker, getting ruined by surroundings such as a road and the fabric, locater right in front of the house.

In part 2, the viewer becomes the driver of the car. We can see a car from the position of the driver, the city on the horizon, police car with the lights on, few policemen standing nearby the car and police officer, who are shining the flashlight inside the user's car (Figure 4.62.). The viewer needs to keep still and place his hands on the wheel, as any movement can provoke active actions from the police officer. As in the first part, the main play area is the only space that has light and colour, everything around it is in darkness.

Part 3 is telling the story about restriction to vote. We can see a voting ballot, but anytime the viewer is trying to reach it, it flies away. Without the right to vote, the world is starting to fall apart, showing the importance of voting as a foundation of having basic human rights and as a first step to the equality.

Part four consist of the 2D footage of the speech, where the viewer gets to become a participant of the events.

INTEGRATION OF 2D IMAGES

In the piece we can see a lot of integrated 2D videos, as the story is based on the real Dr. Martin Luther King's speech "I Have a Dream". All the visual decisions are made around this speech and the footages of the protests, so in this case integration of a real 2D videos is playing the crucial role for the storytelling. The archive black and white videos are combined with more recent recordings of the protests in color, showing the connection between past and present in a fight for the equal rights.

CAMERA PLACEMENT AND CAMERA ANGLE

The position of the viewer in parts 1 and 2 was from the position sited, first – at the table, playing a board game, second – as a driver inside the car. The exact position during the parts while seeing the footages of the speech and protests,

does not have direct information about the position of the viewer, as on the eye-level we can't see any characters or objects by which we could surely understand it. But, due to the narration, as a viewer becomes the part of the process, we can presume, that these parts of the narration the viewer should be standing up.

8. THE KEY
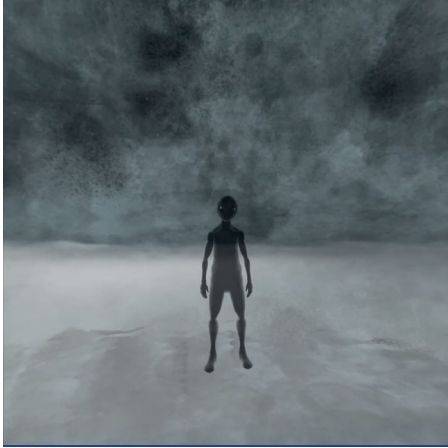
Figure 79.

Figure 80.

The visuals of VR experience are created using CGI. At the beginning of the story the viewer gets into the virtual world, that looks all grey and dark. The visual image of the world is changing by the interaction with the characters – Companions. After opening the box and meeting them, the world around is turning into color. While getting into elevator after the storm, the user also can interact with the Companions that were saved. People around the viewer are giving a feeling of devastation; they are holding on to their companions, but still feel completely alone and broken. The faces of the people, existing in this world, are not really detailed, as we cannot see all the face features, only eyes, but it is enough to understand their emotions. After the monster destructring the Companions, the world loses the colours again.

Next, the viewer is transported into the new world that look like the bottom of the ocean, full of creatures, who has another mood as the monster before – they are trying to help. We see a keyhole in the middle of the sky. To get there, the mermaid is giving the viewer a helmet for having the ability to move forward. While putting on the helmet, it is giving us back all the vivid colours and it helps the Narrator to remember. It is time to unlock their past.

The hidden memory is the image of ruined by the war house. It is shown as a real 360-degree image, where the viewer can move within the space.

COMPARISON

CAMERA/CGI

For the creation of the VR experiences equally were used a 360-degree camera (cases 1, 3, 5) and CGI (2, 7, 8); both of them were used for the creation of cases 4 and 6. The results can be considered as an attempt to use all the available for the filmmakers technologies to create a new type of media in the most empowering way possible.

CHANGE THE POSITION OF THE VIEWER WITHIN THE SCENE

Ability to change the position the viewer has in cases 5 and 8, which provides the user with freedom of movement within the play area. Stable, not changeable, the position of the viewer is made in cases 1, 2, 3, 4, 6, 7. As we can see, the ability of the viewer to freely move within the area is not widely used. It can be caused by a few factors. Firstly is that this type of interaction with the world is not possible while using the camera (except if it is used for making 3D models of the space as in case 5). Secondly is that this method significantly complicates the question of directing the viewer's attention and providing the interaction model that can be done in the way expected by the filmmakers.

CONTINUITY OF THE VISUAL APPEARANCE

The style of the visual appearance is changing depending on the story in cases 2, 3, 4, 6, and 8. The visuals are mostly connected to the emotions of the main character of the scene and are changing together with them. In cases 1, 5, and 7 the visual appearance was made using the same design of the space and its parts and by using alike tools for creating one, whole picture.

The change of the visual appearance connected to the emotional state is not novel, as it is widely used in traditional cinema. Nevertheless, in CVR space the impact of these changes on the viewer is much greater, as the user is located inside the story instead of apart from it.

POV/HEIGHT OF THE CAMERA

Point of view, which was connected to the position of the character inside the scene, was used in cases 1, 3, and 5. All of them were creating the position of the user due to the eye level of the main points of interest of the narration of the scene. This approach, even though implies the changing of PoV, is easily acceptable, as the context can be easily understood by seeing the other characters, that surround the viewer. At the same time, it adds to the feeling of inclusion inside of the scene, being "one of" the characters of the story.

In case 8, the point of view of the user remained the same during the piece, as a standing position.

Viewer's PoV does not have a connection with the positions of the characters in cases 2, 4, 6, and 7. In case 4, the position of the viewer was mostly represented from the standing position, but it has one exception. In one of the scenes, the camera was placed inside the suitcase, which significantly differs from all the other narration and feels confusing. This method was "borrowed" from the traditional cinema, but, in our opinion, it can't be effectively used in CVR space except if the user was actually placed inside the suitcase within the narration of the story. In any other case, this change of perspective is confusing and interrupting the feeling of presence. Another example of unusual viewer positioning was made in case 2, where the viewer's PoV was changing from the standing up position on the eye level of the character to the floating in the air position. This transition can also be considered as the one, that distracts the feeling of presence, as this positioning in not justified by the narration.

We can notice that the position of the viewer is strongly connected to the way filmmakers want to integrate the user into the space.

SHOWING IMAGINARY/REAL WORLD

The real world was shown in cases 1, 3, and 5. Cases 1 and 3 were created as the most traditional interview-like style, which were made in the real existing spaces. On the contrary, cases 2, 4, and 8 are creating their own world. The case 8 looks nothing like the real world, only the last part with the opening of the memory of the narrator teleporting the viewer into the 360-degree image of the real existing space. Cases 2 and 4 visually are like the real world in terms of the location and people, but not in the way it is reflected directly in the VR experience. The combination of the real with imaginary worlds was made in cases 6 and 7.

INTEGRATION OF 2D AS A PART OF STORYTELLING

2D images/videos were integrated into all of the cases, that were analysed. The specifics of using the 2D images inside the non-fiction CVR space is that they can become part of the narration. Examples of it we can find in cases 1, 3, and 7. Especially vivid we can understand how the 2d image can become an important part of the narration in the example of case 7. In this VR experience, part of the narration is made by adding the archive footage of the MLK speech, which became the base of the creation of the whole story. It means, that the 2D part that the viewer can see in the VR experience is made not only for giving the overall context of the story but for giving the main part of the narration.

The question of integrating the 2D images inside non-fiction VR content seems to be interesting, as for showing the real footage of the events, that took part in the past, almost the only way is to implement "flat" images inside the virtual reality space. This means, that most of the non-fiction CVR experiences one way or another will include 2D images if the filmmaker wants to show the archive footage or pictures. The only other way to show the events of the past without using the 2D images can be through the use of reenactments, but, in this case, it will also mean that the real footage (if exist) will not be used directly, but as an overall reference.

SOUND

1. YOU DESTROY, WE CREATE

The VR documentary does not have any voiceover except for the voices of diegetic characters. The sound was made as in traditional documentaries, when first we can hear the narrator's voice and after directly see the person talking, transitioning to a "putting a face to the voice". After we can hear the continuation of the story but with another visuals showing the images connected with the story that is being told by the character. While having the transitions between parts of the film, we hear music. As the film originally was shoot in Ukraine, first we can hear Ukraine, which further is overlapped with the English narration. Throughout the VR documentary we can hear a background music, which intensifies while we are seeing footage of ruined cities. As the third part of this VR film is dedicated to a musician, as a part of the narration of some kind we can hear the music that is created by the character of the movie.

2. ON THE MORNING YOU WAKE (TO THE END OF THE WORLD)

The main narration of the story is decided as a non-diegetic voice. While the character is telling their story and are present in the scene, mostly they are not directly talking, we hear their story as a voiceover. Only in one case (Figure X), in Chapter 2, we see a woman talking directly in the scene, telling the story about her childhood that is related to the events of Hiroshima. In the case other than the main narrator, when the voice of the character is non-diegetic, the voice sound as if it was through the phone call.

The documentary has through-out sound design, that serves for highlighting the important parts of the characters storytelling and acting like accompanying sound. In some cases, the music is used to empower the feeling of anxiety and empathy.

3. TRAVELLING WHILE BLACK

Sound. The main sound in the documentary is narration from the three characters. The nnarration voice is starting after few seconds the viewer can see a location, giving enough time to understand "where" they are and look around. When the transition between two narrators is needed, the "new" voice is starting on the part when the previous scene is not finished yet. It prepares the viewer to a change of the scene, gives time to understand the location of oneself, and hear the sound before putting the face to a voice. This tool is widely used in a traditional cinematography, where the sound usually appears before the image of where the sound is coming from. It is made to get the viewer familiar with new information and works as one of the ways of keeping the viewers' attention and interest.

The story also accompanied with the music on the background. It appears time to time throughout all the piece to help with creation of the atmosphere and the overall mood – exactly like in a traditional cinema.

4. THIS IS NOT A CEREMONY

The main sound of the VR documentary is the voice of the narrator, that guiding the viewer through the story. It is accompanied with the sound design, that is helping to keep the needed atmosphere, but, at the same time, is not distracting from the main narration.

At one of the moments, in the VR documentary appear the explosion, which has really strong and not expected sound. After the explosion, there is the ringing noise all over, that is imitating the effect the sound of the explosion can have on the hearing.

As the story is told by one narrator, the sound always has a location within the space when the main character is visible, which helps to find the sound source and, by this, to have the orientation within the space.

5. HOME AFTER WAR

The main sound of the VR documentary is the voice of the narrator, that guiding the viewer through the story. It is accompanied with the sound design, that is helping to keep the needed atmosphere, but, at the same time, is not distracting from the main narratioN.

At one of the moments, in the VR documentary appear the explosion, which has really strong and not expected sound. After the explosion, there is the ringing noise all over, that is imitating the effect the sound of the explosion can have on the hearing.

As the story is told by one narrator, the sound always has a location within the space when the main character is visible, which helps to find the sound source and, by this, to have the orientation within the space.

6. WE LIVE HERE

The main sound in the documentary is Rocky's narration. Throughout the VR experience we can hear music on the background that serves for better understanding of the woman's emotions. Every interaction piece has its own music, varying from nostalgia to an active music while seeing her positive memories.

The music box, shaped as a house, is having a lot of accompanying sounds that is telling us about what Rocky misses the most, for example the sound of the closing door or the shower. Also, the music box had the recordings of the people having the conversions and laughing, and the couple talking, being completely calm and happy.

7. MLK THE TIME IS NOW

The main source of the sound was the non-diegetic voice of the narrator. It was combined with archive recordings of the speeches by Martin Luther King Jr. and archive videos from demonstrations. The second part of the story was told from the perspective of the parent's, who are trying to make their kid as safe as possible. The voice of the woman we heard as through the phone call, telling her story of raising a son. The man was talking directly to the viewer, and his voice we can hear the same as the narrator's.

8. THE KEY

All the sound in the VR experience is made by combining the only one voice of the narrator and the instrumental music thorough the piece. The sound design is also made by creating the accompanying sound, that comes from the interaction with the world and coming from the characters inside the scenes as Companions or monsters. Spatial audio is helping the viewer to feel more present inside the scene.

COMPARISON

SPATIAL SOUND

Spatial sound was used in cases 5, 6, 7, and 8. This fact again highlights the influence of interactivity on all the other characteristics of the CVR experiences. As the viewer has the ability to interact with the objects of the scene, it means that for providing the real-like experience sound should be spatial in order to help the viewer to feel present inside the scene. Spatial sound in these cases also serves as a way of directing the viewers' attention. Non-spatial sound was in cases 1, 2, 3, and 4, which mostly have the narrator's voice as a main sound source in the VR experience.

CHANGED VOICE

In cases 2, 4, and 7 were used voice changing techniques. In cases 2 and 7, the voice sounded as if it was a phone conversation. In case 2 it was made every time the voice was having non-diegetic nature. In case 7, changing the voice was used as a tool to distinguish two narrators from the woman, who was telling the story from her life, and the man, that was talking directly to the viewer. In VR experience 7, the voice was distorted by adding the echo, to highlight the role of matriarch as a way to highlight the feeling of her being above the other narrators and the viewer, figuratively speaking.

MUSIC

The music was included in all the case studies, playing the same role as in traditional cinema. The music was highlighting the main narration moments, strengthening the impression of the moment and the compassion of the viewer. The music was the characteristic, the use of which was the closest to the traditional cinema through all the other components of the analysis.

INTERACTION SOUND

In cases 5, 6, 7, and 8, which include interaction with the CVR space, the sound design is made especially detailed. First, all the sounds from the interaction are

spatial, so the viewer can understand where the source of the sound is located. Second, the levels of the sound, accompanying the interactions, are much higher, than the sound, accompanying the world itself. The sound from the interaction is coming hot only from the objects, the viewer can interact with, but also from the movements themselves. Even though in real life we do not have clear sounds from every movement we are making, in the CVR space it helps to understand how the world can be interacted with.

INTEGRATION OF THE USER

1. YOU DESTROY, WE CREATE

INTEGRATION OF THE USER

The used doesn't have the whole avatar but visible hands. The piece does not have any interaction with the world. The integration of the user is made as a passive companion, because even though we don't have a direct interactions, there is still the direct eye contact in a first interview (Figure 4.37.) and the shot from the middle of the theatre stage.

DIRECTING ATTENTION

Point of interest on the scene were mainly located directly to the viewer after the cuts. In one scene, point of interest – Opera – was located behind the viewer. As a way of directing the viewer's attention was used the method with limitation of 360 degree view by making part of the area not visible to the viewer (Figures 4.31. and 3.33.).

2. ON THE MORNING YOU WAKE (TO THE END OF THE WORLD)

INTEGRATION OF THE USER

18:25 The spectator does not have any avatar. The integration of the user in "On the morning you wake" is made as passive multifaceted user. Most of the time the viewer is taking a part as an passive observing ghost, but in two scenes it is changed to a passive companion, as the presence of the viewer is noticed by the characters. First, in the scene where the character is telling the story by herself we can see an eye contact (Figure 4.08.), so the woman is talking directly to the viewer. And second, in one of the last scenes of the film, characters are holding hands including the viewer to this circle (Figure 4.65).

Figure 81.

DIRECTING ATTENTION

The main tool for directing the viewer's attention was orientation of the virtual body is faced in the region of interest. Also, another tool, that was used, is creating only one field of view that consist all the action of the scene, leaving the other areas empty from the points of the spectator's interest.

3. TRAVELLING WHILE BLACK

INTEGRATION OF THE USER

The viewer in "Travelling While Black" does not have any avatar. The integration of the user is made by making the viewers a "companion" – they are sitting at the same table with the narrators and can overlook the storytelling, but do not have a "body" and the characters are not "seeing" them. This VR documentary does not have any interaction with the character or the environment.

DIRECTING ATTENTION

The attention of the viewer is directed by the orientation of the virtual body faced in the region of interest.

4. THIS IS NOT A CEREMONY

INTEGRATION OF THE USER

The user does not have any avatar. The user was integrated as passive companion. During the VR experience, all the characters are talking directly to the viewer and communicating using the second person narration "you".

DIRECTING ATTENTION

The attention of the user was directed by the use of the second person narration and orientating the virtual body faced to the region of interest.
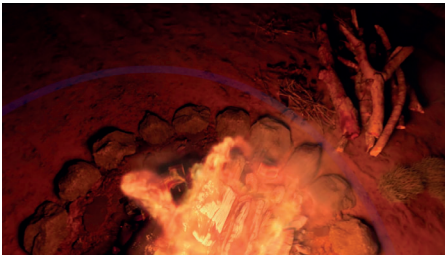
Figure 82.

5. HOME AFTER WAR

INTEGRATION OF THE USER

This is a room scale experience where the user can walk and teleport within the play area. The narrator, who appears withing the play area, is talking directly to the viewer, acknowledging their presence. The only interaction, available to the user, is changing the position inside the space, this way changing the field of view and the angle. The user does not have any avatar. The type of integration of the user is active companion.

DIRECTING ATTENTION

As this VR documentary has an interaction of the user with the space, it has a few ways the viewer's attention was directed. First, the narrator appears in the space only when he gets in the middle of the viewer's field of view. While the narrator starts to speak, he continue the story despite if the user changer their field of view by moving the head or by moving within the space.

Another way of directing the viewer's attention is the sound. First, at the beginning of the story, for inviting the viewer inside the house we can hear the sound of the door opening, and the sound in this VR documentary is spatial, so the user can locate where did the sound came from. The same method was used with the shot in the corridor, where the viewer was surrounded by three doors – the movement was limited until we heard the sound of the door opening inviting us to the next play area. The director's attention was also directed by the voice of the narrator, that once appeared before his avatar (in the kitchen location), and, by finding the source of the sound, the viewer moved to the next, needed by the storyline, location.
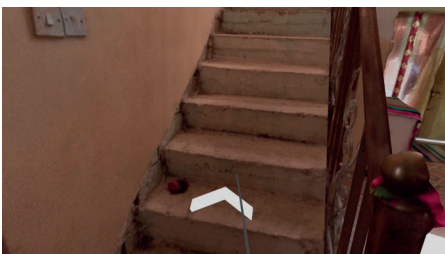
Also, the attention was directed by using visual tools such as circle of light to show that the footage is available to the viewer, and the arrows on the floor of

Figure 83.

the play area (Figure 4.67.) to show where the user should move next.

6. WE LIVE HERE

INTEGRATION OF THE USER

The integration of the user in this VR experience is made as multifaceted user. First, while having the real recorded footages, the role of the viewer is the passive observing ghost, as the characters are not aware of existence of the spectator inside the space. While having the main interactive part, the integration of the user is changed to an active protagonist.

This VR documentary has an interaction part, where the user can interact with the objects around oneself by moving them, listening to the stories that are told from particular objects and change their position. It also applied opening the journal, book, jewellery box and the can for finding a phone inside of it. When all the objects can be interacted with, not all of them were included as a part of the narration.

DIRECTING ATTENTION

The attention of the viewer in the interactive part was held by two methods: the narrators voice, explaining how to interact with the objects and giving the cues to the characters about what objects to interact with, and the light, that was coming from the objects.

7. MLK THE TIME IS NOW

INTEGRATION OF THE USER

The viewer does not have the whole body avatar, only hands are visible. The user is integrated as active protagonist.

Figure 84.

The viewer has the opportunity to interact with the world and move through the narration by raising a clenched fist. The same approach is used for changing one part of the story, to another, where the viewer needs to catch and break the rock in their hand. In the Part 1, the user is interacting with the world by playing the board game, for what they need to take a card from a deck. In Part 2, the user needs to keep their hand on the wheel, in order not to be taken as a thread by the police officer. Part 3 provides the interaction by the ballot, floating in the air, but it is impossible to catch as it is always changing it's position. In part 4, the users need to raise the clinched fist to become the participant of the protest.

DIRECTING ATTENTION

The main tool for directing the viewer's attention was orientation of the virtual body is faced in the region of interest. Also, the main point of interest of the scene was the only field of view where something was happening. The attention of the viewer was directed by the ability to interact with the word. As a directional cue, was used the poster, showing the viewer to raise a hand (Figure 4.69.), as a direct cue of what user needs to do in order to continue the story.

8. THE KEY

Figure 85.

INTEGRATION OF THE USER

The user has the full, not personalized, avatar, and can see themselves in the mirror, that reflects all the movements. The integration of the user is made as the active protagonist. The viewer has the possibility to interact with the objects inside the virtual world and move within the space.

Interaction in this VR experience is available to the viewer during all the story. First, the user needs to take the key to begin the story. Next, we have the interaction with the Companions to let them free from the box and get to meet them, in order for the world around the viewer to start having the colours, and later try to save them from the storm. While moving down in the elevator, viewer also can interact with the Companions, if they were saved in the previous scene. Next interaction is provided in the last scene showing the imaginary world, where the user needs to take a helmet from a mermaid in order to get to the keyhole and open the narrator's memories (Figure 4.70.)

DIRECTING ATTENTION

As a narration is made by non-diegetic voice, it gives the used all the cues during the story in a direct way, telling with what objects viewer need to interact in order to continue the story. Attention of the viewer is also directed by the visual cues that are helping the user to understand how to interact with the objects.

Figure 86.

COMPARISON

INTEGRATION OF THE USER

The integration of the user in cases 1, 3, and 4 were made as a passive companion. Case 2 integration is a passive multifaceted user, as it combines different roles in different parts of narration from, mainly, a passive observing ghost, but in two scenes it is changed to a passive companion, as the characters were aware of the user's presence in the scene.

In case 3, even though characters do not directly notice the user, his positioning inside the scene is made by being in the same conditions, as the other character, which gives the feeling of an actual sense of presence instead of being the passive observing ghost.

As we can see, one of the types of user integration is clearly predominant – passive companion, as it doesn't need any interaction with the characters or

Figure 87.

the world, but anyway gives the user more feeling of being part of the scene rather than observing ghost.

Integration of the user of the interactive cases (5-8) is made in different ways. In case 5, the user is playing the part of an active companion. Even though the user has the opportunity to move around the space, the story is anyway connected to only one main character, who is the narrator of the story. In case 6, the viewer is becoming a multifaceted user: passive observing ghost, at the time we can see the footage from the campsite and active protagonist, while we got to interact with the objects around us. In cases 7 and 8 the integration of the user is made as an active protagonist. In both cases, the viewer exists in the space as a new character.

INTERACTIVITY

Interactivity is different for every case study (from 5 to 8). In case 5 the only available interaction is changing the position within the space. Case 6 provides the user with the possibility to interact with the objects around them. Even though all the objects can be moved, only seven of them have narrative value and are opening part of the character's story. In VR experience 7, a few ways of interaction are available in different parts of the story: playing the board game, keeping hands on the wheel, trying to catch a voting ballot, and raising a clenched into a fist hand. Case 8 gives the opportunity to interact with the objects (the key), and characters (companions and mermaid).

 All the cases provide the user with different types and levels of interactivity, but all of them are connected to the narration, so without interaction, the story will not move forward. We consider it as one of the ways to keep the viewer's attention, but also it is important to remember, that in these cases it is preferable to have enough directional cues for the viewer not to get disoriented.

ATTENTION

The main tool for using the viewer's attention in a non-interactive VR experience (cases 1-4) are visual. All of the cases use the orientation of the virtual body faced in the region of interest, while all the other area of VR space keeps empty, as a main tool for keeping the viewer's attention.

In case 1, dividing the active area from the passive one is made by visually visible borders, that "erase" the space behind the viewer. In case 4, another visual way of attracting the viewer's attention was made by changing the position of the hosts, as during the whole piece they were moving around the field of interest and coming from the medium shot to a close-up zone.

All of the interactive cases (5-8) have a combination of visual and audio tools for directing the viewer's attention.

Visual cues in a way of guidance were used in case 5 (circle of light for opening the footage, arrows showing where to move next); case 6 (highlighting the objects to interact with); case 7 (poster showing where to raise a hand); case 8 (showing how objects can be interacted with).

In cases 5, 6, and 8 use the spatial sound as a tool for directing attention. In cases 6, 7, and 8 audio cues are also made through direct voice narration, telling the user what they need to do.

As all the cases have both visual and audio ways of directing the viewer's attention, it gives the viewer more cues during the story, that can help not to miss any interaction or important plot information. The combination of a few ways of attracting attention also can work better as some people are more sensitive to audio cues, while others pay more attention to visual ones.

CONCLUSIONS

During the last few decades, digital information technologies have greatly changed, introducing to the viewer new communication methods and giving rise to new media formats. Cinematic virtual reality has similarly becoming more as a novel grammar, currently in its early stages of development. In this work, we investigated the main elements, that characterize CVR as a new medium that has its own emerging cinematic language and produced a detailed analysis of eight case studies to understand how these elements can be used on practice.

We investigated the question of the CVR definition and the main features that makes cinematic virtual reality a new medium. We propose the definition of CVR as following: **cinematic virtual reality is the new medium that is letting the viewer experience the story through immersive storytelling using VR devices**. We investigate the concept of the immersive storytelling as one of the main features of CVR. Immersive storytelling includes three elements, presence, interactivity, and plausibility. All the concepts are equally important and working in tight cooperation. Only by considering all of them, the filmmaker can create truly immersive experience, that will have the expected influence on the viewer.

Exploring the question of the new film grammar, and how traditional cinema tools can be used in the CVR space, it is important to understand, that CVR need the whole new approach to the content creation. The filmmaking methods, without needed translation and accommodation, are not working the same way as in conventional cinema. All the concepts should be re-thought, taking into account the main difference of cinematic virtual reality – absence of the limitation of the frame. For understanding the arising cinematic language, new tools and concepts should be implemented. For example, some of the main new concepts are Field of View, Region of interest and Point of Interest. Unfamiliar for the traditional cinema, these concepts becoming crucial in creating the content for CVR. Using concepts of FoV, and PoI, we propose a way of representation of the CVR space, that will help with creation of the content and with the real cases analysis. The use of the proposed method can be found in a Chapter 4: Case study.

One of the important changes in translation of traditional cinematic language into the grammar of CVR, is the role of the camera. While in traditional cinema camera is the viewer's eyes, in CVR camera is the viewer. It affects all the habitual ways of working with the camera as a tool, as the usual approach is no longer applicable. When conventional cinema uses the movement of camera as one of the way of attracting attention, in CVR space, if not carefully made, can cause the motion sickness. The technique, that can be used as the analogue of camera motion but in CVR space, is changing the location of the characters/objects comparing to the viewer, instead of forcing the movement of a viewer to the PoI of the scene.

Another important part in the process of the creating the non-fiction contents for CVR environment is guiding the viewer's attention. The question of the director's cues in the virtual reality space is widely discussed in the academic world. The question of directing academic should be considered in tight cooperation with the story, to make it work. The tools for guiding attention can include sound, environment or motion cues. All of them can be used together or apart, in diegetic or non-diegetic form, directly or indirectly etc. The decisions about what directional cues to use should be made due to the storyline. In the case study analysis, the most used tool for directing attention in non-interactive VR experiences was the orientation of the virtual body faced in the region of interest. In the interactive cases, the tools were changing to a combination of visual and audio cue, mostly used – highlighted areas for interaction and spatial audio, as well as direct non-diegetic narration cues. This shows that the

approach differs because of the level of interactivity each VR experience has, as well as because of the story itself.

The present study includes the case study analysis as an important part for seeing how all the components of CVR environment work on the real cases. The case study was used to implement the proposal of the schematic drawings representing the main point of interest of the narration in each case study. We found that the method is applicable to all the cases except for ones where the viewer has the opportunity to freely move within the space and location of points of interest depends on the position in VR space rather than is connected to the position of the viewer.

The case study investigated each VR experience from the point of narration, visuals, sound, and integration of the user (that includes interactivity and directing of the viewer's attention). If with visual part each piece has its own vision and style, there can be pointed out some overall tendencies of how the user is integrated inside the CVR space. In all 4 non-interactional cases, the role of the viewer was a passive companion (in one of the cases combined with the observing ghost). It can show that the filmmaker strive to make the role of the viewer as present, as possible, without including the interaction. The other parameter, common for all the cases, is integration of 2D images. It can be easily explained, as if the filmmakers want to have the real footage or pictures of the events, the only possible way to do it to incorporate 2D images inside the VR space. The same happened with the question of the avatar of the viewer, as in 7 out of 8 cases there were no avatars of the user (though, 3 cases provided the viewer the visible hands). The case study analysis helped to follow some of the repeating tendencies in the creation of non-fictional content and gave more understanding of the possible immersive narration models.

In short, in this study a definition of CVR has been proposed. We developed a theoretical framework for the schematic representation of CVR space that was used on the real examples of case study. In addition, the study provides the detailed analysis of eight non-fiction VR experiences, chosen by the difference of interactivity level and providing the visual diversity. The research and case study focus were made on how the traditional language of cinema can be converted to the language of cinematic virtual reality. We discovered, that the most of the traditional filmmaking tools cannot be applied with the same result in the CVR. It proves the existence of necessity of creation completely other approach in order to create a new cinematic virtual reality grammar.

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SOURCES OF ILLUSTRATIONS

1.   Ko, D. uk, Ryu, H., & Kim, J. (2018). Making new narrative structures with actor's eye-contact in cinematic virtual reality (CVR). Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), 11318 LNCS. https://doi.org/10.1007/978-3-030-04028-4_38

2.   Ko, D. uk, Ryu, H., & Kim, J. (2018)

3.   Ko, D. uk, Ryu, H., & Kim, J. (2018)

4.   Prepared by the author based on Zhang, A., (2020). Developing a Cinematic Language for Virtual Reality Filmmaking Thesis Type. https://doi.org/10.25904/1912/4021

5.   Kvisgaard, A., Klem, S. Ø., Lund, T., Eoin, N., Rafferty, I., Nilsson, N. C., Høeg, E. R., & Nordahl, R. (2019). Frames to Zones: Applying Mise-en-ScèneSc`Scène Techniques in Cinematic Virtual Reality.

6.   Prepared by the author. Field of view.

7.   Prepared by the author. Region of interest.

8.   Prepared by the author. Point of interest.

9.   Ko, D. uk, Ryu, H., & Kim, J. (2018)

10.   Prepared by the author.

11.   Prepared by the author. Storyboard examples

12.   Prepared by the author. Storyboard examples

13.   Prepared by the author. Storyboard examples

14.   Prepared by the author. Explanation of the viewer/camera position in proposed representation of CVR space.

15.   Prepared by the author. Explanation of the viewer/camera position in proposed representation of CVR space.

16.   Frame extracted from: Gaedtke, F. (Director). (2022). You Destroy. We Create. The war on Ukraine's culture [Film]. https://www.oculus.com/experiences/media/1312735029529063/

17.   Prepared by the author.

18.   Frame extracted from: You Destroy. We Create. The war on Ukraine's culture [Film] (2022).

19.   Prepared by the author.

20.   Frame extracted from: You Destroy. We Create. The war on Ukraine's culture [Film] (2022).

21.   Prepared by the author.

22.   Prepared by the author.

23.   Frame extracted from: Colinart, A. (Director). (2022). On the morning you wake (to the end of the world) [Film]. https://www.onthemorningyouwake.com/

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25.   Prepared by the author.

26.   Frame extracted from: Travelling While Black [Film] (2019).

27.   Prepared by the author.

28.   Frame extracted from: Travelling While Black [Film] (2019).

29.   Prepared by the author.

30.   Frame extracted from: Travelling While Black [Film] (2019).

31.   Frame extracted from: Travelling While Black [Film] (2019).

32.   Frame extracted from: Travelling While Black [Film] (2019).

33.   Frame extracted from Van Loon, C. (Director). (2022). This is not a ceremony [Film]. https://www.imdb.com/title/tt16385382/

34.   Frame extracted from: This is not a ceremony [Film] (2022).

35.   Frame extracted from: This is not a ceremony [Film] (2022).

36.   Prepared by the author.

37.   Prepared by the author. Movement of the hosts.

38.   Frame extracted from: This is not a ceremony [Film] (2022).

39.   Frame extracted from: This is not a ceremony [Film] (2022).

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43.   Frame extracted from: Fabian, L. (Director). (2023). MLK: Now is the time [Film]. https://www.oculus.com/experiences/quest/4790561384366997/
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45.   Frame extracted from: You Destroy. We Create. The war on Ukraine's culture [Film] (2022).
46.   Frame extracted from: You Destroy. We Create. The war on Ukraine's culture [Film] (2022).
47.   Frame extracted from: You Destroy. We Create. The war on Ukraine's culture [Film] (2022).
48.   Frame extracted from: You Destroy. We Create. The war on Ukraine's culture [Film] (2022).
49.   Frame extracted from: You Destroy. We Create. The war on Ukraine's culture [Film] (2022).
50.   Frame extracted from: You Destroy. We Create. The war on Ukraine's culture [Film] (2022).
51.   Frame extracted from: You Destroy. We Create. The war on Ukraine's culture [Film] (2022).
52.   Frame extracted from: You Destroy. We Create. The war on Ukraine's culture [Film] (2022).
53.   Frame extracted from: On the morning you wake (to the end of the world) [Film] (2022).
54.   Frame extracted from: On the morning you wake (to the end of the world) [Film] (2022).
55.   Frame extracted from: On the morning you wake (to the end of the world) [Film] (2022).
56.   Frame extracted from: On the morning you wake (to the end of the world) [Film] (2022).
57.   Frame extracted from: On the morning you wake (to the end of the world) [Film] (2022).
58.   Frame extracted from: On the morning you wake (to the end of the world) [Film] (2022).
59.   Frame extracted from: Travelling While Black [Film] (2019).
60.   Frame extracted from: Travelling While Black [Film] (2019).
61.   Frame extracted from: Travelling While Black [Film] (2019).
62.   Frame extracted from: Travelling While Black [Film] (2019).
63.   Frame extracted from: Travelling While Black [Film] (2019).
64.   Frame extracted from: This is not a ceremony [Film] (2022).
65.   Frame extracted from: This is not a ceremony [Film] (2022).
66.   Frame extracted from: This is not a ceremony [Film] (2022).
67.   Frame extracted from: This is not a ceremony [Film] (2022).
68.   Frame extracted from: Home after war [Film] (2018).
69.   Frame extracted from: Home after war [Film] (2018).
70.   Frame extracted from: Home after war [Film] (2018).
71.   Frame extracted from: Home after war [Film] (2018).
72.   Frame extracted from: We live here [Film] (2022).
73.   Frame extracted from: We live here [Film] (2022).
74.   Frame extracted from: We live here [Film] (2022).
75.   Prepared by the author. Location of interactive objects: 1. journal; 2. radio; 3. jewellery box; 4. postcard; 5. music box; 6. phone; 7. book.
76.   Frame extracted from: MLK: Now is the time [Film] (2023).
77.   Frame extracted from: MLK: Now is the time [Film] (2023).
78.   Frame extracted from: MLK: Now is the time [Film] (2023).
79.   Frame extracted from: The Key [Film] (2020).
80.   Frame extracted from: The Key [Film] (2020).

APPENDIX 1

Year	Authors	Article Title	Document Type	Author Keywords	Abstract	DOI	SEARCH KEYWORDS
1992	SKALET, CD; LEE, GYG; LADNER, LJ	IMPLEMENTATION OF SOFTCOPY PHOTOGRAMMETRIC WORKSTATIONS AT THE UNITED-STATES **GEOLOGICAL SURVEY**	Article		The U.S. **Geological Survey** has provided the Nation with primary quadrangle maps and map products for the last 50 years. The Survey recently completed initial coverage of the conterminous United States and Hawaii at 1:24,000 scale. In Alaska, complete coverage exists at 1:63,360 scale. Effort is underway to build a National Digital Cartographic Data Base (NDCDB) composed of the digital representation of these and other map series. In addition, the Survey plans to meet the demand for more current and complete data through the development and promotion of spatial data standards in cooperation with other Federal, State, local, and private organizations. Plans for a digital revision program call for the extensive use of softcopy monoscopic workstations to serve as the mechanism for revising the planimetric digital data layers. These workstations will be supplemented by analog and analytical photogrammetric workstations to handle hypsography and some amount of feature classification. The advent of a digital orthophotograph production capability, coupled with workstation technology, has directed this trend. The Geological Survey has initiated two research projects to study digital orthophotograph production and revision processes.		360; PRODUCTION
1997	Chen, XL; Zhang, Z; Brueck, SRJ; Carpio, RA; Petersen, JS	Process development for 180-nm structures using interferometric lithography and I-line photoresist	Proceedings Paper	interferometric lithography; photoresist collapse; post-exposure bake; antireflection coat; 180-nm CD	A bilayer positive I-line process, based upon the use of a bottom antireflective coating and implementable on a standard processing track, is described for the production of sub-0.2-mu m features by interferometric lithography. Pattern collapse for small, high-aspect ratio photoresist features was found to be a significant issue. The impact of a number of processing variables on pattern collapse was investigated. These variables included resist thickness, substrate reflectivity, developer concentration, post exposure bake (FEB) time and temperature, L/S pitch differences, and development and drying methods. Using a 0.8-mu m resist thickness, a feature width of 180 nm (360-nm pitch) was attainable without a FEB, while with a suitable FEB, 150-nm features could be obtained. A reduction of resist thickness to 0.6-mu m enables 120-nm features to be obtained without a FEB, and 100-nm features with a FEB.	10.1117/12.275793	360; PRODUCTION
1999	Hilkes, R	540 Mbit sec serial video: The evolution of studio interconnect	Article; Proceedings Paper		SMPTE 259M with data rates up to 360 Mbits/sec, provides the**robust high-speed infrastructure for television and production installations** throughout the world. Today's broadcast and professional video market is undergoing tremendous change. Pressures to shorten time-to-air improve video quality, reduce costs, and-the advent of advanced television/high-definition television, are driving studios to adopt new technologies and business models. At the heart of this change is the need to further evolve the capability of serial digital interconnect. Operation at 540 Mbits/sec now enables a number of applications and capabilities that help studios address these changing requirements	10.5594/J14025	360; PRODUCTION
2005	Fisher, SS; Anderson, S; Ruiz, S; Naimark, M; Hoberman, P; Bolas, M; Weinberg, R	Experiments in interactive panoramic cinema	Proceedings Paper	panoramic cinema; interactive cinema; immersive media; immersive environments; interactive entertainment	For most of the past 100 years, **cinema has been the premier medium for defining and expressing relations to the visible world.** However, cinematic spectacles delivered in darkened theaters are predicated on a denial of both the body and the physical surroundings of the spectators who are watching it. To overcome these deficiencies, **filmmakers have historically turned to narrative, seducing audiences with compelling stories and providing realistic characters with whom to identify.** This paper describes **several research projects in interactive panoramic cinema that attempt to sidestep the narrative preoccupations of conventional cinema and instead are based on notions of space, movement and embodied spectatorship rather than traditional storytelling.** Example projects include interactive works developed with the use of a unique 360 degree camera and editing system, and also development of panoramic imagery for a large projection environment with 14 screens on 3 adjacent walls in a 5-4-5 configuration with observations and findings from an experiment projecting panoramic video on 12 of the 14, in a 4-4-4 270 degree configuration.	10.1117/12.601919	360 video storytelling
2006	Hadiz, VR	The Left and Indonesia's 1960s: the politics of remembering and forgetting	Article; Proceedings Paper	left; communism; 1965; Cold War; post-authoritarianism; memory; New Order; Soeharto; labour; capitalism; Indonesia; Southeast Asia	This article examines **a pivotal decade in the recent history of Indonesian society**: the 1960s. It examines the context within which the Left came to be decisively, and violently, defeated as a social and political force. It then studies the consequences of this defeat for Indonesia's subsequent historical trajectory. The article also suggests that history-writing anywhere is nothing less than the politics of remembering (and forgetting). What is at stake in these exercises is ultimately tied up with the legitimacy of entire social orders and systems of power. Thus, in Indonesia, the trauma of 1965 and its aftermath banished,from the collective memory of Indonesians, the political role of the Left except in the form that runs through New Order-era discourse on Indonesian communism. For Indonesians born or raised after 1965, the 'communist treason' became, arguably, the most critical element of the grand narrative of post-colonial Indonesian history, which was so important in legitimising New Order authoritarianism. The current inability of Indonesian society and its elites to acknowledge and confront the reality of the horrors of the 1960s might prove to be a major impediment to a more genuine and substantive democratisation process.	10.1080/146493706 00982883	SOCIAL; VR; NARRATIVE
2007	de Oliveira, SMV; Santos, DS; Cunha, PG	Occupational Exposures in Nuclear Medicine in Brazil	Proceedings Paper	occupational exposure; nuclear medicine; radiopharmaceuticals; overexposures; radiation protection	In Brazil there are 231 nuclear medicine institutions, public and private, 360 nuclear medicine physicians and a great number of technicians who are sparsely monitored. During the past five years the consumption of radionuclides, the patients cared for, and the number of exposed workers have increased due to the governmental investment in national radionuclides production. The main radionuclides consumed are: Tc-99m (515 TBq/year); I-131 iodine (45 TBq/year); I-123 iodine (266 GBq/year); Ga-67 (2 TBq/year); (TI)-T-201 (less than 1 TBq/year) and (SM)-S-153 (1 TBq/year). The production of F-18-FDG has begun in 2001 and the radioisotope is consumed only in the two major cities in the country, Sao Paulo and Rio de Janeiro, both in Southeast region. During the period 2000-2003, data from 8,881 workers were analyzed, 3,321 working at medical institutions, 346 working at nuclear medicine institutions, 35% of all workers in medical practices were registered in more than one institution. For monitored workers and measurably exposed workers, the values of 2.3 mSv and 5.4 mSv, respectively, for annual effective doses are greater than data presented by the majority of countries and should be investigated. For biologists and nurses, the values of 9.2 mSv and 6.7 mSv respectively, are greater than all other professional categories in the country and should be also investigated. It's possible to attribute the raised workers exposures to the increased workload in nuclear medicine institutions. There were 25 annual effective doses greater than 20.0 mSv, due to routine procedures (no one had occurred in a single event). The need of individual monitoring analysis for those workers who have more than one work place should be emphasized to all employers. Regarding the update of dose limits in legislation, it should be established special dose constraints for nuclear medicine practice.		360; PRODUCTION
2007	Rydlova, E; Drobny, P	Zwischengoldglaser from the Museum of Decorative Arts in Prague	Article		About 360 Zwischengoldglas **objects from the collection of the Museum of Decorative Arts in Prague were examined in order to check their condition**, to explore the technology of their production, and to provide the museum with recommendations for conservation. This article examines the history of Zwiscbengoldglaser, along with their glassmaking technology and their shapes and techniques of decoration, concentrating on production in Bohemia from about 1710 to 1760. The most common forms include beakers with faceted sleeves decorated with faux marble painting or colorful painting on silver leaf combined with gilding, and monochrome beakers with decoration scratched in gold leaf.		360; PRODUCTION

Year	Authors	Title	Type	Keywords	Abstract	DOI	Tags
2008	Gillath, O; McCall, C; Shaver, PR; Blascovich, J	What can virtual reality teach us about prosocial tendencies in real and virtual environments?	Article		As virtual environments (VEs) become increasingly central to people's lives (Terry, 2002), understanding reactions to VEs may be as important as understanding behavior in the real world (Yee, Bailenson, Urbanek, Chang, & Merget, 2007). Immersive Virtual Environment Technology (IVET), which is now being used in psychological research (Blascovich et al., 2002), can provide greater experimental control, more precise measurement, ease of replication across participants, and high ecological validity, making it attractive for researchers. it also can create links between researchers who study basic social psychological processes and those who study new media. **h two studies we examined people's reactions as they navigated through a virtual world and interacted with virtual people, some of whom needed help.** Participants' **compassion and tendency to experience personal distress predicted emotional reactions (concern) and proxemic behavior (gaze orientation and degree of interpersonal distance) to a virtual person in need but not to a control person.** The results support the use of IVET and proxemic variables to measure compassion unobtrusively and they encourage the use of IVET to advance our understanding of people's behavior in and reactions to virtual worlds and new media.	10.1080/152132608 01906489	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2010	Holmes, D	The Comfortable Reader: Romantic Bestsellers and Critical Disdain	Article	bestsellers; Anna Gavalda; Marc Levy; popular fiction; romance	In France **'immersive' storytelling** in the novel has long been associated with lowbrow fiction, and critically disparaged in favour of more self-reflexive, experimental forms. Recently, however, not only have critical debates begun to question the equation of literary value with the text's 'intransitivity' (Barthes), but the massive success of certain **contemporary novels** has suggested a sharp divergence between critical orthodoxy and readers' literary values. Critics' responses to the runaway success of novels by Marc Levy, Anna Gavalda and others have hesitated between bemusement and contempt, while readers express the intense pleasure they find in these optimistic, absorbing stories. **This article contends that the critically discredited art of mimetic (and, worse still, romantic) storytelling provides valuable pleasures, and that readers' responses deserve to be taken seriously.** With the emphasis on novels by Levy and Gavalda, the article interrogates the relationship between literary and popular taste.	10.1177/095715581 0378576	360; VIDEO; STORYTELLING
2011	Huang, L; Xu, YM; Zheng, YJ; Guo, TT; Yu, GY	Research on an In-situ Vision Inspection System of the Nick Depth of Easy Open End	Proceedings Paper	nick depth; in-situ vision inspection system; light-section microscopic imaging system; projection method	The size and shape of the nick of easy open end are key parameters in ensuring high packaging quality, but the present detection methods are still rather primitive. To solve this problem and realize automatic detection of easy open end in industrial production sites, an in-situ vision inspection system based on light-section principle is developed to measure the nick depth quickly and accurately, which utilizes self-developed image acquisition and processing software and uses an automatic blocking and threshold segmentation algorithm based on projection method. Experimental results show that the inspection system has realized the positioning accuracy of +/- 1mm in X and Y directions, and the depth of field in the system is 700 mu m. The vibration characteristics of the system is tested by using shaking table with vibration frequency of 6.7Hz and amplitude of 360 mu m to simulate production environment of easy open end, which verifies that the system can work in similar production environments.	10.1117/12.897098	360; PRODUCTION
2012	Bo, G; Cao, JZ; Zhou, ZF; Qu, ES; Hua, W; Guo, HN	A Robust Image Registration Algorithm Used for Panoramic Image Mosaic	Proceedings Paper	cylindrical projection; Adaptive Harris corners; SIFT descriptor; panoramic images	The **panoramic image** has been widely used in social production, and has become an important topic in research on the field of image processing. For complex images with multiple scenes and other elements, the algorithm that is based on Harris cannot make image registration effectively. This paper proposes a method that combines Harris with SIFT, using the Harris algorithm with adaptive threshold to extract the corners and the SIFT descriptor to make the registration. It improved registration efficiency sub-effectively for the image in complex scenes, and generated a 360-degree panoramic image quickly. The experiments showed that **the algorithm is adaptable and robust.**		360; PRODUCTION
2013	Blug, A; Carl, D; Hofler, H	Inspecting rapidly moving surfaces for small defects using CNN cameras	Proceedings Paper	Quality control; image processing; surface inspection; wire drawing; cellular neural networks	A continuous increase in production speed and manufacturing precision raises a demand **for the automated detection of small image features on rapidly moving surfaces.** An example are wire drawing processes where kilometers of cylindrical metal surfaces moving with 10 m/s have to be inspected for defects such as scratches, dents, grooves, or chatter marks with a lateral size of 100 mu m in real time. Up to now, complex eddy current systems are used for quality control instead of line cameras, because the ratio between lateral feature size and surface speed is limited by the data transport between camera and computer. This bottleneck is avoided by cellular neural network (CNN) cameras which enable image processing directly on the camera chip. This article reports results achieved with a demonstrator based on this novel analogue camera - computer system. The results show that computational speed and accuracy of the analogue computer system are sufficient to detect and discriminate the different types of defects. Area images with 176 x 144 pixels are acquired and evaluated in real time with frame rates of 4 to 10 kHz - depending on the number of defects to be detected. These frame rates correspond to equivalent line rates on line cameras between 360 and 880 kHz, a number far beyond the available features. Using the relation between lateral feature size and surface speed as a figure of merit, the CNN based system outperforms conventional image processing systems by an order of magnitude.	10.1117/12.2020568	360; PRODUCTION
2013	Coffey, AJ; Kamhawi, R; Fishwick, P; Henderson, J	New media environments' comparative effects upon intercultural sensitivity: A five-dimensional analysis	Article	Virtual environment; Web; Intercultural sensitivity; Intercultural Sensitivity Scale; Chen; Starosta; Channel effects; Gender	An experimental 2 (channel) x 2 (gender) x 3 (time) mixed factorial design (N=159) **was applied to test and compare how individual dimensions of intercultural sensitivity might be affected by two channels: a virtual environment (i.e., Second Life) versus a Web environment.** Using a modified version of Chen and Starosta's Intercultural Sensitivity Scale (ISS), the study sought to identify which of the five ISS dimensions played the most influential role in intercultural sensitivity outcomes: interaction enjoyment, interaction engagement, interaction confidence, interaction attentiveness, or respect for cultural differences. **Results showed that one's willingness and effort toward understanding an intercultural interaction - interaction attentiveness - played the greatest and most statistically significant role in intercultural sensitivity outcomes, and that this effect was greatest within the virtual environment channel. G**ender effects were also found, in which men experienced greater enjoyment but women expressed more attentiveness. (C) 2013 Elsevier Ltd. All rights reserved.	10.1016/j.ijintrel.201 3.06.006	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2014	Franquet, R; Montoya, MIV	Cross-Media Production in Spain's Public Broadcaster RTVE: Innovation, Promotion, and Audience Loyalty Strategies	Article	transmedia television; production analysis; public-service media	Multiplatform content broadcasts are one way of securing the position of **public-service broadcasting** in a competitive and changing market. This research focuses on the cross-media fiction series Aguila Roja (Red Eagle) and Isabel, produced by Globomedia and Diagonal TV for Radio Television Espanola (RTVE), the Spanish radio and television corporation. RTVE is a public-service broadcaster that has recently undergone a significant reconversion as a consequence of the recession and a new funding system based exclusively on financial contributions from the state, with a ban on paid advertising, which had been permitted in the past. We examine **the way this organization creates productions for multiple platforms and the innovation strategies that support these processes.** Using a comparative case study approach based on the actor-network theory, **we found a strong 360-degree cross-media production logic in RTVE's fiction series**. However, a detailed analysis reveals difficulties and contradictions regarding the efficacious use of each of the technological platforms available as well as limitations on the actions undertaken in the social media.		360; PRODUCTION

Year	Author	Title	Type	Keywords	Description	DOI	Category
2014	Kim, J	Remediating Panorama on the Small Screen: Scale, Movement and Spectatorship in Software-Driven Panoramic Photography	Article	3D visualization; digital maps; mobile privatization; mobile screen media; mobility; panorama; performative cartography; scale; software; virtuality	Examining what the author calls 'small-screen panoramas', a set of software-based digital panorama services that provide the production and navigation of panoramic photographs available for users' experience on small-screen devices (laptops, mobile phones, tablet PCs), **this article argues that the panoramas' algorithmic view and movement signal an emerging visual regime that remediates the scale and mobility of their pre-digital predecessors.** Digital compositing technique reinstates the sensory and epistemological conditions of the panoramic, 'tourist' gaze of modernity as it combines discrete pictures of a location into a 360-degree seamless visual field that proffers an immersive form of spectatorship. At the same time, however, the applications undermine the visual field and spectatorship of the traditional panorama as their technological features activate the embodied, material, and contingent aspects of mobile media spectatorship: the portability of laptops and mobile phones and the applications' algorithmic streamlining of 2D photographs. These examples, the author claims, demonstrate that, despite the applications' efforts to create seamless virtual 3D images, they lead to the paradoxical coexistence of the animated and the static, of the immersive and the miniaturized, and the embodied and the disembodied.	10.1177/174684771 4526677	360; PRODUCTION
2014	Kamat, VR	The Ocean is our Farm: Marine Conservation, Food Insecurity, and Social Suffering in Southeastern Tanzania	Article	Tanzania; marine conservation; food insecurity; structural violence; social suffering	This paper examines **the social impact of a large-scale marine conservation projec**t (Marine Park) in the coastal region of Mtwara, southeastern Tanzania, following displacement and the enforcement of restrictions on fishing and extracting marine resources. Through an analysis of interviews and focus group discussions with residents in six villages, the paper illustrates how the undesired effects of the Marine Park have become part of people's everyday discourse regarding hardships and their experiences of the violence of everyday life. Elicited narratives provide insights into how the Marine Park, in combination with a multiplicity of factors leading to displacement, dispossession, and social dislocation, has intensified hardships, especially among female-headed households, due to their increasing poverty, marginalization, and food-related insecurity. The narratives shed light on people's lived experiences of disempowerment, feelings of humiliation, anger, despair, low self-esteem, and extreme resentment-in essence, their social suffering. The paper makes a case for addressing the human dimensions of marine biodiversity and conservation interventions as a key step in making them genuinely collaborative and sustainable in terms of social equity and ecological effectiveness.	10.17730/humo.73. 3.f43k115544761g0 v	SOCIAL; VR; NARRATIVE
2015	Dominguez-Martin, E	Immersive journalism or how virtual reality and video games are influencing the interface and the interactivity of news storytelling	Article	Immersive journalism; Immersion; Digital storytelling; First person; 360 degrees; Newsgame; Augmented reality; Virtual reality	**The possibilities of virtual reality technologies**, on the one hand, and the strong **influence of videogames** as a cultural industry, on the other, are greatly affecting nonfiction digital rhetoric, **and journalism** in particular. Immersive journalism is an emerging trend that amplifies **the impact of the story by creating a sensory and interactive experience**. The author presented the first doctoral thesis on this topic and summarizes here **the context and the main features of this kind of factual storytelling.**	10.3145/epi.2015.jul .08	360 video storytelling
2016	Baker, F; Karnapke, M	BEYOND STEREOSCOPIC: COMBINING SPATIAL ACQUISITION TECHNOLOGIES IN REAL-TIME ENGINES TO PRODUCE IMMERSIVE VIRTUAL REALITY EXPEREINCES FOR THE DISSEMINATION OF ARCHAEOLOGICAL RESEARCH	Proceedings Paper	VR 360 film; 3D scanning; Virtual studio production; Rock-Art; Pitoti Valcamonica	The foundation of this paper was the 3D-Pitoti.eu project 2013-2016. Its aim **was to acquire archaeological rock-art from Valcamonica in the Southern Alps by using modern 3D scanning technologies,** building on previous work with 2D animation of rock art[4]. The project also aimed to capture multi-scaled 3D data from the macroscopic level of airborne surveillance down to the sub millimetre of coloured laser scans. These static scans where used to formulate ways of (re-) animating the figures that are depicted in these ancient rock-art artefacts. The use of motion-capture, hand animation and novel volumetric recording systems lead to complex datasets that we combined in a novel workflow utilizing a real-time game engine as our virtual production studio. The final challenge was to create Pitoti Prometheus a narrated 3D 360 degrees. VR film experience for final dissemination of our work for the public and archaeological research sector.		360; PRODUCTION
2016	Maurici, R; Galassi, U	MUDEF WAS BORN IN SARZANA AN IMMERSIVE JOURNEY ALONG THE HISTORY AND EVOLUTION OF FORTIFICATIONS OF LUNIGIANA	Article		The MUdeF - **Multimedia Museum of the Fortresses of Lunigiana,** recently opened in the old Firmafede Fortress in Sarzana, offers an overview, significant and unique in Europe, on buildings dating back to the period of transition from medieval castles to Renaissance ones. The new **museum is an interactive and emotional journey** that winds along 27 rooms, narrating the history and the distinctive elements of Lunigiana, captured through the changes of the fortified buildings, the evolution of customs and traditions and the stories of some historical figures connected to the area. The **multimedia exhibition** of MudeF was designed and developed by ETT S.p.A., a Genoese creative and digital company that has integration of humanistic and technological knowledge as hallmark. The integration of various technological solutions - NFC, capacitive and proximity sensors, projection mapping, 360 degrees video projections, talking pictures - and new generation storytelling, creates an engaging and immersive visit and learning experience. The project is an interesting case study of how the targeted use of new technologies in museums allows to fully enhance historical-architectural complexes that, despite not owning works or collections enough charismatic to compete with the main tourist attractors today, can offer visitors interesting experiences and cultural enrichment through the narration of their long history and connection with the surrounding territories.		360 video storytelling
2016	Hafskjold, L; Eide, T; Holmstrom, IK; Sundling, V; van Dulmen, S; Eide, H	Older persons' worries expressed during home care visits: Exploring the content of cues and concerns identified by the Verona coding definitions of emotional sequences	Article	Home care services; Communication; Older adult; Cues; Emotions; VR-CoDES; Qualitative research/content analysis	Objective: **Little is known about how older persons in home care express their concerns**. Emotional cues and concerns can be identified by the Verona coding definitions of emotional sequences (VR-CoDES), but the method gives no insight into what causes the distress and the emotions involved. The aims of this study are to explore (1) older persons' worries and (2) the content of these expressions. Methods: **An observational exploratory two-step approach was used to investigate audiotaped recordings from 38 Norwegian home care visits with older persons and nurse assistants.** First, 206 cues and concerns were identified using VR-CoDES. Second, the content and context of these expressions were analysed inductively. Results: Four main categories emerged: worries about relationships with others, worries about health care-related issues, worries about aging and bodily impairment, and life narratives and value issues, with several subcategories showing the causes of worry and emotions involved. Conclusion: The two-step approach provides an in-depth knowledge of older persons' worries, causes of worries, and their related emotions. Practice implications: The subcategories described in a language close to the experience can be useful in practice development and communication training for students and health care providers. (C) 2016 Elsevier Ireland Ltd. All rights reserved.	10.1016/j.pec.2016. 07.015	SOCIAL; VR; NARRATIVE

Year	Author	Title	Type	Keywords	Abstract	DOI	Tags
2016	Ceplitis, A	RHIZOMATIC NARRATOLOGY IN 360 DEGREE SPHERICAL CINEMATOGRAPHY	Proceedings Paper	rhizomatic taxonomy; narrative design; spherical video; 360 degrees cinematography; virtual reality	The advances in the digital technology of the entertainment industry have ushered a viewer into the dawn of virtual surround cinema. With the presence of technological pioneers such as NextVR Digital, Nokia OZO, Google Jump, Lytro Immerge, PanoCam3D, to name a few, **the capture and display of 360 degrees ultra-high definition video that aims to offer an immersive physical and visual experience, both on big screens and on portable devices, is gradually becoming accessible to an average consumer. The current 360 degrees filmmaking (often referred to as spherical cinema), however, parrots the narrative and aesthetic schemata of the flat 2D films, and, in doing so, it binds the medium into an inelegant representation, unfit for the new digital setting.** Because 360 degrees film production is fundamentally an offshoot of the post-digital era, it inevitably gravitates towards the breakdown of the authoritarian structures producing a novel narrative and visual regime that departs from the classic spectatorships towards a deeply immersive psychosomatic experientiality. Warranted by VR technologies, such an experientiality is best served when rhizomatic narrative structure is deployed. Based on the concept of rhizome, which was fleshed out in Gilles Deleuze's and Felix Guattari's A thousand plateaus: Capitalism and Schizophrenia to advocate rhizome as the fundamental nucleus unto which social, aesthetic, political, and human interactive models could be built, as well as via simulation **of video prototypes done in 360 degrees, the author contends that rhizomatic thinking, is already locked within the essence of 360 degrees video.** The question is not whether rhizomatic narrative should be espoused, but whether rhizomatic narrative can be advanced to the level where it superseded linear, non-linear, and interactive (albeit still linear) story structure, seen in video games and hypertext works, in addition of being set apart from the design of micro-narratives, so that the rhizome moved from being a mere Deleuzoguattarian metaphor to a practical utility used 360 degrees film production.		SOCIAL; VR; NARRATIVE
2017	Yao, YJ	Analyzing the Transition of Footage and Narrative Logic of Movies and Videos based on Virtual Reality Technology	Proceedings Paper	VR; Narrative Logic of Movies; Transition of Footage	With the gradual maturity of the virtual reality technology and supporting facilities, the film and television art creation has been hit by the new VR technologies. The drafting of film and television art, **the pre-shooting and the post-production are all facing great changes. How to shoot, how to edit, how to narrate a series of film and television art creation issues need to re-explore.** In this paper, we discuss the change of the language of the video camera under the VR technology with a concrete example, and define the VR language under the VR technology from three aspects: the lens, the picture, the light, the color and the sound. Finally, Logical challenge.		SOCIAL; VR; NARRATIVE
2017	Bollmer, G	Empathy machines	Article	aesthetics; affect; digital media; Einfuhlung; empathy; Levinas; virtual reality	A major claim about virtual reality (VR) is that it can foster **empathy through digital simulations.** This article argues, however, **that technologies intended to foster empathy merely presume to acknowledge the experience of another, but fail to do so in any meaningful way.** With empathy, the experiential grounds upon which ethical and moral arguments are made require an essential transmissibility, and that **which cannot be expressed in seemingly universal' terms cannot be acknowledged.** This article makes its arguments through a discussion of **VR as an empathy machine', and contextualizes empathy in digital media by suggesting it repeats not a psychological construct, but a concept derived from late 19th-century German aesthetic theory and its conceptualization of Einfuhlung.** It proposes radical compassion as an alternative to empathy, and suggests that empathy is a limiting and problematic concept that effaces another's experience unless it can be made sensible.	10.1177/1329878X17726794	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2017	Neubauer, D; Paepcke-Hjeltness, V; Evans, P; Barnhart, B; Finseth, T	Experiencing Technology Enabled Empathy Mapping	Article; Proceedings Paper	Virtual Reality; Empathy; User Centred Design; Design Research Methodology	Designing and Understanding **in the Problem Space, within the Virtual Space. How do we connect with spaces and people with limited or restricted access? How do we design for a situation we have not experienced? How do we develop empathy for challenges of unprecedented magnitude?** Virtual reality has been commonly used for final concept presentations and experiences, however, with its recent developments and additional technological improvements in cost and fidelity it can now be implemented earlier in the design process. The nature and complexity of certain design problems necessitates innovative applications of technology alongside the use of proven methodology. This workshop sought to **establish a proven link between virtual reality and empathy which is a critical component within human centered design. Integrating VR into the front end of the design process to create empathy for the user** and context (as seen in artist Chris Milk's work on immersive storytelling) as well as to conceptualize in VR (Google's Tilt Brush app for virtual reality sketching) could be the 'next development in education', disrupting traditional design curriculum. **This research explores that integrating emergent technologies allows designers to develop a better sense of empathy for the user, the space, and the context and ultimately resulting in more validated and human or problem centered solutions to these scenarios. The emerging presence of VR as it can be used in collaborative spaces for social experiences** (virtual project rooms are currently being pioneered by Facebook's VR social environments EG Facebook Spaces), **co-creation, and collaboration across disparate and international projects and teams could become the new normal.** This workshop introduced participants to VR as it can be used to create empathy and to conceptualize solutions as well as the potential to collaborate remotely. A 360 degrees pre-recorded video scenario initially exposed participants to a design problem via Google Cardboard to test the level of empathy that can be developed from this experience. A second immersive scenario included the HTC Vive for a more in depth understanding, allowing participants to independently 'walk'	10.1080/14606925.2017.1352966	360; VIDEO; STORYTELLING/ EXPERIENCE; EMPATHY; VIRTUAL REALITY
2017	Lowe, T; Stengel, M; Forster, EC; Grogorick, S; Magnor, M	Gaze Visualization for Immersive Video	Proceedings Paper		In contrast to traditional video, **immersive video allows viewers to interactively control their field of view in a 360 degrees panoramic scene.** However, established methods for the comparative evaluation of gaze data for video require that all participants observe the same viewing area. We therefore propose new specialized visualizations and a novel visual analytics framework for the combined analysis **of head movement and gaze data.** A novel View Similarity visualization highlights viewing areas branching and joining over time, while three additional visualizations provide global and spatial context. These new visualizations, along with established gaze evaluation techniques, allow analysts **to investigate the storytelling of immersive videos.** We demonstrate the usefulness of our approach using head movement and gaze data recorded for both amateur panoramic videos, as well as professionally composited immersive videos.	10.1007/978-3-319-47024-5_4	360 video storytelling
2017	Seijo, SP	Immersive Journalism: From Audience to First-Person Experience of News	Article; Book Chapter	Immersive journalism; Immersion; Virtual reality; Empathy; Recreated scenarios	This research is focused on **checking the theory about how the application of virtual reality techniques in the audiovisual pieces alters the spectator level of implication with regard to information.** To demonstrate, the author revises the academic theory and analyses **several audiovisual pieces made with virtual reality. According to the study, journalism trends point to the audiovisual landscape, and they do it with the new technologies on the market.** Innovation laboratories of the main European public **televisions** want to apply virtual reality techniques to their own audiovisual pieces, in order to make information closer to the spectator. Therefore, these new products allow the viewers being an actor of the information or recreated reality thanks to the high immersion level.	10.1007/978-3-319-46068-0_14	EXPERIENCE; EMPATHY; VIRTUAL REALITY

Year	Authors	Title	Type	Keywords	Abstract	DOI	Tags
2017	Kelling, C; Vaataja, H; Kauhanen, O	Impact of Device, Context of Use, and Content on Viewing Experience of 360-Degree Tourism Video	Proceedings Paper	Omnidirectional video; virtual reality; user study; presence; user experience design; guidelines; affective content; engagement; airport and travel; tourism; device comparison	With the rapid advancement and development of emerging technologies, more in-depth understanding of **user interactions and experiences are needed**. In this study, we **explored the reactions, impressions, and emotions elicited by a 360-degree video that markets an airport and local attractions for a distant destination**. Differences in presence and viewing experiences on a mobile phone and VR headset were examined in two contexts: a semi-public setting and a private setting. Our results showed a preference for the private setting, not only because of distractions present in the semi-public location, but also due to social and cultural anxieties felt by participants. Furthermore, we suggest a set of guidelines that relate to the experiential elements of viewing 360-degree videos that can aid designers and researchers in the creation of unique content and novel services, in which we recommend establishing an emotional connection, providing engagement, guiding viewer attention, encouraging exploration, understanding the appropriate viewing context, and avoiding technical flaws.	10.1145/3152832.31 52872	omnidirectional; VR; attention
2017	Yuan, Y; Yi, YH; Liu, JH	Integrated visual quality assessment for ZiYuan-3 optical satellite panchromatic products	Article	ZiYuan-3 optical satellite; panchromatic data; image quality assessment; quality elements; GRNN	In practical data production process of ZiYuan-3 (ZY-3) optical satellite, the quality of massive panchromatic (PAN) products is usually measured with multiple quality metrics. Although the existing metrics have been widely used in practice and obtained good performance, they have some limitations: (1) there are so many quality metrics that makes it difficult for users or operators to directly judge whether the imagery is acceptable or not; and (2) a specific quality metric can only measure a certain aspect of image quality and is often not designed from the perspective of human visual system (HVS), leading the objective evaluation result inconsistent with subjective one. To tackle the aforementioned problems, we propose an integrated visual quality assessment (VQA) method to predict comprehensive quality scores for ZY-3 sensor calibration (SC) PAN products. In the proposed method: (1) we exploited eight quality elements that have significant influences on the visual quality of SC PAN products; (2) we constructed a database composed of 360 ZY-3 SC PAN images and the corresponding subjective mean opinion scores (MOS); (3) we introduced generalised regression neural network to combine the extracted quality elements of the images and their MOS and obtained the integrated VQA result. Experimental results on the database showed that the proposed method achieved high accuracy of predicted quality scores and well consistency with HVS, indicating the effectiveness and reliability of the presented approach.	10.1080/13682199.2 017.1313562	360; PRODUCTION
2017	Morente, VR	Journalists and movies in Madrid (1907-1913). Approach to a reception of the early cinema in the press	Article	Spanish cinema; culture; reception; analysis of the speech; journalism; criticism	The target of this work **is to offer the first approach to the reception of movies in the early cinema in Madrid** (1907-1913), from the journalists who were writing on press at those moment. There works gave rise to the first speeches about cinema in Madrid, which turned into an important part in the process of institutionalization of production, distribution and cinematographic exhibition. Simultaneously, It is taken an opportunity to name a serie of journalists who wrote the first chronicles about the Cinematograph. It is based in the textual analysis of the articles about movies written by Julio Camba, Andrenio (Eduardo Gomez Baquero), Miquis (Anastasio Anselmo Gonzalez), Carlos Luis de Cuenca and Josee Maria Jurado, as the first set of sources that allow to know the reception in the press of Madrid in the early cinema. The result of this analysis is the observation of the existence of three types of speeches in cinema: a popular speech, an educational speech and an esthetic speech. These three speeches set the fundation of a later cinematographic criticism and, consequently, eased the appear of an anautonomous cinematographic culture, whitin there began the gradual institutional consolidation of the movies concerning the narrative fiction full-lenght films.	10.5209/HICS.55900	SOCIAL; VR; NARRATIVE
2017	Lescop, L	Narrative grammar in 360	Proceedings Paper	narrative; 360 images; immersion; VR; scenology; ambiance	VR has now come from industry to everyday application. Mainstream software and devices allow artists to create contents with a fast learning curve. Since 2014, with the launch of Google Cardboard and 360 cameras at a reasonable price, with the massive success of Unity 3D and Unreal UDK, **real-time immersion no longer stands in the hands of experts but spreads to creative enthusiasts which result in a huge production of content**. Like at the early age of photography and then cinema, slowly emerge questions about composition, **narrative structure and visual grammar. This article is a raw presentation of issues of narrative grammar in 360.**	10.1109/ISMAR-Adjunct.2017.86	360; PRODUCTION
2017	Kamat, VR	Powering the Nation: Natural Gas Development and Distributive Justice in Tanzania	Article	natural gas development; dispossession; state violence; ethnography; narratives; Tanzania	The discovery of large recoverable **reserves of natural gas in southeastern Tanzania has bolstered Tanzania's determination to transform itself from being one of the poorest aid-dependent countries in the world into an industrializing Middle-Income Country (MIC) by 2025.** Drawing on an ethnographic study conducted in the rural Mtwara region, this article examines the hype and hope surrounding the dominant national political discourse on how the gas project will empower the nation and oppositional discourses from the margins that tell a different story. Narratives of people affected by the gas project reveal differing perspectives, including experiences of domination, exclusion, indignation, humiliation, injustice, resistance, powerlessness, and indifference. The article illustrates how the process and scale of the gas project, and the rapidity with which it was implemented, represents what scholars have variously called accumulation by dispossession and accumulation by displacement. Ultimately, those at the helm of policymaking and governing actions must be fully convinced that the affected communities' concerns regarding dispossession, violence, compensation, and employment are real and deserve to be addressed, urgently. Only then will Tanzania be able to use its gas bonanza to genuinely empower the entire nation.	10.17730/0018-7259.76.4.304	SOCIAL; VR; NARRATIVE
2017	Croci, S; Knorr, S; Smolic, A	Saliency-Based Sharpness Mismatch Detection For Stereoscopic Omnidirectional Images	Proceedings Paper	360 video; omnidirectional images; 3D quality assessment; sharpness mismatch detection; saliency maps; virtual reality	In this paper, we present **a novel sharpness mismatch detection (SMD) approach for stereoscopic omnidirectional images (ODI) for quality control within the post-production workflow**, which is the main contribution. In particular, we applied a state of the art SMD approach, which was originally developed for traditional HD images, and extended it to stereoscopic ODIs. **A new efficient method for patch extraction from ODIs was developed based on the spherical Voronoi diagram of evenly distributed points on the sphere.** The subdivision of the ODI into patches allows an accurate detection and localization of regions with sharpness mismatch. A second contribution of the paper is the integration of saliency into our SMD approach. In this context, **we introduce a novel method for the estimation of saliency maps from viewport data of head-mounted displays (HMD).** Finally, we demonstrate the performance of our SMD approach with data collected from a subjective test with 17 participants.	10.1145/3150165.31 50168	360; PRODUCTION
2017	Dooley, K	Storytelling with virtual reality in 360-degrees: a new screen grammar	Article	Virtual reality; 360-degree video; narrative; writing; immersion	With reference to three recently produced Australian case studies, this article explores approaches to the conceptualization and writing of **short narratives for the emerging medium of cinematic 360-degree virtual reality**. Storytelling for this format involves a **user-focused engagement with time and place**. Whereas the viewer of classical narrative media, such as film or television, is for the most part passive, the **VR viewer is 'present' as an active agent who engages with the unfolding narrative as either witness or participant.** These factors present a number of challenges and opportunities for the creator of narrative VR, when considering viewer immersion and/or **interaction in the 360-degree environment**. The article presents a review of literature that interrogates the specifics of writing for VR, with a specific focus on 360-degree, immersive projects. By interrogating the form of three recently produced works, **the author highlights emerging approaches to narrative structure**, audience acclimation **and the directing of viewer attention**. While some commonalities can be observed across these case studies, the article concludes that to date, there is no one approach and no fully established screen grammar associated with a 360-degree VR narrative.	10.1080/17503175.2 017.1387357	SOCIAL; VR; NARRATIVE / 360 video storytelling

Year	Authors	Title	Type	Keywords	Abstract	DOI	Tags
2017	Clinch, S; Dingler, T; Kunze, K; ElAgroudy, P; Terada, T	WAHM-4th Workshop on Ubiquitous Technologies to Augment the Human Mind: Sharing Experiences	Proceedings Paper	Cognitive Systems; Quantified Mind; BCI; Knowledge Log; Human Augmentation; Lifelogging; Memory Augmentation	A recurring **science fiction theme** is the downloading of abilities from another human to one's own mind. Emerging technologies beyond simple audio/video recordings such as: 360 degrees videos, tactile recorders and odor recorders are promising tools to enable skill transfer and empathy. However, the produced large datasets require new means for selecting, displaying and sharing experiences. This workshop will bring together researchers from a wide range of computing disciplines, such as virtual reality, mobile computing, privacy and security, social computing and ethnography, usability, and systems research. Furthermore, we will invite researchers from related disciplines such as psychology and economics. **The objective is to discuss how these trends are changing our existing research on sharing experiences and knowledge to augment the human mind.**	10.1145/3123024.31 24459	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2018	Diaz-Kommonen, L; Vosmeer, M; Lee, JH; Pham, S; Bassbouss, L; Mancianti, A	360 degrees Video Storytelling and Virtual Reality Workshop	Proceedings Paper	Virtual Reality; Television; 360 video streaming; Storytelling	The purpose of this joint workshop is to bring together a diverse group of researchers and practitioners **for focused discussion and knowledge sharing in 360 degrees video storytelling and virtual reality.**	10.1145/3210825.32 13552	360 video storytelling
2018	Cai, SD; Ch'ng, E; Li, Y	A Comparison of the Capacities of VR and 360-Degree Video for Coordinating Memory in the Experience of Cultural Heritage	Proceedings Paper	Cultural Heritage; Virtual Reality; 360-degre Video; Memory; The Past	Virtual Reality (VR), a medium which can create alternate or representations of reality, **could potentially be used for triggering memory recollections by connecting users with their past.** Comparing to commonly-used media within museum such as photos and videos, VR is distinct because of its ability to move beyond the confines of time and space, by **enabling users to be immersed in the reconstructed context and allowing them to take charge of the environment by interacting with objects, navigating the environment, and evolving the narratives**. In this paper, we **compared audience experiences of cultural heritage (CH) between 360-degree video recordings and Virtual Environments to investigate the capacity of these two types of media for coordinating the audience's memory of the past.** The findings will help guide the future design and evaluation of VR as a medium for communicating CH.		SOCIAL; VR; NARRATIVE
2018	Black, JE; Harrison, VR	A Native American 'playing Indian': Internal colonization in professional wrestling rhetoric	Article	internal colonization; commodification; indigenous media representations; professional wrestling; spectacle; sports	This article **focuses on the tension extant in the ways in which Tatanka, a Native American wrestler (person), assumes the identity of another tribesperson (persona) to generate both economic and social capital.** We address Tatanka's narrative as an example of internal colonization and commodification, given that he had to 'play Indian' to pass as an authentic Native American. We discuss these two critical concepts and then provide some analysis of the public fragments that surround Tatanka's narrative.	10.1386/macp.14.2. 173_1	SOCIAL; VR; NARRATIVE
2018	Bruno, F; Petriaggi, BD; Mangeruga, M; Cozza, M	An underwater tablet for documentation and use of submerged archaeological sites	Article		Within the i-MareCulture and Lab4Dive projects, a**n international partnership is developing different technologies for both in-situ and virtual underwater exploration**. In particular, an underwater tablet dedicated to the archaeological sites is being developed to **improve the recreational diving experience and support the research activities** conducted by the archaeological divers. This tablet allows the diver to recognize his position in the underwater site, to acquire geo-localized photos and notes and to visualize the hypothetical reconstruction of the underwater remains through the augmented reality. In addition, it has been realized a virtual diving application that enables every user to explore some different underwater archaeological sites of the Mediterranean Sea without the need to conduct a proper dive. This virtual visit can be enjoyed by means of different Head Mounted Displays (HMDs), such as the HTC Vive, the Samsung Gear VR or the Google Daydream, exploiting the features of these devices to interact with the virtual environment. During the visit, additional information can be obtained playing some videos realized with the typical approach of the storytelling and a 360 degrees field of view.		360 video storytelling
2018	McRoberts, J	Are we there yet? Media content and sense of presence in non-fiction virtual reality	Article	Virtual reality; non-fiction; presence; documentary; interactivity; immersion	**Sense of presence is a central but widely contested concept in virtual reality** (VR) and has been the subject of significant debate, discussion and research. Key factors considered to influence sense of presence are: media form, media content and user characteristics but as yet, relatively little consideration has been given to how these apply to the emerging field of non-fiction VR. **Non-fiction VR can be distinguished from other forms of VR by trying to engage audiences with real-world stories, where sense of presence is intended to offer audiences opportunities for empathic engagement and social transformation. This paper offers a framework to analyse how four media content dimensions (immersion, positionality of the user, interactivity and narrative agency) influence sense of presence in non-fiction VR projects.** With the intention of offering deeper insights on how sense of presence relates to the purposes of non-fiction narrative, it unpacks each media content variable and illustrates how these can be applied critically in relation to two notable non-fiction VR works, Gone Gitmo [2007. Directed by Nonny de la Pena and Peggy Weil] and 6x9: A Virtual Experience of Solitary Confinement [2016. Directed by Francesca Panetta and Lindsay Poulton. The Guardian].	10.1080/17503280.2 017.1344924	SOCIAL; VR; NARRATIVE/ NARRATIVE VR NON-FICTION
2018	Radclyffe-Thomas, N; Varley, R; Roncha, A	Balancing the books: Creating a model of responsible fashion business education	Article	business education; ethics; employability; fashion; graduate attributes; sustainability literacy	This research article provides an account of a series of curriculum interventions at undergraduate and postgraduate level which engage fashion business students with real world practical and ethical complexities faced by twenty-first-century fashion businesses. Fashion education has predominantly nurtured creativity in design and promotion whilst focusing on identifying efficiencies for business operations, but increasingly the negative environmental and social impact of the global fashion industry requires a new focus on how fashion business can promote ethical and sustainable practices. The authors explore how research into sustainable fashion can be integrated into the business curriculum to guide students as they develop their personal positions on engagement with the serious issues the fashion industry faces today and tomorrow. The authors applied their research into sustainable fashion with contemporary sustainability pedagogies to design teaching delivered through case studies, lectures, seminars and assessment tasks designed to engage students with a 360-degree understanding of sustainability and to promote students' development of creative solutions to our industry's challenges. The authors sought to develop a range of teaching resources and learning sessions in line with the United Nation's Principles for Responsible Management Education (PRME) and in doing so used the lens of sustainability to explore every aspect of the fashion industry: production, design and promotion. Through the examples explored in this article, our exploratory research aims to understand how to design and implement a model of responsible fashion business education that responds to social and environmental needs and resonates with new generations of students who demonstrate an increased interest in concepts of shared social, environmental and economic value.	10.1386/adch.17.1.8 9_1	360; PRODUCTION
2018	Ross, M; Munt, A	Cinematic virtual reality: Towards the spatialized screenplay	Article	cinematic; virtual reality; VR; 360; media; immersive screenwriting	This article considers **how screenwriting might operate in the newly established medium of cinematic virtual reality** (CVR). In Part One, we take a wide view of ways to consider screenwriting and development for CVR. Our approach theorizes CVR in the tradition of picture-making (or image-making) **practices that can be traced within a broader history of the visual arts - from painting, to photography and contemporary art. In this way, we lay open the possibility for CVR to find diverse paths as it responds to narrative concerns rather than suggest it should merely repeat the consolidation of narrative that occurred with the transition of exploratory early cinema to the dominant Classical Hollywood system.** In Part Two, our case study approach considers co-author, Miriam Ross', CVR practice-based research to allow a discussion of the format that can be used for delivery of the CVR screenplay. Our aims are to connect a historically based spatialization of the image with the question of the spatialization of the screenplay for CVR 360-degrees media. The agenda is to expand the conversation around CVR to reflect upon, and inspire, new ways of thinking (and seeing) the potential for the development of screen ideas in this medium.	10.1386/josc.9.2.191 _1	SOCIAL; VR; NARRATIVE

2018	Bahng, S	Cinematic VR as a Reflexive Tool for Critical Empathy	Proceedings Paper	Virtual reality; Cinematic VR; Critical empathy; Immersive storytelling; Reflexivity	**This practice-based research aims to develop cinematic VR as a reflexive device for exploring critical empathy. Critical empathy is a concept that emphasizes the limitations and complications of empathy from reflexive perspectives.** Many artists and filmmakers have become increasingly interested in using VR as a creative medium for evoking empathy. However, the complexity of the empathic process in reflexive contexts has not been considered sufficiently. Current cinematic VR is focused on creating an immersive illusion to induce a sense of presence or embodied experience rather than eliciting reflection. Although VR technologies have been developing rapidly, there are obvious gaps between physical reality and virtual reality in terms of embodiment and bodily presence. Those gaps do not necessarily need to be erased to create immersive illusions; rather, they can be used effectively as a new method of storytelling and as aesthetic techniques for promoting self and social reflection. The practical exploration of the creation of a new method of immersive storytelling could add substantive insight to understanding cinematic VR, which can be seen as a reflexive device as well as a sociocultural tool for critical empathy.	10.1007/978-3-030-04028-4_43	CINEMATIC VR INERACTIVE EXPERIENCE/VR; EMPATHY; INTERACTIVE;/ 360; VIDEO; STORYTELLING/ EXPERIENCE; EMPATHY; VIRTUAL REALITY
2018	Graham, K; Fai, S	Creating Non-Linear Digital Stories of the Canadian Parliament Buildings and Rehabilitation Project	Proceedings Paper	digital storytelling; dissemination; virtual reality; web; exhibition; interactive; non-linear storytelling	The Library of Parliament offers guided tours of the Canadian Parliament Buildings in Ottawa, Canada. Trained guides lead visitors through the main spaces of the Centre Block following a carefully scripted itinerary. Unfortunately, the Centre Block will be closing in 2018 to undergo a multi-year long rehabilitation, suspending the current tour program and relocating parliamentary activities. The closing of Centre Block presented two research challenges: **how to continue to engage the public in the rich history of the Centre Block and how to engage and educate the public about the rehabilitation process. Carleton Immersive Media Studio has been working with Public Services and Procurement Canada for over two years to record and model the existing conditions of the Centre Block in preparation for the rehabilitation.** In this paper, we **discuss three projects - the Senate Virtual Tour, the VR Kiosk, and Building Canada's Parliament - that repurpose these existing digital assets to teach an online public about the past and future of Canada's Parliament Buildings.** The projects offer non-linear, self-guided, and interactive experiences that engage the visitor by offering a sense of agency. In the first example, visitors can experience the digitally assisted storytelling of the Senate Virtual Tour by taking a self-guided walk through the spaces of the Senate and choose from a range of artefacts that are available for closer study. The second example, the VR Kiosk, provides passive virtual reality experience narratives focusing on the rehabilitation project, and lastly, Building Canada's Parliament, offers interactive games and images, video, and 360-video to tell the story of the Parliamentary architecture and the rehabilitation project.		SOCIAL; VR; NARRATIVE
2018	Fearghail, CO; Ozcinar, C; Knorr, S; Smolic, A	Director's Cut - Analysis of Aspects of Interactive Storytelling for VR Films	Proceedings Paper	360 degrees film; Storytelling; Director's cut; Virtual reality	To explore methods that are currently used **by professional virtual reality (VR) filmmakers to tell their stories and guide users**, we analyze how end-users view 360 degrees video in the presence of directional cues and evaluate **if they are able to follow the actual story of narrative 360 degrees films.** In this context, we first collected data from **five professional VR filmmakers.** The data contains eight 360 degrees videos, the directors cut, which is the intended viewing direction of the director, plot points and directional cues used for user guidance. Then, we performed a subjective experiment with 20 test subjects viewing the videos while their head orientation was recorded. Finally, we present and discuss the experimental results and show, among others, that visual discomfort and disorientation on part of the viewer not only lessen the immersive quality of the films but also cause difficulties in the viewer gaining a full understanding of the narrative that the director wished them to view.	10.1007/978-3-030-04028-4_34	360 video storytelling
2018	Fraustino, JD; Lee, JY; Lee, SY; Ahn, H	Effects of 360 degrees video on attitudes toward disaster communication: Mediating and moderating roles of spatial presence and prior disaster media involvement	Article; Proceedings Paper	Crisis communication; Disaster communication; 360 degrees video; Immersive media; Presence	Visual media technologies such as **360 degrees video, augmented reality, and virtual reality are on the rise for immersive storytelling** in a variety of public relations contexts. Yet there is a profound lack of scholarly research in public relations, crisis communication, and disaster communication **to explore the effects of content displayed using these delivery formats on publics' responses.** To begin addressing the knowledge gap, this work reports results from a laboratory experiment investigating effects of media modality (traditional unidirectional video content vs. 360 degrees omnidirectional video content) on attitudes toward the disaster communication content. Results demonstrate that 360 degrees video featuring the aftermath of a natural disaster yields enhanced attitudes toward the helpful impact of the content. Importantly, mediation analyses show that (1) **a sense of spatial presence underlies these effects, and (2) the mediating effects of spatial presence are attenuated by involvement with similar disaster media coverage** (indirect experience).	10.1016/j.pubrev.2018.02.003	360; VIDEO; STORYTELLING
2018	Szczurowski, K; Smith, M	Emulating Perceptual Experience of Color Vision Deficiency with Virtual Reality	Proceedings Paper	Color Vision Deficiency; Color-blindness; Design; Virtual Reality; Head Mounted Display	One of the major goals of Universal Design is to create experiences that are inclusive to all users, including those affected by Color Vision Deficiency. Color Vision Deficiency might have a significant impact on a users' perception of the content or the environment. There is a range of tools already available, that can be used to either aid or automate the process of readability testing for digital interfaces and content in respect to Color Vision Deficiency. Two different approaches to addressing this issue can be found. A brief review of such methodologies is provided in this paper. The first approach (user-end) attempts to solve the problem by altering mediation between the user and the content. The second (design-end) allows the designer to view an image, or color scheme altered to recreate the perceptual experience of a user affected by Color Vision Deficiency and assess the design from the perspective of a color-blind user. With an implemented proof-of-concept we investigate the potential use of Virtual Reality Head-Mounted Displays to e**mploy similar methodology, to allow designers or interior decorators to experience physical environments (i.e.: classroom, library or a cafeteria) from the perspective of a color-blind person.** Such tools might **increase the designers' empathy towards color-blind users but also allow them to identify visual components**, such as infographics or advertisement, in a physical environment that are poorly visible to color-blind users. Such tools could be developed by taking advantage of a modern Head-Mounted Displays six degrees of freedom tracking, a 360 camera and color processing filters applied during post-processing at run-time, allowing a designer to easily switch between different types of colorblindness emulation.	10.3233/978-1-61499-923-2-378	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2018	Shin, D; Biocca, F	Exploring immersive experience in journalism	Article	Embodiment; empathy; engagement; immersion; immersive journalism; viewing experience; virtual reality; virtual reality journalism	Although virtual reality (VR) has been widely used **to deliver news** stories in immersive journalism (IJ), it is not clear how people are actually experiencing these stories and their contexts. Focusing on the immersion feature of VR stories, this study explicates the user experience to determine what it is like to experience news stories in VR and **how immersion improves viewing experiences in IJ**. This study proposes a VR experience model in the IJ context that integrates cognitive, affective, and behavioral factors as the primary influencing determinants. The results indicate that the meaning of immersion strongly depends on the users' traits and contexts and that the function of immersion is strongly determined by the users' own cognition and intentions. VR stories are viewed and accepted based on the manner that users imagine and intend to experience them. The model demonstrates the users' cognitive processes of experiencing quality, value, and satisfaction, which determine how people empathize with and embody VR stories. **The results confirm the relationship between immersion and both empathy and embodiment, implying a new conceptualization of immersion in the IJ context.**	10.1177/1464448417733133	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2018	Dowling, D; Fearghail, CO; Smolic, A; Knorr, S	Faoladh: A Case Study in Cinematic VR Storytelling and Production	Proceedings Paper	**360-video; Virtual reality; Storytelling; Cinematography;** YouTube Analytics	Portraying **traditional cinematic narratives in virtual reality (VR) is an emerging practice** where often the methods normally associated with cinematic storytelling need to be adapted to the 360 degrees format. In this paper we investigate some proposed cinematic practices for narrative storytelling in a cinematic VR film set in late 9th century Ireland that follows the perilous journey young Celt as he evades being captured by Viking raiders. From this we will analyze the fidelity of those practices with results collected from YouTube Analytics.	10.1007/978-3-030-04028-4_42	360; PRODUCTION; STORYTELLING/ 360; PRODUCTION

Year	Authors	Title	Type	Keywords	Abstract	DOI	Category
2018	Rey, EB; Heravi, B; Uskali, T	Ibero-American data journalism: development, contestation, and social change. Presentation	Article	Data journalism; Automation; Non-legacy organisations; Ibero-America-Immersive storytelling; Community journalism; Social change	As the emphasis of **data journalism** research shifts to the Global South one region that remains relatively under researched is Ibero-America. Arguably, a space that has pioneered data journalism practices and with enormous potential for **social change and development through open data**, Ibero-America has excelled in many areas related to the field: La Nacion in Argentina has to date one of the most innovative data journalism units globally. Also, La Nacion, together with the Spanish newspaper El Pais, were, together with the Guardian, the New York Times and the Spiegel, the first news organisation that extracted and published information from WikiLeaks' War Logs. Finally, Spain is one of the most open societies in Europe, and a global example for open data. Yet, an absence of Ibero-American data journalism studies from mainstream scholarship, creates an opportunity to further **explore the developments and evolution of data journalism** in this geographic region. In this vein, this special edition of Icono14 aims at repositioning Iberian American data journalism within the broadest discussions on the field, recontextualising its contribution into debates on the role of this journalistic practice in the Global South.	10.7195/ri14.v16i2.1221	360; VIDEO; STORYTELLING
2018	De Gracia, MJB; Damas, SH	Immersive feature through 360 degrees video in Spanish news media	Article	immersive journalism; immersive feature 360 degrees video; innovation media; virtual reality; immersive storytelling	This paper offers the results of a **content analysis on how Spanish media are using the 360 degrees video feature**. Unlike other conventional ways of storytelling, this new modality provides the viewer with a sensation **of being really present in a reality** that is only being represented, which favors a deeper and more meaningful understanding of it. The study consists of a sample of 147 360 degrees video features produced by 19 Spanish media **between January 2015 and December 2017**. The results confirm a slight increase in the number of publications in 2017 and a preference for using this format to cover social issues. The main purpose of these features seems to be to show the events in their context. The use of the several techniques to increase the sense of presence is still low	10.26441/RC17.2-2018-A3	360; VIDEO; STORYTELLING
2018	Benitez-de-Gracia, MJ; Herrera-Damas, S	Immersive feature through 360 degrees video: Design of an analysis model	Article	Immersive feature; Immersive journalism; 360 degrees video; Presence; Virtual reality; Immersive storytelling; Journalistic innovation	The evolution **of recording technology for real images in 360 degrees video** has fueled adoption by some media, particularly from 2015. It is an emerging and innovative trend that offers the viewer the possibility **of approaching an event with great realism**. In this article we propose a model to **conduct content analysis** based on feature identification and basic characterization. Our model identifies **which elements are influential in generating a sense of being in a represented place**. The objective is to identify the factors involved in the construction of a story that generates a sensation of immersion in the reality that is being represented.	10.3145/epi.2018.ene.14	360; VIDEO; STORYTELLING
2018	Athanasopoulos, G; Lucas, C; Cierro, A; Guerit, R; Hagihara, K; Chatelain, J; Lugan, S; Macq, B	King's Speech: Pronounce a Foreign Language with Style	Article	**Immersive Language Learning**; L2 Pronunciation; Spoken **Karaoke**; Computer Assisted Pronunciation Training; Gamification; Audiovisual Speech Technology	Computer assisted pronunciation training requires strategies that capture the attention of the learners and guide them along the learning pathway. In this paper, we introduce an **immersive storytelling scenario for creating appropriate learning conditions**. The proposed learning interaction is orchestrated by **a spoken karaoke**. We motivate the concept of the spoken karaoke and describe our design. Driven by the requirements of the proposed scenario, we suggest a modular architecture designed for immersive learning applications. We present our prototype system and our approach for the processing of spoken and visual interaction modalities. Finally, we discuss how technological challenges can be addressed in order to enable the learner's self-evaluation.	10.7559/citarj.v10i2.414	360; VIDEO; STORYTELLING
2018	Ko, DU; Ryu, H; Kim, J	Making New Narrative Structures with Actor's Eye-Contact in Cinematic Virtual Reality (CVR)	Proceedings Paper	Cinematic Virtual Reality; Narrative; Eye contact	With an advent of the VR market, using 360-degree cameras to create Cinematic VR (CVR) experiences opened up a prominent question **that can challenge the traditional film narratology. Additional fields of view are allowed so the viewers in CVR can move their heads to choose more attentive and informative scenes, but frequent scene changes are not welcomed due to VR nausea. These technical drawbacks (and/or advantages) demand a new narratology for CVR, in particular, how the director of CVR can convey certain narratives to the viewers in conjunction with how he/she can attract the viewers to look at the acting persons in the 360-degree scenes**. In this study, we **employed well-established underpinnings of both eye contact and gaze, by which the acting persons in CVR can effectively convey the narrative structure**, and, at the same time, more attentiveness from the viewer in CVR can be ensured. We completed two versions of CVR, one with the traditional film narratology and the other for the new CVR narratology (i.e., eye contact and gaze) proposed in this article, and are now in the stage of evaluation. Our preliminary results showed that the viewers in the CVR film with more eye contact and gazes effectively presented the narratives of the film and also were more satisfied with the CVR environment.	10.1007/978-3-030-04028-4_38	CINEMATIC VR INERACTIVE EXPERIENCE
2018	Reyes, MC	Measuring User Experience on Interactive Fiction in Cinematic Virtual Reality	Proceedings Paper	Cinematic virtual reality; Interactive digital narrative; Interactive fiction in cinematic virtual reality; Hyperfiction; Medium-conscious narratology; User experience measurement	This paper proposes **a methodology to measure User Experience** (UX) dimensions on Interactive Fiction in Cinematic Virtual Reality (IFcVR), **in order to evaluate the effectiveness** of IFcVR as a narrative form and as a vehicle for different types of messages. The presented methodology merges Human Computer Interface (HCI) evaluation techniques with Interactive Digital Narrative (IDN) user dimensions, and gathers both qualitative and quantitative data by mixing different types of instruments. An experimental evaluation of an interactive VR fiction film functional prototype demonstrates the viability of the proposed methodology while gathered data shows a positive acceptance by the participants to IFcVR as an entertaining and immersive experience.	10.1007/978-3-030-04028-4_33	CINEMATIC VR INERACTIVE EXPERIENCE
2018	Ozcinar, C; Cabrera, J; Smolic, A	Omnidirectional Video Streaming Using Visual Attention-Driven Dynamic Tiling for VR	Proceedings Paper	omnidirectional video; virtual reality; visual attention; tiling; adaptive streaming	This paper proposes **a new adaptive omnidirectional video (ODV) streaming system that uses visual attention (VA) maps.** The proposed method benefits from a novel approach to VA-based bitrate allocation algorithm and dynamic tiling, providing enhanced virtual reality (VR) video experiences. The main contribution of this paper is the use of VA maps: (i) to distribute a given bitrate budget among a set of tiles of a given ODV and, (ii) to decide an optimal tiling structure (i.e., tile scheme) per chunk. For this, a novel objective metric is proposed: the visual attention spherical weighted (VASW) PSNR. This metric operates in the spherical domain and by means of a VA probabilistic model aims at capturing the quality of the actual areas observed by the users when navigating through the ODV content. We evaluate the proposed system performance with varying bandwidth conditions and the tracked head orientations from disjoint user experiments. Results show that the proposed system significantly outperforms the existing tiled-based streaming method.		omnidirectional; VR; attention

Year	Authors	Title	Type	Keywords	Abstract	DOI	Tags
2018	Ramirez, EJ; LaBarge, S	Real moral problems in the use of virtual reality	Article	Applied ethics; Institutional review boards; Media experience; Moral psychology; Phenomenology; Virtual Reality	In this paper, we argue that, under a specific set of circumstances, **designing and employing certain kinds of virtual reality (VR) experiences can be _unethical._** After a general discussion of simulations and their ethical context, we begin our argument by distinguishing between the experiences generated by different media (text, film, computer game simulation, and VR simulation), **and argue that VR experiences offer an unprecedented degree of what we call perspectival fidelity that prior modes of simulation lack.** Additionally, we argue that when **VR experiences couple this perspectival fidelity with what we call context realism, VR experiences have the ability to produce virtually real experiences.** We claim that virtually real experiences generate ethical issues for VR technologies that are unique to the medium. Because subjects of these experiences treat them as if they were real, a higher degree of ethical scrutiny should be applied to any VR scenario with the potential to generate virtually real experiences. To mitigate this unique moral hazard, **we propose and defend what we call The Equivalence Principle. This principle states that if it would be wrong to allow subjects to have a certain experience in reality, then it would be wrong to allow subjects to have that experience in a virtually real setting.** We argue that such a principle, although limited in scope, should be part of the risk analysis conducted by any Institutional Review Boards, psychologists, empirically oriented philosophers, or game designers who are using VR technology in their work.	10.1007/s10676-018-9473-5	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2018	de Gracia, MJB; Damas, SH	Viewer's immersion in 360 degrees video features. Comparative analysis of In the skin of a refugee and Fukushima, polluted lives	Article	Immersive storytelling; feature; 360 degrees video; innovation; virtual reality	The aim of this paper is to **identify some of the narrative resources being used in immersive features** to increase in the viewer the sensation of being inside the represented reality represented. In order to do, so we have used a blended methodology based on **content analysis** and in **depth interviews with their creators**, to perform a comparative analysis between 2 Spanish projects. The selected features are En la piel de un refugiado **(In the skin of a refugeee)**, published by El Confidencial in 2016 and Fukushima, vidas contaminadas (Fukushima, polluted lives), also published that year by El Pais. Results indicate the coincidence in the use of some narrative techniques, but also great differences when using other resources. This fact certifies the experimental nature of this type of contents.		360; VIDEO; STORYTELLING
2018	Ozcinar, C; Cabrera, J; Smolic, A	Viewport-Aware Omnidirectional Video Streaming Using Visual Attention and Dynamic Tiles	Proceedings Paper	omnidirectional video; visual attention; tiling; adaptive streaming; virtual reality	In this paper, we introduce **a new adaptive omnidirectional video (ODV) streaming system that uses visual attention (VA) maps, providing enhanced virtual reality (VR) video experiences.** Our proposed method benefits from dynamic tiling and viewport-aware bitrate allocation algorithms. Our main contribution is utilizing the VA maps for deciding the tiling structure (i.e., tile scheme) per chunk and distributing a given bitrate budget to each tile in a viewport-aware way. For this, we first estimate viewport-based VA maps using the collected users' viewport trajectories. Then, an optimal pair of tiling scheme and unequal bitrate allocation for each tile of a given content is determined per chunk by calculating the expected viewport quality using our proposed VA -weighted objective quality measurement (OmniVA). We evaluate the proposed method performance with varying bandwidth conditions and viewport trajectories from different users. The results show that the proposed method significantly outperforms the existing tiled -based method in terms of viewport-PSNR.		omnidirectional; VR; attention
2018	Wen, C; Luo, X	Virtual Art Experience on Cultural Heritage Information with Construction of Evaluation Criteria	Proceedings Paper	Cultural Heritage Information; Virtual Art; Immersive Experience; Emperor Qin's Mausoleum	The cultural heritage intuitively **reflects the progress of human and social development.** As humans having entered the 21st century, an experience era of information pluralism, new information and interaction technologies such as virtual reality (VR) etc. provide effective methods **on the digital inheritance of cultural heritage information** (CHI). Moreover, the application of virtual art in the digital survival of CHI changes the linear narrative mode of traditional exhibition and propagation and strengthens the interactive narrative characteristic of the theme and story of CHI. **The evaluation of virtual art experience** has become one of the important measures for promoting the digital development of cultural heritage. Aiming at CHI's virtual art experience, in this paper, firstly a restoration and display VR system of Emperor Qin's mausoleum has been built. Then based on the features of the built VR system, some virtual art characteristics and user experience requirements of the system are analyzed, and an architecture of objective evaluation criteria of virtual art experience is established. Finally, an evaluation test of the virtual art experience on the virtual environment of the First Emperor's mausoleum is adopted according to the criteria, which provides many possibilities for digital protection and reconstruction of CHI in the Qin Dynasty.		SOCIAL; VR; NARRATIVE
2018	Nash, K	Virtual reality witness: exploring the ethics of mediated presence	Article	Virtual reality; humanitarian communication; ethics; proper distance; empathy	The notion of immersive witness underpins much of the exploration of virtual reality (VR) by journalists and humanitarian organisations. **Immersive witness links the experience of VR with a moral attitude of responsibility for distant others.** In accounts of media witness, the ability of the media to sustain an experience of presence has played an important, albeit often implicit, role linking the spectator spatially **and temporally to distant suffering**. However, the concept of media witness has to date assumed that the media represent, **that news stories and documentaries present to their audiences images and sounds that communicate something of an event. VR, in contrast, seeks to simulate, providing the audience with something of an experience that is linked in various ways to the experiences of others.** It is this simulative function that is seen as fundamental to VR's moral address. This paper explores the moral potential of VR suggesting that while there is much to recommend VR as a platform for humanitarian communication there is an inherent moral risk attached: the risk of improper distance. The United Nation's VR work serves as a case study for exploring VR's moral potential and the risk of improper distance.	10.1080/17503280.2017.1340796	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2018	Larsen, M	Virtual sidekick: Second-person POV in narrative VR	Article	virtual reality; **narrative VR**; second-person POV; uberization of filmmaking; immersive storytelling; catatonic mode; floating-head POV; Hollywood structure	Today's **virtual reality (VR) restricts the screenwriter with its technological shortcoming**s, and there is little agreement on how stories should be told in the new format. While its immersivity heightens **the audience's sense of presence, and perhaps accentuates empathy, it draws attention away from plot and information**, favouring mood and emotion. While the narrative VR of the mid-2010s favoured first-person point-of-view (POV) protagonists, what we must consider is how, as **technological advances grant audiences ever-greater agency, traditional storytelling collapses when said audiences can take autonomous action and affect the plot.** A disembodied third-person POV, as in regular cinema, is also unlikely to satisfy audiences. This paper argues that **second-person POV**, where the viewer is the protagonist's sidekick, is the device **that will allow future VR audiences to fully immerse and interact without giving up our perennial pleasures of plot**, character arc and leaning back while others do the work. In the 2020s, narrative VR's economies of production are also likely, through an uberization of filmmaking, to dramatically change the industry and the role of the screenwriter.	10.1386/josc.9.1.73_1	360; VIDEO; STORYTELLING
2018	Pouli, T; Phung, TH	VR Color Grading using Key Views	Proceedings Paper	Virtual reality; color correction; color grading; post-production	**Color grading is a crucial step in film post-production f**or defining the creative intent and giving a particular look and feel to the content. **In the context of VR, no adapted solutions exist yet for color grading 360 imagery**, leading to cumbersome work-arounds and costing precious production time. To enable colorists to work on 360 content without modifying their existing workflows, **we introduce the concept of key views representative rectilinear views extracted from the 360 scene through a visual attention analysis.** Key views can be edited independently using traditional color grading approaches. Our solution then seamlessly propagates the edits to the rest of the sphere, allowing for localized grading to be applied but without requiring the use of masks or windows.	10.1145/3234253.3234287	360; PRODUCTION

Year	Authors	Title	Type	Keywords	Abstract	DOI	Codes
2018	Palmer, S	What Country, Friends, Is This?' Using Immersive Theatre Practice to Inform the Design of Audience Experience in Estate 360 degrees	Proceedings Paper	360-degree video; Immersive theatre; Performance; Design for audience experience; Interactive film; Scenography	This paper focuses on issues arising from the making of an experimental interactive 360-degree video that emerged from a relational `immersive' site-specific theatre project for a public audience that was staged in historic grounds in South Florida, USA in April 2017. This work was undertaken with academics from University of Miami, Kim Grinfeder and Stephen Di Benedetto. The specific nature of the performance event, the filming of aspects of this experience and the post-production processes each raise significant questions relating to the development of methods of 'interactive' digital storytelling for 'immersive' audience experience. The role of theatre practice and performance design in developing these mediated experiences seems to be an important element that has largely been ignored in thinking about how digital immersive experiences might be created. The video Estate 360 degrees was first published on-line in January 2018 and is freely available to download: https://interactive.miami.edu/estate/.	10.1007/978-3-030-04028-4_45	360; PRODUCTION; STORYTELLING / 360; PRODUCTION / 360 video storytelling
2019	Paino-Ambrosio, A; Rodriguez-Fidalgo, MI	A proposal for the classification of immersive journalism genres based on the use of virtual reality and 360 degrees video	Article	Immersive journalism; virtual reality; 360-degree video; genres; immersion; immersive genres	Introduction: The use of virtual reality and 360-degree video technologies in the field of journalism has led to the emergence of new lines of research, like the one addressed in this article. Objectives: This study focuses on the exploration of the different issues related to the production of pieces of the so-called immersive journalism and examines how the narrative elements of traditional journalism are reformulated in these immersive pieces. Methods: The study is based on the analysis of 2,178 pieces of immersive journalism produced by Spanish and international media companies, between 2012 and 2017. Results and conclusions: This analysis has allowed us to develop an innovative proposal for the classification of immersive journalism genres, which has not been done before. This typology is based on the analysis of the reformulation of the narrative elements of news storytelling within immersive journalism.	10.4185/RLCS-2019-1375	360; PRODUCTION; STORYTELLING/360 video storytelling
2019	Schreer, O; Feldmann, I; Renault, S; Zepp, M; Worchel, M; Eisert, P; Kauff, P	CAPTURE AND 3D VIDEO PROCESSING OF VOLUMETRIC VIDEO	Proceedings Paper	Volumetric video; stereo; point cloud; virtual reality	**Volumetric video** is regarded worldwide as the next important development step in the field of media production. Especially in the context of the extremely rapid development of the Virtual Reality (VR) and Augmented Reality (AR) markets, **volumetric video is becoming a key technology**. In this paper, a new capture and processing system for volumetric video is presented, **called 3D Human Body Reconstruction (3DHBR)**. The system is based on 16 stereo pairs of high-resolution cameras capturing a moving person in 360 degree. A **novel stereo approach provides depth information from all perspectives,** which is then fused to a single consistent 3D point cloud. A meshing and mesh reduction algorithm finally produces a sequence of meshes that can be integrated into common render engines. Given that, an integration of realistic dynamic 3D reconstructions of moving persons in VR and AR applications is possible.		360; PRODUCTION
2019	Reyes, MC; Dettori, G	Combining Interactive Fiction with Cinematic Virtual Reality	Proceedings Paper	Cinematic Virtual Reality; Interactive Fiction; Hyperfiction; Interactive Immersive Film	This contribution discusses t**he creation of a new hybrid narrative form, the Interactive Fiction in cinematic Virtual Reality (IFcVR), consisting in interactive fiction films developed by means of cinematic virtual reality (360 degrees videos), whose narrative units are interlaced with each other according to an interactive narrative structure.** This represents an improvement of cinematic Virtual Reality (cVR), a format that is currently receiving **increasing attention by research and cinema but appears rather limited from the points of view of both narrative and entertainment in that users do not have any agency in the storyworld, which strongly restrains the ambition of VR to grant freedom to interactors within the immersive experience**. This contribution illustrates the hybridization process that joins cVR and Interactive Fiction (IF) in order to create interactive immersive filmic experiences. Such process is not a trivial task, because it entails harmonizing paradigms based on different ways of transmitting and representing stories, and contributing to establish a suitable narratology for this form of interactive digital narrative. This study investigates such issues and presents a prototype IFcVR that was created and tested in order to show the feasibility of the idea. Results show that the narrative hybrid IFcVR is perceived by its users as an entertaining, narrative and interactive experience.	10.1145/1234567890	CINEMATIC VR INERACTIVE EXPERIENCE
2019	Garcia-Ochoa, YC; Monzo, VR	CONSTRUCTION OF THE SOCIAL IMAGINARY OF ALTERNATIVE THERAPIES THROUGH DISCOURSE IN SOCIAL NETWORKS: CASE STUDY OF THE CHANNEL ALTERNATIVE THERAPIES AND NATURAL REMEDIES	Article	Alternative Therapies; Social Networks; Social Imaginary; Marketing	The objective of this research is **to analyze how the social imaginary of natural, complementary and alternative therapies is constructed through its discourse in social networks.** For this, the thematic channel Alternative therapies and natural remedies of the YouTube platform has been chosen. An analysis of the content of this channel was carried out and synergies were examined with the Facebook page and the website linked to it, in order to determine whether, in addition to contributing to the diffusion of these therapies, there is a different intentionality. The analysis period of the channel has been one year: from July 2017 to July 2018. A sample of 40 videos per year has been selected, ordered according to the number of visualizations, and their common characteristics have been examined in terms of quality, themes, post-production and narrative style. The results show that the channel is used as a platform to transmit content with a favorable stance to this type of treatment. In the same way, the development of a marketing strategy oriented to a lucrative purpose is verified.		SOCIAL; VR; NARRATIVE
2019	Aziz, T	DESIGNING A RESPONSIVE 'IMMERSIVE' STORY EXPERIENCE: RACISM AND THE SONIC REPRESENTATION OF THE STEPHEN LAWRENCE MURDER	Proceedings Paper	multi-channel sound; storytelling; interactivity; audience engagement; anti-racism	**Immersive storytelling** has recently gained popularity as a technique for interacting with audiences, typically providing experiences favouring visual media through 360-degree video, virtual reality, etc. This paper investigates the potential of using a multi-channel **sound-only experience** to explore the issue of racism in society by re- visiting the murder of Stephen Lawrence, in 1993, and the media and public debates generated by the case. **Fusing the dimensions of sound, storytelling and computer-mediated interactivity,** the practice-led research involved developing a prototype for a responsive sonic story environment based on the case. The prototype was tested on an audience and qualitative data, based on in-depth interviews, was collected. Transcripts of the interviews were analysed, with reference to the dimensions of experiential engagement proposed by Busselle and Bilandzic (2009), to gain an understanding of audience engagement with the story environment. The paper illustrates the role that artists/designers can have in providing new insights into and/or understandings of real life and lived experience.		360; VIDEO; STORYTELLING
2019	Reyes, MC; Dettori, G	Developing a Media Hybridization based on Interactive Narrative and Cinematic Virtual Reality	Article	Interactive Fiction; Cinematic Virtual Reality; Interactive Digital Narratives; Interactive Immersive Film	While the media ecosystem changes in a vertiginous way, **interactive narratives make their entrance in the mainstream distribution platforms and VR looks for its feature content, new media hybrids continue to emerge from the mixture of different communication forms, narratives and supports.** This article **discusses the evolution of a hybrid narrative form (that we name IFcVR) born from the convergence between Interactive Fiction and cinematic Virtual Reality. The interest for such hybridization arises from the communication and sense-making potential of narrative, and from the high level of perceptive and narrative immersion granted by virtual reality and interactive storytelling.** This study works out a definition of IFcVR by investigating each of its roots in earlier media. Merging different forms of media entails tackling issues of various kinds. We highlight such issues, which leads us to identify the main characteristics of IFcVR: (1) its definition and components as a form of interactive digital narrative; (2) a shift from the authorial point of view of classical media, literature, cinema and theatre; and (3) the creative challenge that interactivity poses to authors, that of creating a coherent narrative development with consistent dramatic tension throughout the variety of possible paths determined by user's choices. We discuss the effectiveness of IFcVR as a consistent and entertaining experience by describing the creation and evaluation of an IFcVR prototype, a short film entitled ZENA.	10.24193/ekphrasis.22.8	VR; CINEMATIC; INTERACTIVITY/CINEMATIC VR INERACTIVE EXPERIENCE

Year	Authors	Title	Type	Keywords	Abstract	DOI	Tags
2019	Gomes, PV; Marques, A; Pereira, J; Correia, A; Donga, J; Sa, VJ	e-EMOTION CAPSULE: As artes digitais na criacao de emocoes	Proceedings Paper	Immersive Environments; Virtual Reality; Augmented Reality; Video 360; Empathy; Schizophrenia; Mental Health and Wellness Literacy	This paper describes the process of creating the multidimensional artifact e-EMotion-Capsule **that explores immersiveness to generate emotions through the creation of impactful environments.** E-EMotion-Capsule's multidimensional perspective allows participants to experience different environments created using immersive technologies such as 360 video, virtual reality environments and mixed reality platforms. The participant puts on RV goggles to interact with the eEMotion-Capsule artifact, becoming himself part of the immersive universe in which he became involved. **Their own emotions trigger the cognitive functions of perceptive, symbolic and logical processing that determine their interpretation** . The artifact uses the innovative **360-degree narrative concept in which body movement provides interactive, autonomous and personalized experimentation, coupled with visual and sound stimuli that fuse with the participant himself.** Digital art incorporating this type of narrative induces the participant **to assume the role of the main character, unleashing in this the duality between reacting and acting**, between observing and provoking, breaking indifference and generating unrest. The construction of the artifact was validated with a set of tests that focused on programming, interface design and measurement of the ability to generate emotions. The experience within the universe created by eEMotion-Capsule allows each person to build their own experimentation, navigating the artistic space guided by their own cognitive sense.	10.1145/3359852.33 59962	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2019	Zerbarini, M; de Tejada, CSS; Gramajo, ME	Envolverse de Espacio 360 degrees VR Video-Performance-2019	Proceedings Paper	Immersive art; Virtual reality; Performance; 360 degrees video	The virtual realities have, in the present and for their specificities, **a great importance in the production of Immersive Video**, the 360 degrees Video, the 360 degrees On Line Video and specifically **the Virtual Reality that comprises the Digital Immersive Installation and the visualizations with 3D glasses.** The experiences of simulation in art, of which Virtual Reality is its most current exponent, no longer offer us a window into an apparent reality but **a tool to create a new reality**. Envolverse de espacio is an artwork that relates art and technology, where the viewer will be present in another place and new questions will be manifested. The reality of being present in one dimension and virtually in another proves that the use of technol ogy is not only a means, but a discourse on the relationship art / technology itself. There is a clear and agreed technological form, even though the content (of the video) is free and open to different interpretations.	10.1145/3359852.33 59945	360; PRODUCTION
2019	Araujo, AB	Eq A Sketch 360, a Serious Toy for Drawing Equirectangular Spherical Perspectives	Proceedings Paper	Spherical perspective; equirectangular; drawing; digital drawing; art education; geodesics; VR panoramas; anamorphosis	**Eq a Sketch 360 is a simple program** for raster sketching VR panoramas in equirectangular spherical perspective. It is built as a serious toy, to develop sketching intuition regarding equirectangular drawing as proper perspective drawing, with its specific constructions of vanishing points, geodesics, line projections, antipodes, and grids. It is useful as a teaching aid and as a production tool for preliminary perspective sketches to be further rendered with other digital or traditional tools. It is naturally adapted for the input variables adequate for observational sketches. In this paper we survey the operation and purposes of the program. We also show how it calculates the equirectangular geodesic through two given points, which enables one of its main drawing features.	10.1145/3359852.33 59893	360; PRODUCTION
2019	Gargoles, M	Increasing empathy in artistic virtual environments: The presence in spherical image from the invisible avatar	Proceedings Paper	virtual reality; empathy; presence; immersive imagen; art	Nowadays the image is three dimensional and interactive, now the viewer becomes a user, now is the center of a sphere. A new world can be seen through virtual reality. In the bubble paradigm, **our relationship with the environment has changed, these immersive images make us posiible to choose the point of view, making a unique experience**. It is important to modify our relationship with the environment. **From the embodied cognition, the relationships of our body with the virtual environment allow us to feel with more intensity what we perceive**. This paper investigates the relationship of the user in these virtual and non-virtual environments. I **use the environment created by Marina Abramovic, dividing the differentiated and the interaction with Abramovic's avatar in the absence of our avatar in the virtual world, that is, in the corporal invisibility and the absence of our avatar, it is possible to increase presence, awareness and empathy through other sensory mechanisms of experience, the elements of the image and other virtualities.**	10.4995/ANIAV.201 9.9015	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2019	das Merces, JAS; de Castro, FF; Canete, VR	Memory of the excess living of compulsory displacement by Tucurui Hydroelectric	Article	Memory; Compulsory Displacement; Tucurui Hydroelectric Plant; Temporalities	In this article we describe **the mnemonic narratives about the compulsory displacement suffered by people affected by the implementation of the Tucurui Hydroelectric Power Plant in the Tocantins River** (Para). Our objective is to understand the meanings attributed to temporalities locally denominated Breu Velho and Nom Brew through ethnographic methodology with execution of participant observation and semistructured interviews and informal conversations with people who have lived the compulsory displacement. Functioning as a reference of the absence of the way of life in the places flooded by the filling of the artificial lake of the plant, Breu Velbo denominates the restatement of a demand to inhabit that the Novo Brea does not consecrate due to the excess of the event, that broke the expectations and disabled the dynamics social conditions that conferred security on the environment by the being-in-theworld conformation neglected by the inversion that the Western ontology makes of the person.		SOCIAL; VR; NARRATIVE
2019	Bakk, AK	Sending Shivers Down the Spine. VR Productions as Seamed Media	Article	virtual reality; immersion; performing arts; liveness; intermediality	According to Rebecca Rouse's concept of media of attraction (2016), **the mediums of virtual reality have four characteristics: they are participatory, interdisciplinary, unassimilated and seamed**. The author's hypothesis is that even **though 360-degree films and virtual reality experiences as seamed mediums are remediating the medium of film, they have the characteristics of the medium of live performance**. She points out that the characteristics of performance art based on Fischer-Lichte's taxonomy (2008), such as liveness and co-presence, are influencing the development of 360-degree films and virtual reality experiences. As an argument, **she analyses three virtual reality productions created by performing artists**, which operate with the specificity of intermediality and the longing for immersion, the main characteristic of virtual reality. These productions lean on the immediacy characteristics of the medium of film and performance by using cut-scenes, linear narratives, live streaming, but also by including the human interface, i.e., the actor, who ensures a higher level of absorption.(1)	10.2478/ausfm-2019-0020	360; PRODUCTION
2019	Brooks, J; Kaufman, L; Tyler-Jones, M	Soundscape Case Study: A Tudor Soundscape in a Historic House Chapel - Origins, Challenges and Evaluation	Article		During an extensive conservation project in 2017, the National Trust, working with academics from Oxford, Southampton and Bangor Universities and drawing on research in the re-enactment of medieval liturgy, experimented with a **soundscape installation** at The Vyne, a manor house near Basingstoke. Dealing with the challenge **of telling a Tudor story without a contemporaneous collection, the soundscape deployed specially commissioned new recordings of Tudor polyphony and plainsong**, spoken and intoned prayers, and Foley effects to simulate the celebration of Mass in The Vyne's pre-Reformation chapel. The soundscape imagines a moment in 1535 when Henry VIII attended a Lady Mass, surveying the service from his position of power in the lord's chambers above the chapel. It places visitors at the heart of a politically-charged time for both his religious reforms and his marriage, standing where his officers of the church would have stood as the liturgy and Nicholas Ludford's elaborate polyphonic music unfolded around them. Although the **soundscape provides a model for using sound in immersive storytelling in fragile historic house environments, evidence of impact on visitors is limited by current evaluation methods commonly employed in the sector**. This case study describes **the rationale and construction of the soundscape**, evaluates existing evidence for impact on visitors, and proposes alternatives for better evaluating historic house soundscapes.	10.1111/cura.12303	360; VIDEO; STORYTELLING

Year	Authors	Title	Type	Keywords	Abstract	DOI	Categories
2019	Silva, R; Brandao, D	STORYWORLDS IN VIRTUAL REALITY	Proceedings Paper	Virtual Reality; Storytelling; Immersion; Storyworlds; Participatory Narratives	The project consists in the building **of a fiction world** and **creation of a virtual reality (VR) experience**, exploring the potential of this medium for immersion and storytelling. An original fiction world was used: Offland, which is a fantasy approach to the western genre, centered around an inhospitable wasteland. **We worked lightly in the world building of maps, regions, civilizations, races and cultures, the project is based on McDowell's methodology, in which the design of a world precedes the telling of a story.** The VR experience portrays one specific scenario of an illusion inducing oasis, **centering the experience in exploration, survival and altered states of mind such as hallucinations.** The Virtual Environment serves us as a sandbox **to test different moments and experiences, to answer in what ways fiction storytelling can be enhanced by virtual reality's interactivity.** We interpreted Brett Leonard's concept of Storyworlding through short narratives distributed through the space, in which the user participates naturally through interaction with the environment, The virtual experience also explores user participation, allowing for users to leave voice recordings for the next users, and creating a more collective narrative. Through user testing we found that the experience should start with a goal to guide exploration, balancing linearity and nonlinearity allows for a narrative that's both comprehensive and engaging, the lack of characters or their representation causes little emotion and empathy, details make the fictional world more discernible, and participation should not be forced, it should feel simple to the user. The project expects more iterations and testing sessions, as it will benefit the VR storytelling community with more practical and solid guidelines.		EXPERIENCE; EMPATHY; VIRTUAL REALITY
2019	Salny, R	The Role of Ontological Time Forms in Film Appreciation	Article	time; duration; cinema; non-existence; aesthetic appreciation; film; Kant; Bergson; Bakhtin; Ingarden	The process **of the feature film appreciation is ambivalent and includes both direct experience of the represented reality and its comprehension.** A lot of film theorists of the last century (Andre Bazin, Bela Balazs, Gilles Deleuze, Siegfried Kracauer and others) considered that sensuous contact with the artistic reality plays the key role in the perception of the film. **Meanwhile, the artistic cognition presupposes the comprehension of the artwork integrity that is impossible without a detached attitude.** The present article attempts to consider the possibility of an integrated application of I. Kant and A. Bergson's theories to ontological interpretation of the film time. Philosophical conceptions of R. Ingarden's aesthetic appreciation and M.M. Bakhtin's artistic cognition provided the grounds for the integration of these theories. The ideas of I. Kant and A. Bergson were reframed by M.M. Bakhtin. He largely accepted Kant's **theory about the arrangement of the subject's inner life in time and also he lead the virtual discussion with Bergson about the key stance of his theory, i.e. immersion into the actual reality.** Both ideas in the modified form provided the basis for the chronotope category (time - space) devised by Bakhtin that combines two types of cognition: artistic apprehension and aesthetic contemplation. R. Ingarden placed the same principle of transition from the moment of immersion into nonexistence and vice versa that was formulated by M.M. Bakhtin. **On the basis of these two forms of time experience, the subject of perception creates two forms of involvement in the artistic reality, blending into each other: going beyond oneself' (V.P. Zinchenko), immersion in the depicted reality (empathy) and detachment (non-existence) in relation to it.** In the first form the subject experiences continuous time and is not aware of its own forms of activity. In the second form, the subject is aware of its own presence (M. Heidegger, M.I. Yanovsky) in the objectified form - the structural relations of the image and/or work elements. The first form is characterized by a state of detachment, the second - the action of imagination, associative, image and abstract-logical thinking.	10.13187/me.2019.1.116	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2019	de la Casa, JMH; Mateo, RC; Bautista, PS	Virtual reality and 360 degrees video in business and institutional communication	Article	virtual reality; 360 video; corporate communication; immersive journalism	**Addressing the presence and development of virtual reality** in the professional field is a somewhat complex challenge. It is a current topic in multiple forums and an emerging field, but it has not consolidated a solid theoretical and academic basis on which to base its presence in society, as well as its possibilities in relation to the construction of storytelling, **a new look and business models**. This article explains the communicative use of virtual reality in the business and institutional spheres. It is proposed through a representative review of case studies the uses of the multimedia format with immersive capacity and **virtual reality developed by some institutions, in order to delimit their intentionality to raise awareness, educate, entertain, inform or develop marketing strategies.** In the same way, it describes if this format is only a fashion or a strategy to achieve presence of branding.	10.26441/RC18.2-2019-A9	360 video storytelling
2019	Mabrook, R; Singer, JB	Virtual Reality, 360? Video, and Journalism Studies: Conceptual Approaches to Immersive Technologies	Article	360? video; Actor-Network Theory; immersive technology; normative theory; sociology of news; storytelling; virtual reality	A growing number of **newsrooms** are experimenting with Virtual Reality (VR) and other immersive storytelling techniques, typically supported by technology companies that see **journalism as a potential vehicle for taking VR** mainstream. The resulting pieces have been wide-ranging in topic, style, and scope, but all introduce new complexities to **journalistic norms and practices**. To date, however, journalism studies scholars have conducted relatively little research into these immersive technologies. This essay proposes three conceptual approaches to examining VR journalism: Actor-Network Theory, normative theory, and a sociological perspective on journalistic work.	10.1080/1461670X.2019.1568203	360; VIDEO; STORYTELLING
2019	Selva-Ruiz, D; Martin-Ramallal, P	Virtual reality, advertising and minors: Another challenge of cybersociety in the face of immersive technologies	Article	Virtual reality; Minors; Immersive advertising; Advertainment; YouTube; Spherical video	**Virtual reality** stands as a discourse beyond technology, with increasing visibility in all social areas, and becoming one of the protagonists of cyberculture. **Advertising is no stranger to this boom of immersive storytelling**, and it is becoming usual that campaigns with a transmedia approach use this resource in the face of narratives and channels of dissemination. Among the existing publics, minors are especially sensitive to the messages to which they are exposed, and therefore must be protected. There is a **multitude of studies whose central axis is occupied by this social sector**, although there are few studies that interrelate it with digital advertising. In this paper, virtual reality and its presence on YouTube are conceptually exposed, analyzing its advertising use focused on minors. The present investigation tries to elucidate if the immersive advertising complies with the strict control parameters of conventional advertising in its dealings with the minors, and **analyzes the convenience of consumption of these campaigns for this public**, as well as in what conditions its application is recommended.	10.7195/ri14.v17i1.1234	360; VIDEO; STORYTELLING
2020	Tong, LW; Jung, SC; Lindeman, RW	Action Units: Directorial Cues for Immersive Storytelling in Swivel-chair Virtual Reality	Proceedings Paper	Virtual Reality; 360-degree video; storytelling; social cues	The use of 360-degree videos has been increasing in the past years. However key challenges, such as **how to guide viewer's attention** without limiting free exploration, has also emerged. In this paper we proposed the notion of Action Units (AUs), composed of social cues, **aimed to improve the user experience of the 360-degree video-based immersive storytelling platform** that a viewer uses while seating in a swivel chair, namely Swivel-chair VR. We then evaluated AUs against other two commonly use techniques, by comparing their effects on memory, engagement, enjoyment, cybersickness, and behaviors of searching and attention. The results indicate that when used, **AUs helped to increase the levels of engagement and enjoyment, reduce the search time of targets and the level of cybersickness**. It is also preferred by users for its diegetic aspects	10.1109/VRW50115.2020.0-219	360; VIDEO; STORYTELLING

Year	Author	Title	Type	Keywords	Abstract	DOI	Tags
2020	Young, M	An experiment in putting an ardent hand-crafted 2D animator into the heady dimension of the non-linear world of 360 degrees and seeing what floats	Proceedings Paper	Auteur; Narrative; 360 degrees; Aesthetic; Hand-Drawn; Animation; Circus; Elephants	This paper focusses **on the character designing development** and process for Elephant Elephant Elephant! (previously called Millimation's Elefunk Mini-top Experience ME2)**a hand drawn 360 degrees immersive story**. It is a reflection of the journey of an 'independent avant-garde, experimental film-maker with a self-conscious auteur's perspective', a term coined by Paul Well's, when he discussed the notion of the auteur in animation (1), who decided to develop a hand drawn immersive experience to take the audience on a journey reflecting on the absurdity of the practice of elephants performing in the circus. It aims to demonstrate that **even the technology of the often clinically real Virtual world can be subverted with the creativity and experiment that puts an ardent hand-crafted 2D animator into the heady dimension of the non-linear world of 360 degrees.** This may encourage other like-minded creatives in to this virtual reality to mess up the aesthetics. The project has spanned four years in a practice-based research exploring the narrative strategies for immersive stories in 360 degrees. The key constraint in the design imposed by the auteur has been to maintain a hand drawn 2D animation aesthetic - the result in the context of the animation short's history of the experimental, it is perhaps quite conservative, being it shifts between being cartoonish and relatively representative but that the whole content is reliant on the hand of the artist as the sole creative in the production - and to see if it this aesthetic can translate and maintain the qualities present in traditional animation shorts when transferred in to the more immersive setting. This paper will concentrate on the development of the design of the main character, the elefunk in relation to it's role in the narrative content of the Millimation's Elefunk Minitop Experience (ME2).		360; PRODUCTION
2020	Gutierrez-Caneda, B; Perez-Seijo, S; Lopez-Garcia, X	Analysing VR and 360-degree video apps and sections. A case study of seven European news media outlets	Article	immersive journalism; virtual reality; 360-degree video; Apps; responsive design; 360 storytelling	Introduction. The evolution of the internet and new technologies have transformed the media ecosystem, opening the door to new narrative trends. In this scenario, many news media outlets have begun to use technologies such as virtual reality and resources like 360-degree video in their production processes, which constitutes a novel form of journalism production known as Immersive Journalism. Methods. **The aim of this article is to analyse how European news media outlets organise and disseminate their immersive offer (360-degree videos) based on the study of seven case studies in order to determine whether their strategies in fact help users to locate, search and access such contents**. Results and conclusions. The study concludes that the diverse sections and apps of the seven cases analysed exhibit several weaknesses that complicate the access and, consequently, the consumption of the 360-degree videos available.	10.4185/RLCS-2020-1420	SOCIAL; VR; NARRATIVE/360; PRODUCTION; STORYTELLING/360 video storytelling/360; PRODUCTION
2020	Hassan, R	Digitality, Virtual Reality and The 'Empathy Machine'	Article	virtual reality; digitality; journalism; empathy	The man who works recognizes his own product in the World that has actually been transformed by his work: He recognizes himself in it, he sees in it his own human reality, in it he discovers and reveals to others the objective reality of his humanity, of the originally abstract and purely subjective idea he has of himself. Alexandre Kojeve (1980, 27)**The essay critiques an aspect of the so-called post-mobile wave of technological change that claims, through the vector of virtual reality (VR), to have created an 'empathy machine' that will form the basis of a new journalism.** Through VR devices deployed by news organisations such as the New York Times, and multilateral institutions such as the United Nations, users will be so powerfully immersed in, for example, a street demonstration, or a refugee camp, that the empathy they feel may constitute a new strengthening of the fourth estate's civic role in informing and enlightening the public, to the extent that it can go beyond subjective empathy to develop a shared basis for political participation in civil society. The essay considers these claims from the overarching context of what is called digitality. It argues that human agents are analogue agents from an analogue world. Digitality, by contrast, is an essentially alienating sphere wherein digital media cannot replicate analogue communication processes without generating gaps, voids, and 'missing information'. It further argues, extending insights from Guy Debord, that what VR does produce is a powerful 'integrated spectacle' that is a pale substitute for the form of interactive experience needed for the generation of empathy. Taken together, the essay concludes that empathy, a contestable term in its common understanding to begin with, cannot be generated from a digital source. Moreover, should VR become the next dominant post-mobile technological wave as the tech giants predict, then people, users and consumers of VR products in the fourth estate news context, will be further distanced from the analogue reality of the actual world.	10.1080/21670811.2018.1517604	VR; EMPATHY; INTERACTIVE/EXPERIENCE; EMPATHY; VIRTUAL REALITY
2020	Pavlik, JV	Drones, Augmented Reality and Virtual Reality Journalism: Mapping Their Role in Immersive News Content	Article	augmented reality; drones; journalism; photogrammetry; virtual reality; volumetric	**Drones** are shaping journalism in a variety of ways including**in the production of immersive news** content. This article identifies, describes and analyzes, or maps out, four areas in which **drones are impacting immersive news content**. These include: 1) enabling the possibility of providing aerial perspective for first-person perspective flight-based immersive journalism experiences; 2) providing geo-tagged audio and video for flight-based immersive news content; 3) **providing the capacity for both volumetric and 360 video capture**; and 4) generating novel content types or content based on data acquired from a broad range of sensors beyond the standard visible light captured via video cameras;**these may be a central generator of unique experiential media content** beyond visual flight-based news content.	10.17645/mac.v8i3.3031	360; PRODUCTION
2020	Martinez-Cano, FJ; Ivars-Nicolas, B; Martinez-Sala, AM	DUAL UBIQUITY: BASIS FOR THE EFFECTIVENESS OF THE VRCINEMA AS A PROSOCIAL TOOL ANALYSIS OF HUNGER IN LA. AND AFTER SOLITARY	Article	virtual reality cinema; videoactivism; dual ubiquity; immersive narration; presence; virtual environments	The audiovisual medium has served as a transmitter of values throughout its history.**From militant cinema to videoactivism, audiovisual productions have been agents that generate awareness in the viewer,** and currently offer new possibilities through the evolution of the media ecosystem and the emergence of virtual reality (VR). Among them, dual ubiquity,**key in the generation of empathy in the viewer, since it is capable of transporting the audience to other realities.** Therefore, what impact can virtual reality have on the field of contemporary audiovisual activism? To deepen this issue, **a bibliographic review of the references has been carried out, as well as on recent research that addresses this issue**. Once this first phase is completed, we design a virtual reality film analysis model that updates the immersive triangle (Cortes-Selva, 2015), based on the variables established by Archer and Finger (2018) and Dominguez-Martin (2015), with which two productions of Emblematic Group, one of the main producers of the field of non-fiction with RV, have been analyzed. Finally,**the results show some of the common features identified as necessary to produce an emotional impact on the audience, essential for their effectiveness as tools of social transformation.**		EXPERIENCE; EMPATHY; VIRTUAL REALITY
2020	Bollmer, G; Guinness, K	Empathy and nausea: virtual reality and Jordan Wolfson's Real Violence	Article	aesthetics; contemporary art; Einfuhlung; embodiment; Jordan Wolfson; modernism; virtual reality (VR)	Jordan Wolfson's Real Violence (2017) is a brief virtual reality (VR) piece that depicts the artist beating a man to death with a baseball bat. Wolfson uses the haptic possibilities of VR to rapidly **induce nausea in the viewer, an act that both relies on empathetic aspects of VR simulation - 'empathy' here linked with its history in German aesthetic psychology as Einfuhlung - and is a confrontational distancing that questions the politics of 'empathetic' immersion**. Real Violence demonstrates how contemporary judgments of VR and empathy repeat debates from the late 19th and early 20th centuries, reinventing and emptying particular political/aesthetic strategies that have long characterized a strain of modernist art that uses the formal possibilities (and limits) of media in order to critique the very same possibilities (and limits). This article, through its discussion of Wolfson's work, seeks to identify and inhabit the **complex contradictions present in any discussion of empathy, transgressive confrontation, and the social function of art and VR today**. It examines the limitations of immersion and emotional projection, along with the limitations of interpreting this work (and VR in general) as a means for enacting 'progressive' social and ideological change through the immersive, empathetic capacities of media. The article concludes by arguing that judgments of Real Violence (and the politics of 'transgressive' art more broadly) require assuming the will or intent of an artist who uses confrontation and transgression to 'correct' the experience of the viewer, which is something that cannot be assumed for either Wolfson or Real Violence, and rather his work is exemplary of emptying out the possibilities represented by both VR and critical aesthetic intervention.	10.1177/1470412920906261	EXPERIENCE; EMPATHY; VIRTUAL REALITY

2020	Bujic, M; Salminen, M; Macey, J; Hamari, J	Empathy machine: how virtual reality affects human rights attitudes	Article	Virtual reality; 360-degree video; Immersive journalism; Human rights; Attitude change; Being-there	Purpose **This study aims to investigate how media content consumed through immersive technology may evoke changes in human rights attitudes.** It has been proposed that our inability to empathize with others could be overcome by stepping into another's shoes. Immersive journalism has been postulated as being **able to place us into the shoes of those whose feelings and experiences are distant to us**. While virtual reality (VR) and 360-degree news videos have become widely available, it remains unclear how the consumption of content through immersive journalism affects users' attitudes. Design/methodology/approach Utilizing a between-subject laboratory-controlled experiment (N = 87) **this study examined participant scores on the Human Rights Questionnaire before and after consuming 360-degree video immersive journalism content via** VR (n = 31), 2D (n = 29), and Article (n = 27) formats. Collected data were analysed using statistical inference. Findings Results indicate **that immersive journalism can elicit a positive attitudinal change in users**, unlike an Article, with mobile VR having a more prominent effect than a 2D screen. Furthermore, this change is more strongly affected by users' higher Involvement in the content. Originality/value These findings are relevant for grasping the distinct effects novel and recently popularized technologies and media have on attitudinal change, as well as inform the current debate on the value of VR as empathy machines.	10.1108/INTR-07-2019-0306	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2020	Maranes, C; Gutierrez, D; Serrano, A	Exploring the impact of 360 degrees movie cuts in users' attention	Proceedings Paper	Human-centered computing; Human computer interaction (HCI); Interaction paradigms; Virtual reality	Virtual Reality (VR) has grown since the first devices for personal use became available on the market. However, **the production of cinematographic content in this new medium is still in an early exploratory phase**. The main reason is that **cinematographic language in VR is still under development, and we still need to learn how to tell stories effectively.** A key element in traditional film editing is the use of different cutting techniques, in order to transition seamlessly from one sequence to another. A fundamental aspect of these techniques **is the placement and control over the camera.** However, **VR content creators do not have full control of the camera**. Instead, users in VR can freely explore the 360 degrees of the scene around them, which potentially leads to very different experiences. While this is desirable in certain applications such as VR games, it may hinder the experience in narrative VR. In this work, we perform a systematic analysis of users' viewing behavior across cut boundaries while watching professionally edited, narrative 360 degrees videos. We extend previous metrics for quantifying user behavior in order to support more complex and realistic footage, and we introduce two new metrics that allow us to measure users' exploration in a variety of different complex scenarios. From this analysis, (i) we confirm that previous insights derived for simple content hold for professionally edited content, and (ii) we derive new insights that could potentially influence VR content creation, informing creators about the impact of different cuts in the audience's behavior.	10.1109/VR46266.2020.00-79	360; PRODUCTION
2020	Nakamura, L	Feeling good about feeling bad: virtuous virtual reality and the automation of racial empathy	Article	digital industries; digital media; embodiment; empathy; gender; race; trauma; virtual reality (VR); women of color	Virtual reality (VR)'s newly virtuous identity as the **'ultimate empathy machine'** arrives **during an overtly xenophobic, racist, misogynist, and Islamophobic moment in the US and abroad.** Its rise also overlaps with the digital industries' attempts to defend themselves against increasingly vocal critique. **VR's new identity as an anti-racist and anti-sexist technology that engineers the right kind of feeling has emerged to counter and manage the image of the digital industries as unfeeling and rapacious.** In this article, **the author engages with VR titles created by white and European producers that represent the lives of black and Middle Eastern women and girls in Lebanon, Nairobi, and Paris.** She argues that the invasion of personal **and private space that documentary VR titles 'for good' create is a spurious or 'toxic empathy' that enables white viewers to feel that they have experienced authentic empathy for these others, and this digitally mediated compassion is problematically represented in multiple media texts as itself a form of political activism.**	10.1177/1470412920906259	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2020	Ivars-Nicolas, B; Martinez-Cano, FJ; Cuadra-Martinez, J	Immersive experiences in 360 degrees video for social youth engagement	Article	360 degrees video; immersion; presence; documentary film; young audience; virtual reality	Educational and cultural television is an audio-visual medium that seeks to bear an impact on the knowledge, the attitudes and the values of an audience. This text introduces the CREA TV platform as an informal educational and socializing audio-visual instrument and describes the development of the documentary Miguel Hernandez 360 degrees made in 360 degrees video. **Two objectives are pursued through this: first, to introduce 360 degrees video production as a means to use format to engage the audience and to foster the assimilation of contents; on the other hand, to teach values.** To identify its effects, this experience was tested with secondary school students. The results of the analysis suggest that this 360 degrees video **has an impact on the connection between the viewer and the story due to its immersive character and sense of presence during the viewing of the documentary**, as well as on the understanding and assimilation of the information it contains.	10.1386/cjcs_00029_1	360; PRODUCTION
2020	Ferjoux, C	Immersive Journalism and Empathy: Emotion as Immediate Knowledge of Reality	Article	immersion; empathy; journalism; virtual reality; experience	This article questions the frequent use **of the notions of immersion and empathy in discourses relating to immersive journalism** between 2014 and 2019. The euphoria expressed about the virtual reality capabilities to **transcribe the accuracy of the facts can be understood at different levels**. It symbolises a technological utopianism. It also illustrates the paradigm of socio-technical diffusion specific to innovations. It finally reformulates a dialectical ambivalence of the journalism's ethos, where emotion appears to be both a source of motivation and a raw material for information.		EXPERIENCE; EMPATHY; VIRTUAL REALITY
2020	Colussi, J; Reis, TA	Immersive journalism: a narrative analysis in virtual reality apps	Article	immersive journalism; mobile journalism; virtual reality; 360 degrees videos; smartphone	This paper, which is part of the field of immersive journalism studies, compares the narrative of contents published in El Pais VR, Folha 360 degrees, Estadao RV and NYT VR, specific applications **for 360 degree productions of the newspapers El Pais (Spain), Folha de S. Paulo and Estado de S. Paulo (Brazil) and New York Times (United States)**. In addition **to identify the main characteristics of 51 publications, the main of this study is to verify the level of immersion these contents provide to the users.** Due to this, a content analysis has been carried out, based on methodological contributions by authors from different countries. The final result points out that the spatial immersion level is much higher than the sensory level in most of the sample, which leads to a relative virtual reality experience for the user. Hence, with the exception of the content of NYT VR, the user does not usually feel involved psychologically about to immerse totally in the story and forget reality. Therefore, it is necessary to encourage the creation of more innovative initiatives with digital avatar narratives.	10.4185/RLCS-2020-1447	360; PRODUCTION / SOCIAL; VR; NARRATIVE
2020	Selmanovic, E; Rizvic, S; Harvey, C; Boskovic, D; Hulusic, V; Chahin, M; Sljivo, S	Improving Accessibility to Intangible Cultural Heritage Preservation Using Virtual Reality	Article	Virtual reality; intangible cultural heritage; head-mounted display; storytelling	Presentations of **virtual cultural heritage artifacts** are often communicated via the medium of interactive digital storytelling. The synergy of a storied **narrative embedded within a 3D virtual reconstruction** context has high consumer appeal and edutainment value. **We investigate if 360. videos presented through virtual reality further contribute to user immersion for the application of preserving intangible cultural heritage**. A case study then analyzes whether conventional desktop media is significantly different from virtual reality as a medium for immersion in intangible heritage contexts. The case study describes bridge diving at Stari Most, the old bridge in Mostar Bosnia. This application aims to present and preserve the bridge diving tradition at this site. The project describes the site and history along with cultural connections, and a series of quiz questions are presented after viewing all of the materials. Successful completion of the quiz allows a user to participate in a virtual bridge dive. The subjective evaluation provided evidence to suggest that our method is successful in preserving intangible heritage and communicating ideas in key areas of concern for this heritage that can be used to develop a preservation framework in the future. It was also possible to conclude that experience within the virtual reality framework did not affect effort expectancy for the web application, but the same experience significantly influenced the performance expectancy construct.	10.1145/3377143	360 video storytelling

2020	Hudson, D	Interactive documentary at the intersection of performance and mediation: navigating 'invisible' histories and 'inaudible' stories in the United States	Article	Digital; environmentalism; feminism; interactive documentary; postcolonial; United States	Examining **four interactive documentaries, this article analyzes how performance and mediation can encourage curiosity, empathy, and accountability in relation to complex issues and perspectives that cannot be always represented with any pretense of objectivity or ethics in conventional analogue practices.** They can foreground emotional and affective registers as meaningful - sometimes more meaningful than the empirical and rational registers typically prioritized in analogue media. **They model a critical engagement with digital evidence, tactile interfaces, and locative experiences to navigate a postcolonial/transnational United States and allow for potentially multi-perspectival understandings of issues.** Documentary studies historically focused on visible or audible evidence. It has paid less attention to invisible and inaudible evidence. By activating invisible geographies, interactive documentaries facilitate new ways of imagining relationships and new ways of enacting collaborative solutions to problems that are larger than any one of us. They can instruct in ways to navigate larger processes, such as forced migration and global warming. Rather than the universalizing revolutions of past centuries - industrial revolutions, anticolonial revolutions - the current moment demands micro-revolutions and micro-assemblies. **In addition to devoting our intellectual energies and financial resources in 360 degrees VR as a new mode for documentary presentation,** we can focus on less expensive technologies that allow underrepresented perspectives to affect audiences.	10.1080/17503280.2 019.1678561	VR; EMPATHY; INTERACTIVE;
2020	Jurado-Martin, M	Latin American film festivals of virtual, augmented, and immersive reality: An overview	Article	film festivals; Latin America; virtual reality; immersive reality; 360 degrees cinema	The surge of techniques of virtual reality applied to cinema carried out an actual revolution for the film industry. Indeed, such features applied to cinema broadened several dimensions of the audiovisual, mainly video games, broadened production, exhibition, and commercial expectations. **This phenomenon has not gone unnoticed by film festivals as part of cultural and creative industries.** Nonetheless, in Latin America, there are only a **few events exclusively devoted to virtual, augmented, 360 degrees, or immersive reality applied to films**. By analyzing the **film festivals' official web pages** retrieved through the FilmFreeWay database, this paper describes some **key features of Latin American film festivals specialized in these areas of visual production**. The review shows that such efforts are in their very early stages, in the making, or they have not triggered the interest of the local film industry.	10.5354/0719-1529.2020.56993	360; PRODUCTION
2020	John, B; Kalyanaraman, S; Jain, E	Look Out! A Design Framework for Safety Training Systems A Case Study on Omnidirectional Cinemagraphs	Proceedings Paper	omnidirectional cinemagraphs; 360-degree panorama; virtual reality; safety training	Accidents occur when a person's attention is distracted. **A key aspect of safety training is directing people's attention to potential hazards**. Unfortunately, creating such hazards also puts people at risk, especially during safety training in manufacturing and construction. Virtual reality provides a training mechanism by which hazardous training scenarios can be created without putting the trainee at risk. We present a general framework for safety training systems and also present results from a case study where we create and evaluate a novel safety training environment, namely, **omnidirectional cinemagraphs.**	10.1109/VRW50115. 2020.0-245	omnidirectional; VR; attention
2020	Balado, J; Gonzalez, E; Arias, P; Castro, D	Novel Approach to Automatic Traffic Sign Inventory Based on Mobile Mapping System Data and Deep Learning	Article	LiDAR; RetinaNet; inception; Mobile Laser Scanning; point clouds; data fusion	Traffic signs are a key element in driver safety. Governments invest a great amount of resources in maintaining the traffic signs in good condition, for which a correct inventory is necessary. This work presents a novel method for mapping traffic signs based on data acquired with MMS (Mobile Mapping System): images and point clouds. On the one hand, images are faster to process and artificial intelligence techniques, specifically Convolutional Neural Networks, are more optimized than in point clouds. On the other hand, point clouds allow a more exact positioning than the exclusive use of images. The false positive rate per image is only 0.004. First, traffic signs are detected in the images obtained by the 360 degrees camera of the MMS through RetinaNet and they are classified by their corresponding InceptionV3 network. The signs are then positioned in the georeferenced point cloud by means of a projection according to the pinhole model from the images. Finally, duplicate geolocalized signs detected in multiple images are filtered. The method has been tested in two real case studies with 214 images, where 89.7% of the signals have been correctly detected, of which 92.5% have been correctly classified and 97.5% have been located with an error of less than 0.5 m. This sequence, which combines images to detection-classification, and point clouds to geo-referencing, in this order, optimizes processing time and allows this method to be included in a company's production process. The method is conducted automatically and takes advantage of the strengths of each data type.	10.3390/rs12030442	360; PRODUCTION
2020	Zhao, ZJ; Ma, XJ	ShadowPlay2.5D: A 360-Degree Video Authoring Tool for Immersive Appreciation of Classical Chinese Poetry	Article	Classical Chinese poetry; storytelling; education; virtual reality; 360-degree video; pen-based interface; authoring tool; 2.5D animation; image-based modeling	An immersive experience brought about by virtual reality can potentially enhance **the appreciation of classical Chinese poetry**, which is difficult to describe clearly in everyday language or ordinary media. However, making **3-dimensional illustrations** for a 360-degree display in virtual reality is usually a labor-intensive and time-consuming procedure and hard to master for non-professional media creators, such as teachers. Motivated by the homology theory of classical Chinese poetry and painting, we propose an image-based approach of building 2.5-dimensional immersive stories to visualize classical Chinese poetry. Specifically, using Chinese shadow play as a metaphor, we have designed and implemented ShadowPlay2.5D, a sketch-based authoring tool to help novices create 360-degree videos of classical Chinese poetry easily. To ensure coverage of the diverse themes in Chinese poetry and preserve the sense of culture, we build a Chinese ink-painting style image repository of essential poetic elements identified via crowdsourcing. To facilitate construction of 2.5-dimensional scenes, we design features that support puppet-like animation, instancing, and camera organization in a 3-dimensional environment. Through two user studies, we show that ShadowPlay2.5D can help novices make a short 360-degree video in about 10-15 minutes, and the 2.5D stylized illustrations created can bring about a better immersive experience for poetry appreciation.	10.1145/3352590	360 video storytelling
2020	Laws, ALS	The empathy machine vs. the objectivity norm	Article; Book Chapter				EXPERIENCE; EMPATHY; VIRTUAL REALITY
2020	Steinfeld, N	To Be there when it Happened: Immersive Journalism, Empathy, and Opinion on Sexual Harassment	Article	Immersive journalism; virtual reality; workplace sexual harassment; media effect; storytelling; experiment; empathy	The study examines **the use of immersive journalism, journalistic storytelling using Virtual Reality, as a tool to promote knowledge, empathy, and change in views and opinions on the phenomenon of sexual harassment among men and women. Testimonies of employees reporting workplace harassment were adapted into a screenplay.** The screenplay presented ongoing verbal sexual harassment of an employee by her manager, filmed from the victim's point of view by the use of a 360-degree camera. In a controlled experiment, change in attitudes on sexual harassment and empathy toward the victim were compared between participants consuming the content as either a written script, 2-dimensional screened video or 360-degree, 3-dimensional immersive virtual reality experience. The results point to an interaction effect, where a decrease in stereotypical views of sexual harassment was predicted by gender (men), method of consumption (immersive), and assessment of the effectiveness and emotionality of the content. Implications and directions for future research and practice are discussed.	10.1080/17512786.2 019.1704842	360 video storytelling / EXPERIENCE; EMPATHY; VIRTUAL REALITY

Year	Authors	Title	Type	Keywords	Abstract	DOI	Tags
2020	Chao, FY; Ozcinar, C; Zhang, L; Hamidouche, W; Deforges, O; Smolic, A	Towards Audio-Visual Saliency Prediction for Omnidirectional Video with Spatial Audio	Proceedings Paper	Audio-visual saliency; spatial sound; ambisonics; omnidirectional video (ODV); virtual reality (VR)	Omnidirectional videos (ODVs) with spatial audio enable viewers to perceive 360 degrees directions of audio and visual signals during the consumption of ODVs with head-mounted displays (HMDs). By predicting salient audio-visual regions, ODV systems can be optimized to provide an immersive sensation of audio-visual stimuli with high-quality. Despite the intense recent effort for ODV saliency prediction, the current literature still does not consider the impact of auditory information in ODVs. In this work, we propose an audio-visual saliency (AVS360) model that incorporates 360 degrees spatial-temporal visual representation and spatial auditory information in ODVs. The proposed AVS360 model is composed of two 3D residual networks (ResNets) to encode visual and audio cues. The first one is embedded with a spherical representation technique to extract 360 degrees visual features, and the second one extracts the features of audio using the log mel-spectrogram. We emphasize sound source locations by integrating audio energy map (AEM) generated from spatial audio description (i.e., ambisonics) and equator viewing behavior with equator center bias (ECB). The audio and visual features are combined and fused with AEM and ECB via attention mechanism. Our experimental results show that the AVS360 model has significant superiority over five state-of-the-art saliency models. To the best of our knowledge, it is the first work that develops the audio-visual saliency model in ODVs. The code will be publicly available to foster future research on audio-visual saliency in ODVs.		omnidirectional; VR; attention
2020	Perez-Seijo, S; Garcia-Orosa, B	Use of 360-Degree Video in Organizational Communication: Case Study of Humanitarian Aid NGOs	Article; Book Chapter	Organizational communication; 360 video journalism; Immersive journalism; Public relations	Virtual reality and 360-degree video are being used in several areas. **Journalism** is among them. In fact, the use of these technologies and formats has given way to a novel trend known as **Immersive Journalism**. But organizational communication and, more specifically, humanitarian aid NGOs have found in 360 video storytelling an opportunity to bring the realities where they work closer to the society. The aim of this immersive narrative is to allow users to become witnesses through a first-person experience of the stories' events. And connected to this, to promote the creation of ties with `the others' and their realities. In this study, it is analyzed from a critical and ethical point of view the 360-degree video content produced by five well-known NGOs: International Federation of Red Cross and Red Crescent Societies, Doctors Without Borders, UNHCR, Save the Children and World Vision International.	10.1007/978-3-030-36315-4_8	360 video storytelling
2020	Sidorenko-Bautista, P; de la Casa, JMH; de Julian, JIC	Use of New Narratives for COVID-19 Reporting: From 360 degrees Videos to Ephemeral TikTok Videos in Online Media	Article	COVID-19; 360 video; ephemeral video; journalism; Generation Z	The disruptive evolution of technology has impacted on all aspects of communication. Consequently, various alternatives are being developed for **storytelling, delivering messages, and connecting to people**. The evolution of social media and multimedia technologies is evident. Since 2014, we have witnessed changes both in the concept of immersion over the 360 degrees format and virtual reality. Such changes aim at much closer proximity between user and content, strengthening possible empathic bonds. Even so, emerging audiences, especially Generation Z, spend time in digital environments that do not support this type of content. As a consequence, their interactions and multimedia behavior focus on vertical, ephemeral content, rendering TikTok as an innovative alternative with a significant growth trend. This study proposes a **review of media outlets and journalists' work reporting on the COVID-19 pandemic using 360 degrees multimedia narratives** and TikTok. Research shows evidence of the limited use of the immersive multimedia format and the increase of productions in the ephemeral vertical format of TikTok-whose audience reach has grown significantly.		360; PRODUCTION; STORYTELLING / 360; PRODUCTION / 360 video storytelling
2020	Andrejevic, M; Volcic, Z	Virtual Empathy	Article	Virtual Reality; Social Media; Polarization; Empathy; Mobile Phones	This article offers **a theoretical response to the recent interest in virtual reality (VR) as a technology for enhancing empathy.** It argues that the version of empathy envisioned by the champions of the technology-one in which care for the other is a function of immersion over the ability to collapse the other's experience into one's own-runs counter to the very concept of empathy, as originally construed, which preserves otherness in its alterity. The point is not simply to invoke a historical concept of empathy to contrast with the VR version, but **to emphasize its enduring salience in response to recent technological developments**. There **is little doubt regarding the need for empathy**, in the sense explored in this article, as we confront the pathologies of political fragmentation and social polarization facilitated by the current iteration of social media. However, this **article argues that the VR version is more likely to exacerbate than redress these concerns.**	10.1093/ccc/tcz035	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2021	Fisher, JA; Samuels, JT	A Proposed Curriculum for an Introductory Course on Interactive Digital Narratives in Virtual Reality	Proceedings Paper	Virtual Reality; Interactive Digital Narratives; Curriculum design	Immersive Media **programs of study** are being developed and enacted at many higher **education institutions**. It is proposed that a course on Interactive Digital Narratives (IDN) in Virtual Reality (VR) can familiarize undergraduate students of diverse backgrounds with the foundational technical, design, and development tenets of immersive storytelling. Course curriculum balances IDN design and **immersive storytelling strategies** with VR project management, user experience and interface design, spatial audio, digital scenography, introductory programming, and rudimentary artificial intelligence. The course connects technical and media affordances to theories of IDN to provide an introductory understanding of IDN in VR. The proposed course ran in the spring of 2021 at a small liberal arts college. The paper presents **the course's 15-week curriculum**. An evaluation that includes student work, insights lessons, and resources is provided.	10.1007/978-3-030-92300-6_47	360; VIDEO; STORYTELLING
2021	Donmez, SC	An Analysis on the The Key Virtual Reality Experience	Article	Reality; Virtual Reality; Narrative; Telepresence; Digital Narrative	Humanity attempted to reach out to reality and seek answers to the questions about it throughout history by narratives and tools that have transformed throughout the ages. As the tools could changed, the codes of the narratives also changed. Humanity, whose search for reality has changed, has now started to create its own reality with the developing digital technology. All the questions and answers attributed to reality and its origin since the early ages have gained a different dimension today through the realities that can be produced digitally. **Virtual reality technology, which is one of the most important narrative tools of the digital age, also needs to be analyzed with its codes and narrative structure** in this context. From this point of view, in this study, an analysis will be carried out by adapting the style analysis used in cinema to virtual reality. **In the study, The Key virtual reality content will be analyzed.** The content focuses on the events experienced by a girl of a refugee fleeing the war, and these events are tried to be conveyed to the user with virtual reality technology. In the analysis, answers were sought to questions about the codes and structure of the virtual reality narrative. As a result of the analysis, it was seen that The Key virtual reality content was successful in creating empathy and conveying experiences. In terms of interactivity and user participation, disruptions and deficiencies were encountered. These deficiencies cause the content to remain weak at the point of interaction and participation, which is one of the most basic capabilities of virtual reality. In general, it has been concluded that despite its current shortcomings, it is an effective and sufficient content with its successful structure in editing and flow.	10.17829/turcom.930923	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2021	Dufresne, KV; Stout, B	Anchorhold Afference Virtual Reality, Radical Compassion, and Embodied Positionality	Proceedings Paper	Materiality; Game studies; Radical compassion; Affect	This work situates **the potential of empathy and affective application in VR systems** - as well as explore the role of gamified spaces through digital humanities and critical making. We argue that the material infrastructure of VR technologies make Anchorhold Afference, a virtual reality model of Julian of Norwich's anchorhold created by Author 1 with Unity and Oculus, an especially vivid experience. In a time when VR is conflated with video games and in which games are most traditionally associated with conquest, winning, and mastery, Anchorhold Afference opposes this and instead fosters radical compassion, as aligning with feminist media and data understandings, **to invite users to an embodied experience. This work considers how VR technology can allow us to discover and evaluate the embodiment and materiality of isolation and confinement through a singular, unified and gamified experience, while also retrospectively considering the rhetorical emergence evoked through this process.**	10.1145/3450741.3465249	EXPERIENCE; EMPATHY; VIRTUAL REALITY

Year	Authors	Title	Type	Keywords	Abstract	DOI	Category
2021	Foxman, M; Markowitz, DM; Davis, DZ	Defining empathy: Interconnected discourses of virtual reality's prosocial impact	Article	Empathy; immersive media; prosocial change; virtual reality	While a consumer revolution in virtual reality (VR) has piqued the interest of many fields, industries, and professions, it is unclear when, how, and **to what degree the technology can elicit empathy**. To better understand **how the relationship between VR and empathy is communicated and defined**, we performed qualitative and quantitative thematic analyses on popular (N = 640) and academic articles (N = 53) that included both terms. Findings revealed empathy is an aspirational term for journalists and researchers to showcase **the potential of immersive media for prosocial change**. Writers in both corpora suggested that empathetic experiences could lead to prosocial action through VR, but do not consistently define or measure empathy, given the inherent complexities surrounding the term. Drawing on seminal research in the field, we conclude with a definition of empathy related to immersive media.	10.1177/146144482 1993120	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2021	Ozcinar, C; Imamoglu, N; Wang, WM; Smolic, A	Delivery of omnidirectional video using saliency prediction and optimal bitrate allocation	Article	360 degrees Video streaming; Attention-based bitrate allocation; Saliency maps with transfer learning and supervision	In this work, we propose and investigate a user-centric **framework for the delivery of omnidirectional video (ODV) on VR systems by taking advantage of visual attention (saliency) models for bitrate allocation module.** For this purpose, we formulate a new bitrate allocation algorithm that takes saliency map and nonlinear sphere-to-plane mapping into account for each ODV and solve the formulated problem using linear integer programming. F**or visual attention models, we use both image- and video-based saliency prediction results; moreover, we explore two types of attention model approaches: (i) salient object detection with transfer learning using pre-trained networks, (ii) saliency prediction with supervised networks trained on eye-fixation dataset.** Experimental evaluations on saliency integration of models are discussed with interesting findings on transfer learning and supervised saliency approaches.	10.1007/s11760-020-01769-2	omnidirectional; VR; attention
2021	Honkavuo, L	Ethics simulation in nursing education: Nursing students' experiences	Article	Caring science; clinical practice; ethics simulation; hermeneutics; nursing students	Background: **Ethics stimulation in nursing education** focuses on human, non-technical factors in a clinical reality. Simulation as a teaching method began in the 1930s with flight simulators. In the beginning of the 1990s, simulations developed further in tandem with other technological and digital inventions, including touchscreen and three-dimensional anatomical models. Medical science first used simulation as a **pedagogical teaching tool.** In nursing education, simulation has been used for approximately a hundred years. Teaching has mainly focused on medical-technical, patient-specific interventions and their management. Objective: The objective of this study was, from a caring science didactic perspective, to deepen the understanding of ethics simulation in nursing education. Design: Qualitative design and explorative, descriptive and hermeneutic approach of an inductive character. Methods: Semi-structured face-to-face interviews in 2016-2017 with six Norwegian nursing students who were encouraged to narrate about their experiences of ethics simulation in nursing education. Ethical considerations: Informed consent was obtained from the participants. Anonymity and confidentiality regarding data material were guaranteed. Results: Interpretation of the nursing students' narratives resulted in the following meaning units: ethical being and ethos, nursing students' formation process, bridge-building between theory and clinical practice, and teacher and ethics simulation. Conclusion: Through ethics simulation, nursing students can obtain an increased knowledge and a sense of being able to handle difficult ethical situations. Nursing students' values, moral actions and ethical value base offer a positive point of departure, for both theoretical and practical ethics teaching, and an awareness of the unique human being, the patient, in clinical reality. The implementation of ethics simulation needs more attention in nursing education.	10.1177/096973302 1994188	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2021	Jin, YZ; Patney, A; Bovik, A	Evaluating Foveated Video Quality Using Entropic Differencing	Proceedings Paper	Entropic Differencing; foveated video quality assessment; contrast sensitivity function	Virtual Reality is regaining attention due to recent advancements in hardware technology. Immersive images / videos are becoming widely adopted to carry omnidirectional visual information. However, **due to the requirements for higher spatial and temporal resolution of real video data, immersive videos require significantly larger bandwidth consumption.** To reduce stresses on bandwidth, foveated video compression is regaining popularity, whereby the space-variant spatial resolution of the retina is exploited. Towards advancing the progress of foveated video compression, we propose a **full reference (FR) foveated image quality assessment algorithm**, which we call foveated entropic differencing (FED), which employs the natural scene statistics of bandpass responses by applying differences of local entropies weighted by a foveation-based error sensitivity function. We evaluate the proposed algorithm by measuring the correlations of the predictions that FED makes against human judgements on the newly created 2D and 3D LIVE-FBT-FCVR databases for Virtual Reality (VR). The performance of the proposed algorithm yields state-of-the-art as compared with other existing full reference algorithms. Software for FED has been made available at: http://live.ece.utexas.edu/research/Quality/FED.zip	10.1109/PCS50896. 2021.9477465	omnidirectional; VR; attention
2021	Li, BJ; Kim, HK	Experiencing organ failure in virtual reality: Effects of self- versus other-embodied perspective taking on empathy and prosocial outcomes	Article	Avatar; embodiment; empathy; perspective taking; prosocial; virtual reality	This study capitalizes **on the unique capability of virtual reality (VR) to examine the efficacy of self- versus other-embodied perspective** taking **in promoting kidney donation** in Singapore. The study used a 2 (self- vs other-embodied) x 2 (mirror vs photo presentation) between-subjects VR experiment (N = 128), **wherein participants played the role of a patient needing a kidney donation, either as themselves or as a typical organ-failure patient**. Our findings showed **that self-embodied perspective taking triggered self-oriented emotions** (i.e. personal distress) and **subsequently egoistic motivations that resulted in alternative prosocial behaviors** (e.g. monetary donation, volunteering) than kidney donation. We found that **embodying the other, rather than the self, had the practical benefit of inducing other-oriented emotions** (i.e. empathy) **and hence altruistic motivations that promoted kidney donation**. This study clarified the conditions under which embodied perspective taking promoted different prosocial outcomes, and the specific mechanisms through which it achieved those outcomes.	10.1177/146144482 1993122	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2021	Schlembach, R; Clewer, N	Forced empathy': Manipulation, trauma and affect in virtual reality film	Article	immersive technology; prosthetic memory; vicarious trauma; virtual reality; visceral experience	**Exploring two recent examples of virtual reality (VR) short films designed to produce visceral experiences** (on solitary confinement and on seeking asylum), we call into question claims that assign **normative value and even transformative power to the VR medium - imagined as so-called 'empathy machines'.** Drawing on a growing body of literature that seeks to contest such claims, we point to and problematise **both the manipulative intent of such projects and the liberal-humanitarian logic, which underpins them.** Based on such a logic, advocacy through immersive technologies supposes that if only individuals can be made to 'feel' something they will be changed by it and so will their behaviour. Whatever progressive motivations of the content producers, the emphasis on empathetic identification threatens to by-pass critical engagement and raises wider questions about the potentially de-politicising effects of seeking technological solutions to effect social change.	10.1177/136787792 11007863	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2021	Rivera-Pesquera, M; Cacho-Elizondo, S; Duran-Dergal, R	Forget-me-not? Using Immersive Technologies in Brand-building Communication Processes: An Exploratory Study in the Mexican Context	Article	Branding; communications; new immersive technologies; virtual reality; augmented reality; artificial intelligence	New immersive technologies (NITs) can be an ally or a rival when it comes to **brand relationships.** Given the multiplicity of options, marketers need to understand their customers also as audiences seeking experiences. However, such experiences need to exist within a company's digital ecosystem. This study presents an **analysis of six companies that have used NITs to varying degrees.** We propose a framework in which more cases of NIT usage in companies can be studied. We conclude that the more the initiatives come from a company's top-management overall ecosystem transformation, the more likely NIT adoption will fit into a general strategy for a brand-strengthening process and the more it will be effective. This exploratory analysis opens up a path for building new frameworks to measure a company's degree of involvement with and usage of interactive technologies.	10.1177/097325862 11036768	EXPERIENCE; EMPATHY; VIRTUAL REALITY

Year	Authors	Title	Type	Keywords	Abstract	DOI	Tags
2021	Goutier, N; De Haan, Y; De Bruin, K; Lecheler, S; Kruikemeier, S	From Cool Observer to Emotional Participant: The Practice of Immersive Journalism	Article	Immersive journalism; virtual reality; 360 degrees video; interviews; interaction; participation; agency	Over the past years, innovative technologies (such as Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality (MR)) have become more common within news organizations. These technologies allow users to immerse themselves in a virtual world. With these types of productions, **the journalist tries to engage and involve the user by introducing emotional styles, often to create empathy.** This does not only demand new technological skills, but also challenges the way journalist allow emotions in journalistic productions, and what role they take in relation to the story and the user. Through **fifteen in-depth interviews with immersive producers and experts** in renowned news organizations across the globe, this paper examines **both the motivations of journalists who produce immersive stories, and how they seek to balance traditional journalistic norms and emotionality in them.** The results show that journalists believe that emotions and facts can be compatible with journalistic production. Yet, they struggle with their role in relation to the user. Immersive journalism obliges journalists to carefully reconsider their relationship with their public. In sum, this study **illuminates an ongoing professional debate on the role of emotionality, user agency, and journalistic control and autonomy.**	10.1080/1461670X.2021.1956364	360; PRODUCTION/ EXPERIENCE; EMPATHY; VIRTUAL REALITY
2021	Budiyanti, T; Sunyoto; Noflindawati; Makful; Prihatini, R; Fatria, D; Hendri; Octriana, L	GENETIC VARIABILITY OF SINGLE, DOUBLE AND THREE-WAY CROSS HYBRIDS IN PAPAYA (Carica papaya)	Article	Carica breeding; Fruit characteristics; Kybridization; Selection	The production of high-yielding varieties of papaya is intended to improve both fruit quality and productivity. However, high genetic variability has a significant role in characters selection. In papaya (Carica papaya), genetic variability can be expanded through the hybridization of selected parents. This research aims to determine the genetic variability of 70 papaya hybrids of the Indonesian Tropical Fruit Research Institute's (ITFRI) collection. The research was carried out at the Sumani Experimental Field of ITFRI in Solok (360 m asl), West Sumatera. The study was arranged using randomize block design with 70 papaya hybrids as treatments factors, each with three replications. Hybridization was performed by the back cross, single-cross, double-cross, three-way cross, and selfing. The results show a wide genetic diversity of 70 papaya hybrids, which can be inferred from fruit weight (5002000g), flesh thickness (1.5-3.5cm), peel hardness (0.70-0.90 kg/cm2), flesh hardness (0.150.4kg/cm2), and total soluble solids (TSS) (9 -12.50brix). The wide genetic diversity can be applied in the selection stage to obtain a superior hybrid with fruits characteristics that include small-medium size, thick flesh, crispy flesh texture, and sweet taste as preferred by the consumer.		360; PRODUCTION
2021	Kahn, AS; Cargile, AC	Immersive and Interactive Awe: Evoking Awe via Presence in Virtual Reality and Online Videos to Prompt Prosocial Behavior	Article	Awe; Eudaimonic Media Effects; Prosocial Behavior; Virtual Reality; Presence	Awe is a widely researched, self-transcendent emotion with a robust ability to prompt prosocial behavior. Within the communication and media disciplines, however, the effects of awe have received only limited empirical attention. Moreover, extant research has ignored the role that media affordances may play in engendering awe and prosocial outcomes. **This article presents two studies that explore the prosocial consequences of awe, as mediated by presence and when engendered by immersive features of various media, including virtual reality (VR). Study 1 (N = 154) found that awe content presented in highly immersive VR induced awe via an effect entirely mediated by presence, though impacts on subsequent prosocial outcomes were inconsistent.** Study 2 (N = 188) attempted to replicate and clarify the prosociality results from Study 1, as well as contextualize them with respect to eudaimonic appreciation and hedonic enjoyment. Results demonstrated awe effects across all three measures of prosociality.	10.1093/hcr/hqab007	VR; EMPATHY; INTERACTIVE;
2021	Husz, O	Money cards and identity cards: De-vicing consumer credit in post-war Sweden	Article	Credit cards; de-vicing; money; identity; moral technologies; everyday finances	This article has a twofold ambition. **First, exploring the peculiar Swedish case, it contributes to the international history of credit cards dominated by the American narrative.** Early adaptation of new banking technologies was in Sweden combined with negative general attitudes towards consumer credit. Although introduced early in a European comparison, credit cards needed to be reconceptualised, reshaped, and renamed to be accepted. **Second, the paper's contribution to the study of financial products and their intertwining with values, affects, and the rhythm of the everyday is that it reveals the role of de-vicing which refers to the strategies conducted by card issuers while dealing with the moral resistance.** Marketers exploited the non-credit properties of the card in order to spread its use into the everyday practices of consumers. The card itself was turned into a device for de-vicing - destigmatising - consumer credit. By looking at the technical and cultural arrangements built into the card, I unpack the workings of two de-vicing strategies that reconfigured cards (1) as modern money and (2) as membership/identity cards. The Swedish example reveals how plastic cards were reshaped in the forcefield between money and identity and became instrumental in reorganising moralities of debt.	10.1080/17530350.2020.1719868	SOCIAL; VR; NARRATIVE
2021	Thomsen, SP; Lopesi, L; Gushiken, GP; Damm, L; Lee, KL; Pickering-Martin, J; Iosefo, F; Naepi, S; Tuiburelevu, L	Negotiating the Digital VR: Emerging Pacific Scholars and Community Building on Twitter	Article		Although **the power of social media to bring people together across borders is acknowledged, very little has been written about the potential of social media sites for emerging Pacific scholars living transnationally across our region and beyond.** We deploy thematic talanoa **to demonstrate how emerging Pacific scholars engage Twitter as a platform where routes and relationships are established and teu/tauhi in the digital yd.** Furthermore, we argue that emerging scholars of Pacific heritage are building an augmented reality founded on Pacific-specific ways of relationship building, forming external to, and in response to, marginalising dominant narratives inside and outside Pacific worlds.	10.26686/jnzs.iNS33.7388	SOCIAL; VR; NARRATIVE
2021	Molina, FV	PRODUCTION DESIGN TOOLS IN 360-DEGREE MUSIC VIDEO AS A MODEL FOR THE NEED OF A MORE IMERSIVE AUDIOVISUAL PRODUCT	Article	musci video; 360 music video; production design; storyboard; concept art; 360 video; spherical video; youtube	The 2020 health crisis and all movility restrictions imposed by all territorial's authorities to control the spread of SARS-COVID-19 have created a general situation of self-isolation around the world. **These situations have generated the need of a new experiencing way, more immersive and participative over cultural products.** Thus, users' interaction has increase in certain kind of online platforms and products which allow to satisfying this kind of needs, like **360-degree or spherical music video.** Althought this kind of spherical video already gained experience since 2015 in platforms like Youtube, its popularity was not enough to standardize its production. This does not only affect to professionals, but also for non professional users (better known as prosumers) which are the true causative agents of most new types and transformations in music video. This research's goal is to study the different production design's tools used in a real case: Efimera (Love of lesbian, 2015), to shed light on the particularities of this kind of production, as well as offering these different tools used to create it.	10.15198/seeci.2021.54.e720	360; PRODUCTION
2021	Joachim, J; Schneiker, A	Public or private? Blurring the lines through YouTube recruitment of military veterans by private security companies	Article; Early Access	Audio-visual social media; boundary blurring; military veterans; private security; public-private; YouTube	**Private security companies (PSCs) blur the lines between the public and the private sector through the provision of services to state militaries.** Based on a multi-modal qualitative content analysis of YouTube recruitment videos aimed at veterans, we show how PSCs also challenge these boundaries through their hiring practices. By relating to veterans' past as hero warriors and by envisioning their future as corporate soldiers, the companies appear as 'like-military' and as allowing ex-militaries to 'continue their mission'. The findings contribute to scholarly debates about the privatization of security. They illustrate that similarly to the public sector, the private is also re-constituted through the military values that veterans introduce. The study adds to the literature on the visualization of war showing how video-based platforms allow security actors such as PSCs to construct their corporate identity in ambivalent ways by appealing to different emotional levels and by giving rise to different narratives.	10.1177/14614448211047951	SOCIAL; VR; NARRATIVE

2021	Choy, SM; Cheng, E; Wilkinson, RH; Burnett, I; Austin, MW	Quality of Experience Comparison of Stereoscopic 3D Videos in Different Projection Devices: Flat Screen, Panoramic Screen and Virtual Reality Headset	Article	Videos; Electroencephalogr aphy; Quality of experience; Three-dimensional displays; Fatigue; Visualization; Frequency measurement; Stereoscopic video; omnidirectional content; virtual reality; quality of experience; electroencephalogr aphy; simulator sickness	The use of Stereoscopic 3D (S3D) videos has been popular in **commercial markets with ongoing developments in the field of visual entertainment in recent years.** A wide variety of projection methods of 3D video content is currently available, such as **projection to a panoramic screen and projection of omnidirectional video content from head mounted displays using Virtual Reality (VR)** technology. This article investigates the **Quality of Experience (QoE) and associated Visually Induced Motion Sickness (VIMS) caused by the viewing of S3D videos**. The investigations used three different projection screens: a 3D flat screen, a 3D panoramic screen in a hemispherical shaped room and a VR headset. Several assessment methods including a Simulator Sickness Questionnaire (SSQ), ElectroEncephaloGraphy (EEG), and measurement tools for eye blink rate detection were applied to measure the QoE experienced by viewers. The SSQ scores were also compared with the behavioral data such as attention and meditation levels and enjoyment ratings acquired from different video content and projection screens. The results indicate that the projection screen is a key factor affecting the level of visual fatigue, VIMS and QoE assessments, which are discussed in-depth in the article.	10.1109/ACCESS.20 21.3049798	omnidirectional; VR; attention
2021	Kumar, VR; Klingner, M; Yogamani, S; Milz, S; Fingscheidt, T; Mader, P	SynDistNet: Self-Supervised Monocular Fisheye Camera Distance Estimation Synergized with Semantic Segmentation for Autonomous Driving	Proceedings Paper		State-of-the-art self-supervised learning approaches for monocular depth estimation usually suffer from scale ambiguity. They do not generalize well when applied on distance estimation for complex projection models such as in fisheye and omnidirectional cameras. This paper introduces a novel multi-task learning strategy to improve self-supervised monocular distance estimation on fisheye and pinhole camera images. Our contribution to this work is threefold: Firstly, we introduce a novel distance estimation network architecture using a self-attention based encoder coupled with robust semantic feature guidance to the decoder that can be trained in a one-stage fashion. Secondly, we integrate a generalized robust loss function, which improves performance significantly while removing the need for hyperparameter tuning with the reprojection loss. Finally, we reduce the artifacts caused by dynamic objects violating static world assumptions using a semantic masking strategy. We significantly improve upon the RMSE of previous work on fisheye by 25% reduction in RMSE. As there is little work on fisheye cameras, we evaluated the proposed method on KITTI using a pinhole model. We achieved state-of-the-art performance among self-supervised methods without requiring an external scale estimation.	10.1109/WACV4863 0.2021.00011	omnidirectional; VR; attention
2021	Marin, A	The immersive documentary: understanding the phenomenon in nonfiction stories through a typology proposal	Article	**Immersive documentary**; Immersion; Interactivity; Virtual reality; 360 degrees; Immersive journalism; Digital storytelling; Image; Representation	Following the evolution of the documentary and the transformation of representation based on the development of image technologies, the **immersive documentary endows the nonfiction audiovisual genre with new qualities**. In this context, **their differentiating characteristics are identified and described, adapting the study methods to the nature of such productions**. Through **a filmic analysis of 30 immersive documentaries and a complementary case study**, we present a first proposal for **the modalities of the immersive documentary**. The results point to the central role of the user and the relationship between the image, the medium, and the body as key to understanding immersive nonfiction experiences.	10.3145/epi.2021.jul .11	360; PRODUCTION; STORYTELLING/ 360; PRODUCTION
2021	Milovidov, SV	TRANSMEDIA STORYTELLING AS A WAY TO TURN FAN PRACTICES INTO A CULTURAL INDUSTRY	Article	transmedia storytelling; audience; participatory culture; media consumption; user experience; fictional world; fans; network	There are numerous empirical sociological researches of transmedia storytelling media consumption. However, they mainly record either the practices of media consumption of specific media formats included in the structure of a transmedia project or the producers' ways for constructing a narrative that creates transitions between media platforms. **Often, researchers pay little attention to the circumstances of users' interaction with the fictional world and their social relationships that form around a transmedia project**. This study consists of a series of in-depth interviews and observations on the media consumption practices of users and fans of the fictional world which has formed around a series of **fantasy works under the general name The Witche**r. This transmedia project is interesting because, unlike specially created transmedia franchises with the expansion structures carefully planned by media companies, it forms itself spontaneously, as a result of the activities of different institutions and user participation, does not have a single development strategy, and is shaped by grass-root practices. The observation of media consumption practices of transmedia storytelling allows us to conceptualize construction's peculiarities, such as narrative structures. Based on this data, it is possible to construct a network of interactions formed by the user migration between media platforms and compare such practices with the audience's everyday practices. Since modern people form their understanding of the world based on their own experience and by using mediatized communication, transmedia storytelling represents a special kind of virtual reality or its particular case, which can be supplemented with the help of VR-technologies.	10.30628/1994-9529-2021-17.1-29-47	SOCIAL; VR; NARRATIVE
2021	Perez-Seijo, S	Use of 360 degrees video by digital native media: exploratory analysis of the first steps in the Spanish journalistic landscape	Article	360 degrees video; Immersive journalism; 360 degrees video storytelling; VR storytelling; Digital native media; Cybermedia; Online media; Virtual reality; Digital journalism; Immersive narratives; 360 degrees video reports; Innovation; Interactive journalism; Multimedia; Spain	High technology has been one of the main assets used by the media around the world to stand out from the masses and reach an increasingly fragmented audience, including **drone journalism, artificial intelligence, and virtual reality**. In this regard, the mid-2010s saw a whole phase of experimentation that began with so-called **immersive journalism**, a new way of producing news content using virtual reality and 360 degrees video, which introduced various novelties in the way stories are both told and consumed/watched. Among these, 360 degrees real-image videos are the most common form, which can be partly explained by factors such as time and cost, although it is also possible to find **completely computer-generated (CG) nonfiction experiences**. Legacy media such as The New York Times, El Pais, or the BBC have been experimenting with the possibilities of this immersive storytelling, but what about **digital native media**? The aim of this paper is to **explore the use of 360 degrees video by Spanish digital native media in order to observe the degree of development of immersive storytelling**, as well as the quality of the pieces available more than 5 years after the start of this phenomenon known as **immersive journalism**. For this purpose, a content analysis of 360 degrees videos published during the period 2015-2019 by El espatiol, eldiario.es, El independiente, and El HuffPost has been carried out. The study of these particular cases reveals the absence of a narrative strategy aligned with the immersive format; in general, these are simple videos that provide little added value compared with the conventional format. Furthermore, the results show that the history of immersive journalism by these cybermedia has been limited in terms of both volume and time, with little guarantee that it will continue into the future.	10.3145/epi.2021.m ay.04	360; VIDEO; STORYTELLING

2021	Raeburn, G; Tokarchuk, L	Varying user agency and interaction opportunities in a home mobile augmented virtuality story	Proceedings Paper	Human-centered computing; Human computer interaction (HCI); HCI design and evaluation methods; User studies; Applied computing; Arts and humanities; Media arts	**New opportunities for immersive storytelling experiences** have arrived through the technology in mobile phones, including the ability to overlay or register digital content on a user's real world surroundings, to greater immerse the user in the world of the story. **This raises questions around the methods and freedom to interact with the digital elements, that will lead to a more immersive and engaging experience.** To investigate these areas the Augmented Virtuality (AV) mobile phone application Home Story was developed for iOS devices. It allows a user to move and interact with objects in a virtual environment displayed on their phone, by physically moving in the real world, completing particular actions to progress a story. A mixed methods study with Home Story either guided participants to the next interaction, or offered them increased agency to choose what object to interact with next. **Virtual objects could also be interacted with in one of three ways; imagining the interaction, an embodied interaction using the user's free hand, or a virtual interaction performed on the phone's touchscreen.** Similar levels of immersion were recorded across both study conditions suggesting both can be effective, though highlighting different issues in each case. The embodied free hand interactions proved particularly memorable, though further work is required to improve their implementation, arising from their novelty and lack of familiarity.	10.1109/ISMAR521 48.2021.00051	360; VIDEO; STORYTELLING
2021	Sanders, JJ; Caponigro, E; Ericson, JD; Dubey, M; Duane, JN; Orr, SP; Pirl, W; Tulsky, JA; Blanch-Hartigan, D	Virtual environments to study emotional responses to clinical communication: A scoping review	Review	Immersive virtual environments; Clinical communication; Affect; Emotion; Scoping review	Objective: **This scoping review explores the potential for virtual environments (VE) to evaluate emotional outcomes in clinical communication research.** Authors representing multiple disciplines use review results to propose potential research opportunities and considerations. Methods: We utilized a structured framework for scoping reviews. We searched four literature databases for relevant articles. We applied multidisciplinary perspectives to synthesize relevant potential opportunities for emotion-focused communications research using VE. Results: Twenty-one articles met inclusion criteria. They applied different methodological approaches, including a range of VE technologies and diverse emotional outcome measures, such as psychophysiological arousal, emotional valence, or empathy. Major research topics included use of virtual reality to provoke and measure emotional responses, train clinicians in communication skills, and increase clinician empathy. Conclusion: Researchers may leverage VE technologies to ethically and systematically examine how characteristics of clinical interactions, environments, and communication impact emotional reactions and responses among patients and clinicians. Variability exists in how VE technologies are employed and reported in published literature, and this may limit the internal and external validity of the research. However, virtual reality can provide a low-cost, low-risk, experimentally controlled, and ecologically valid approach for studying clinician-patient communication. Practice implications: Future research should leverage psychophysiological measures to further examine emotional responses during clinical communication scenarios and clearly report virtual environment characteristics to support evaluation of study conclusions, study replicability, and meta-analyses. (c) 2021 Elsevier B.V. All rights reserved.	10.1016/j.pec.2021. 04.022	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2021	Studt,SJE	Virtual reality documentaries and the illusion of presence	Article	Virtual reality; nonfiction; fiction; documentary; presence; illusion	**I argue that virtual reality (VR) documentaries mandate that users employ a fictional attitude toward their presence in a virtual environment (VE) for the purpose of engaging with nonfictional content.** The most salient feature of VR is that VR users typically feel as though **their bodies were present in a VE.** This paper explores **presence in VR as a perceptual illusion facilitated by certain technological features.** Drawing on Kendall Walton's concept of fiction, I argue that the illusion of presence in VR also requires a fictional attitude that VR users employ when imagining themselves in a VE. In the case of VR documentaries, while users' attitude in regards to the feeling of presence is best characterized as make-belief, they nevertheless employ an attitude of belief in regards to the content of the documentary and accept this content as nonfictional.	10.1080/17503280.2 021.1923147	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2021	Barreda-Angeles, M; Aleix-Guillaume, S; Pereda-Banos, A	Virtual reality storytelling as a double-edged sword: Immersive presentation of nonfiction 360 degrees-video is associated with impaired cognitive information processing	Article	Virtual reality; 360 degrees-video; immersive journalism; information processing; psychophysiology; attention	This study examines **the effects of the immersive presentation of nonfiction omnidirectional video** on audiences' cognitive processing. Participants watched a sample of 360 degrees-video nonfiction content, presented either in a virtual reality headset or on a computer screen. **Measures of heart rate variability and electrodermal activity were collected, together with self-reported ratings of presence, information recognition, and memory.** The results indicate that **the immersive presentation elicits higher arousal and presenc**e, but also **lower focused attention, recognition, and cued recall of information.** These effects on focused attention and memory were not mediated by variations on arousal or presence. Implications are discussed in terms of the psychological effects of immersive media, as well as their relevance for media practitioners.	10.1080/03637751.2 020.1803496	360 video storytelling / EXPERIENCE; EMPATHY; VIRTUAL REALITY
2021	Morriet, O	Virtual Reality: An Empathy Machine?	Article		Since the mid-2010s, the term empathy has taken hold in the North American virtual reality industry. **Some virtual reality authors claim they use these technologies to create empathy in their users.** The commonly posed question is whether virtual reality is an empathy machine. The author believes that if there is empathy in virtual reality, it is tied more to the experience design and its spectatorial reception than to the immersive and interactive properties of the medium alone. With this article, the author **proposes to think through the possible vectors of empathy in virtual reality and then to illustrate these arguments through an analysis of the work Homestay (2018) by Paisley Smith.**		EXPERIENCE; EMPATHY; VIRTUAL REALITY
2021	Hasler, BS; Landau, DH; Hasson, Y; Schori-Eyal, N; Giron, J; Levy, J; Halperin, E; Friedman, D	Virtual reality-based conflict resolution: The impact of immersive 360 degrees video on changing view points and moral judgment in the context of violent intergroup conflict	Article	360 degrees video; arousal; empathy; engagement; intergroup conflict; moral judgment; perspective-taking; physiological; presence; virtual reality	We present **an experimental study conducted in the context of the Israeli-Palestinian conflict that examined the effect of immersive 360 degrees video on inducing a more critical perception of the ingroup's actions in the conflict.** An immersive experience of a simulated **conflict scenario filmed from the outgroup's point of view led to the judgment of the ingroup actors' behavior as less moral and less justified compared to watching the same scenario as a two-dimensional video.** This effect was not mediated through increased outgroup perspective-taking and empathy but through higher levels of hostile emotions toward the ingroup actors, which in turn were influenced by an increased sense of presence and engagement in the immersive experience. These findings provide initial evidence for the still widely unexplored potential of virtual reality as a new method for conflict resolution.	10.1177/146144482 1993133	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2021	Leen, C	Visceral reality in Alejandro Gonzalez Inarritu's Carne y arena/Virtually Present, Physically Invisible (Gonzalez Inarritu 2017)	Article	activist art; Mexican-US border; migration; virtual reality; Alejandro G. Inarritu; installation art	Gonzalez Inarritu's Came y arena/Virtually Present, Physically Invisible (Gonzalez Inarritu 2017) is a multilayered virtual-reality **installation** that premiered at the Cannes Film Festival and later won a Special Achievement Oscar. This work is a notable departure**from the director's previous output, both in its use of virtual reality and in its focus on the divisive subject of migration.** Came y arena has been praised for its technological innovation, but it has also been criticized for tackling such a political subject through the medium of virtual reality. For some critics, virtual reality is an entirely inappropriate medium for exploring such a serious issue, privileging, in their view, spectacle over reflection. Gonzalez Inarritu has countered such critiques by asserting that the use of virtual reality makes the experience of visiting Came y arena **intensely personal and immersive.** This article will situate the installation in relation to Gonzalez Inarritu's previous work and examine the debates surrounding the relationship between virtual reality and empathy with reference to Came y arena.	10.1386/slac_00035 _1	EXPERIENCE; EMPATHY; VIRTUAL REALITY

Year	Authors	Title	Type	Keywords	Abstract	DOI	Index Terms
2021	Wang, HS; O'Fearghail, C; Zerman, E; Braungart, K; Smolic, A; Knorr, S	VISUAL ATTENTION ANALYSIS AND USER GUIDANCE IN CINEMATIC VR FILM	Proceedings Paper	cinematic VR; omnidirectional video; visual effects; visual attention analysis; saliency prediction	**Due to the character of 360 degrees video, it is often a challenge for filmmakers to guide the attention of users to the region of interest.** Visual effects as a type of user guidance is frequently applied to traditional film Nevertheless, the influence of visual effects in 360 degrees video has been rarely explored. For this reason, the purpose of this paper is to study how four different visual effects, respectively Desaturation, Context-based Darkening, Area Darkening, and Object to Follow, affect visual attention of users in 360 degrees video. Therefore, we performed a subjective test as well as analyzed the saliency maps predicted with a convolutional neural network. In the subjective test, 15 participants were requested to watch four 360 degrees videos, which were implemented with visual effects, while the position of their viewport was recorded. The results of this work are compared to earlier research on the same videos without visual effects. We show that Area Darkening has the best effect on guiding the visual attention, Context-based Darkening makes the best contribution on enhancing the saliency of the region of interest, while Desaturation has nearly no effect for user guidance and does not change the saliency of the videos. A Logo as Object to Follow create a new salient area, while the predicted saliency of areas apart from the Logo remains the same.	10.1109/IC3D53758. 2021.9687294	omnidirectional; VR; attention
2021	Pimentel, D; Kalyanaraman, S; Lee, YH; Halan, S	Voices of the unsung: The role of social presence and interactivity in building empathy in 360 video	Article	360 video; climate change; empathy; immersive storytelling; interactivity; social presence	360 video is considered **an empathy machine**, in part because it places audiences in the perspective of the other. Despite its popularity, its influence on empathy is not fully understood. **Two possible mechanisms driving empathy within 360 video are social presence (sense of being with others) and interactivity** (degree of control over media content). To elucidate how 360 videos can encourage empathic outcomes through these factors, a 2 (social presence: high/low) x 2 (interactivity: high/low) between-subjects experiment (N = 110) was conducted testing 360 videos about Alaskan climate change refugees. Results demonstrate that social presence contributes to prosocial behaviors (donations) through empathic concern, an effect augmented by interactivity. Unexpectedly, **the social presence manipulation also contributed to greater perceived interactivity**. Collectively, results are promising and elucidate the role of social presence and interactivity in immersive storytelling.	10.1177/146144482 1993124	360; VIDEO; STORYTELLING
2021	Dekker, A; Wenzlaff, F; Biedermann, SV; Briken, P; Fuss, J	VR Porn as Empathy Machine? Perception of Self and Others in Virtual Reality Pornography	Article		The usage of virtual reality (VR) pornography has risen in recent years. Anecdotal evidence suggests that the steep increase may be driven by an essential difference compared to traditional pornography, namely strong feelings of intimacy and the illusion of interaction with the porn actors. The present study is the first to systematically address this topic in an experimental design. Fifty healthy male participants watched two pornographic films on consecutive days in the laboratory, randomly one in VR and one traditional two-dimensional (2D) film. The perception of 2D and VR pornography was assessed using several self-report measures. Furthermore, the role of the social neuropeptide oxytocin in facilitating intimacy and interaction was studied. In the VR condition, participants felt more desired, more flirted with, more looked into the eyes. They were also more likely to feel connected with the actors and more likely to feel the urge to interact with them. Interestingly, saliva levels of oxytocin were related to the perceived eye-contact with the virtual persons indicating a role for the social neuropeptide in the perception of increased intimacy and interaction in VR. Thus, VR pornography seems to be a powerful tool to elicit the illusion of intimate sexual experiences.	10.1080/00224499.2 020.1856316	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2021	Klik, E	We Should Have Had a Historian: Live Television and the Accident of the Moon Landing Tapes	Article	erasure; moon landing; magnetic recording; liveness; media archeology; broadcast history	**Forty years after the first moon landing in 1969, National Aeronautics and Space Administration announced that it had likely recycled the tapes containing the original footage of the landing.** Although the mission was a monumental event viewed by millions of people around the world, the production and handling of the recorded materials was a matter of little concern to more than a small group of employees, historians, and space enthusiasts. This article argues that despite the fact that the erasure of these archival materials was accidental, it was not an accident per se but rather a fulfillment of a logic designed into the apparatus of magnetic tape recording from its very inception, and therefore a generative event for the media archeologist. By evoking histories and theories of broadcast and magnetic recording, I argue that erasure is a process that discloses networks of economic, cultural, material, and aesthetic discourses and interests.	10.1177/152747642 0934764	SOCIAL; VR; NARRATIVE
2021	Ramirez, EJ; Elliott, M; Milam, PE	What it's like to be a ____: why it's (often) unethical to use VR as an empathy nudging tool	Article	Empathy; Implicit bias; Intersectionality; Nudge; Simulation ethics; Virtual reality	In this article, we apply the literature on the ethics of choice-architecture (nudges) **to the realm of virtual reality (VR) to point out ethical problems with using VR for empathy-based nudging.** Specifically, **we argue that VR simulations aiming to enhance empathic understanding of others via perspective-taking will almost always be unethical to develop or deploy. We argue that VR-based empathy enhancement not only faces traditional ethical concerns about nudges (autonomy, welfare, transparency), but also a variant of the semantic variance problem that arises for intersectional perspective-taking.** VR empathy simulations deceive **and manipulate their users about their experiences.** Despite their often laudable goals, such simulations confront significant ethical challenges. In light of these goals and challenges, we propose VR designers shift from designing simulations aimed at producing empathic perspective-taking to designing simulations aimed at generating sympathy for their targets. These simulations, we claim, can avoid the most serious ethical issues associated with VR nudges, semantic variance, and intersectionality.	10.1007/s10676-021-09594-y	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2021	Barbara, J; Haahr, M	Who Am I that Acts? The Use of Voice in Virtual Reality Interactive Narratives	Proceedings Paper	Virtual reality; Second-person; Immersion; Interactive narrative	**Self-identification is a key factor for the immersion of the VR interactive narrative player.** Diegetic non-protagonist narrators, touched-up heterodiegetic narrations with internal focalization, and casting the player in a 'virtual sidekick' role are suggested by the literature to support self-identification. This paper **analyses the use of second-person voice and level of interactivity in two VR productions.** In one, minimal use of the second person to address the player and negligible agency results in **limited telepresence in a 360-video VR tour** of a concentration camp accompanying a Holocaust survivor. In the second, use of a **touched-up heterodiegetic narration with internal focalization heightens immersion levels but self-identification of the player as sidekick suffers as the narrative's forward drive shifts between narrator, protagonist and antagonist.** Future empirical work should explore the impact of second-person voice and interaction on the resultant self-identification and immersion.	10.1007/978-3-030-92300-6_1	360; PRODUCTION
2022	de Bruin, K; de Haan, Y; Kruikemeier, S; Lecheler, S; Goutier, N	A first-person promise? A content-analysis of immersive journalistic productions	Article	Content analysis; immersive journalism; literature review; presence; virtual reality	Major **news outlets** increasingly use immersive techniques in their journalistic productions. The idea is that, through the application of immersive technologies, **the news consumer can engage with and be part of the story**. However, we do not know, to what extent this promise is actually fulfilled in productions currently accessible to **news audiences**. This study uses a multi-step approach to fill this knowledge gap. First, based on an interdisciplinary **literature review**, we propose a conceptual model of immersive journalism. We then use the elements of this model to content **analyze 189 journalistic productions** *that are labeled as immersive by the producers*, including 360 degree videos, computer-generated VR, and interactive, 360 web productions, stemming from a variety of outlets and countries. Results show that the level of user immersion in these productions is actually limited, with little interaction and technical inclusion possibilities. Our results contribute to an emerging field of journalism studies, in which the user plays a new role when interacting with advancing technologies.	10.1177/146488492 0922006	360; PRODUCTION

Year	Authors	Title	Type	Keywords	Abstract	DOI	Tags
2022	Vazquez-Herrero, J; Sirkkunen, E	Back to Fukushima: Perceptions and effects of an immersive journalism story	Article	Immersive journalism; 360 degrees video; Virtual reality; News media; Immersion; Presence; Empathy; Reception; Experience; Narration; Metaverse	**News media organizations** have been experimenting with immersive journalism formats in recent years. The search for **new ways to tell stories is driven by technology and has given rise to new -and not so new-forms of expression**. The initial enthusiasm has dissipated over the years, so the uncertainty of the future of **immersive journalism** justifies the study of the most potential ways of using this technology in journalism. This research was carried out in Finland and Spain, and **it is based on a textual narrative analysis and a reception study comparing the online article and 360 degrees video versions of the report Fukushima: Contaminated Lives from El pais.** The results identify the affordances of both formats and **confirm that immersive journalism has the capacity to generate a greater emotional effect** based on a greater perception of presence, realism and involvement, also having a positive impact on increasing interest and changing opinions on related topics. The narration of online article seems to work better only if there is large amount of information that has to be understood and contextualized. However, authors claim that, instead of an essential break, there are similarities between both formats, which are situated on the same continuum of emotionality and rationality. These findings also indicate that immersive storytelling can be an important part of the emotional or affective turn in contemporary journalism. The sensation of presence and empathy towards distant and complex realities emerge as the main distinguishing values of the kind of immersive journalism that Fukushima: Contaminated lives represents.	10.3145/epi.2022.ene.08	EXPERIENCE; EMPATHY; VIRTUAL REALITY/360; VIDEO; STORYTELLING
2022	Butterworth, A	Beyond sonic realism: a cinematic sound approach in documentary 360 degrees film	Article	Sound; virtual reality; 360 degrees film; cinema; sound design	**Sound is often recognised as critical to the success of 360 degrees film, but in a new medium fraught with technological challenges and time constraints, there is little research to guide sound designers in their creative practice.** As practitioners engage with this new 360 degrees format, the wisdom and techniques developed from decades **of documentary sound** practice promise more compelling viewing experiences; however, there **are many differences between cinematic documentary and non-fiction 360 degrees film**. This article contributes towards a new language of sound for this medium by exploring the sound design approaches of four non-fiction 360 degrees films that experiment with cinematic sound practices. The findings discussed were gained from interviews conducted with leading sound designers Tom Myers from Skywalker Sound (Collisions, 2016); Joel Douek (Under the Canopy, 2017); Roland Heap (My Africa, 2018); and Mike Lange, Michael Thomas and Heath Plumb (Inside Manus, 2017). The findings **detail the benefits of including sound designers from the beginning of pre-production**, the implications for sound recording, and the post-production considerations in the sound studio. The practice-centred guidelines presented in this paper can be used by sound designers, directors and screen educators in the creative design and development of 360 degrees film soundscapes.	10.1080/17503280.2022.2048234	360; PRODUCTION
2022	Cummings, JJ; Tsay-Vogel, M; Cahill, TJ; Zhang, L	Effects of immersive storytelling on affective, cognitive, and associative empathy: The mediating role of presence	Article	Empathy; immersion; perspective-taking; presence; virtual reality	Popular claims of virtual reality systems serving as **empathy machines'** often fail to consider (a) the cognitive mechanisms driving the effects of technological immersion on empathy and (b) the conceptualization of empathy as a **multidimensional construc** t. More, recent research has yielded mixed empirical support. This study investigates how dimensions of **psychological presence-perceived self-location, sense of copresence, and judgments of social realism-mediate the effect of immersion on cognitive,** affective, and associative empathy. Findings indicate that **experiencing a news story via 360 degrees video** on a head-mounted display led to stronger self-location and copresence than engaging with the same video via desktop or reading a text version. While only copresence increased cognitive empathy, both self-location and copresence facilitated affective empathy. Whereas self-location and copresence enhanced associative empathy, social realism decreased it. These results highlight the value of a multidimensional conceptualization of empathy in **investigating the prosocial potentia** l of immersive media.	10.1177/1461444820986816	360; VIDEO; STORYTELLING/ EXPERIENCE; EMPATHY; VIRTUAL REALITY
2022	Kazlauskaite, R	Embodying ressentimentful victimhood: virtual reality re-enactment of the Warsaw uprising in the Second World War Museum in Gdansk	Article	ressentiment; victimhood; virtual reality; memory politics; Museum of the Second World War; Poland	This article examines **how the Museum of the Second World War in Gdansk, Poland, employs an immersive virtual reality (VR) experience 'Postcard from the Uprising'** (Kartka z Powstania) in order to build an affective memory regime that prescribes an emotional repertoire for museum audiences. By engaging in a narrative inquiry of the VR experience, I demonstrate **how it evokes the emotional dynamic of ressentiment, which has been identified as the affective driver of right-wing populism and which informs the historical policy of Poland's ruling Law and Justice (PiS) party.** The ressentimentful emotional regime is predicated on (1) the repeated re-experiencing of perceived injustice and victimhood, which requires (2) an outlet of negative emotions directed at the enemy and (3) a reclaiming of self worth and dignity along with an ennobled and morally superior victimhood position. The VR experience functions as an emotion training device through which 'appropriate' emotions towards the past are instilled in the audience. The VR narrative transforms collective historical victimhood from a powerless to a morally superior position and may help the PiS in harnessing feelings of injustice and victimhood present among the museum visitors, who yearn to overcome these feelings and reclaim their self-worth and dignity.	10.1080/13527258.2022.2064897	SOCIAL; VR; NARRATIVE
2022	Morriet, O	Empathy in virtual reality as an author's posture: a Quebec study	Article	Virtual reality; VR; empathy; scripting; scenario; experience design; author; writing; Quebec	For certain authors, virtual reality (VR) is an effective media to gain user empathy, in part because of its immersive and interactive properties. **How do VR work creators consider empathy?** When they seek to stimulate empathy through their works, what mechanisms do they implement? Conversely, do they care little about it or do they reject it categorically? Is there a specifically Quebecois use of empathy in virtual-reality creations? **The analysis of Quebec VR works undertaken to try and answer those questions confirms a definite interest towards empathy in VR, an interest encouraged by funding bodies.** Furthermore, two trends can be noted: certain VR authors seek individualized empathy (relating to personal stories), while others pursue non-individualized empathy (relating to a group of people or a human archetype). Our study did not identify specific Quebec characteristics for the use of empathy in VR, but does **allow us to conclude that empathy in VR is an author's choice**, perhaps even creator posturing, with an ethical purpose.	10.3138/cjfs-2021-0057	EXPERIENCE; EMPATHY; VIRTUAL REALITY/VR; EMPATHY; INTERACTIVE;
2022	Soler-Adillon, J	Experimenting with non-fiction VR storytelling: micronarrative, abstraction and interactive navigation. The case of In Pieces VR	Article	Virtual reality; experimental documentary; interactive documentary; digital art; abstraction; micronarrative	This article presents In **Pieces VR, a VR-based artwork and experimental documentary on political prison, and discusses its main design challenges, goals, and creative approach.** This project aims at **creating a documentary and artistic experience that departs from conventional immersive journalism by presenting to its viewers a story made out of very small narrative units, and with subjects presented in the form of virtual sculptures devoid of any specific identity.** The idea is that by leaving much of the making sense left open, **viewers will have to fill in the gaps.** The working hypothesis is that this **will help create a different emotional, intellectual and political connection with the piece than that a conventional documentary would achieve, particularly to an audience unfamiliar with, or even politically alien to its specific context.** Public exhibition of the work and user evaluation showed that the piece was successful in creating such connections.	10.1080/14626268.2022.2154808	NARRATIVE VR NON-FICTION

2022	Egliston, B; Carter, M	Oculus imaginaries: The promises and perils of Facebook's virtual reality	Article	Facebook; imaginaries; Oculus; platforms; virtual reality; VR	This article explores **the Oculus suite of virtual reality (VR) technologies, with a specific focus on the period following the company's 2014 acquisition by Facebook.** Through a close reading of promotional material, we first **describe and analyse the 'Oculus imaginary' - the narrative produced by Facebook about the Oculus as integrated into and enhancing the experience of Facebook's wider suite of social software.** The purpose of this narrative, we suggest, is **to construct and 'sell'** a Facebook-specific vision of VR's potentials - one that is appealing both to end users and platform complementors - and moreover, a vision that appears to be conducive to Facebook's current methods **for accumulating profit and power**. Following on, we develop via a **study of YouTube user comments posted on promotional videos for the Oculus**, an anticipatory account of how the Oculus imaginary is perceived to relate to the lives and values of everyday individuals.	10.1177/146144482 0960411	SOCIAL; VR; NARRATIVE
2022	Gitau, L; Kenning, G; Burgess, S; Bennett, J; Kuchelmeister, V; Neidorf, M; Ginnivan, N	Pre-Engagement as Method: An EmbodiMap (TM) VR Experience to Explore Lived Experience of People from South Sudanese Refugee Background	Article	arts based methods; virtual environments; community based research; case study; methods in qualitative inquiry	This paper discusses the use **of pre-engagement as a method to introduce EmbodiMap, a Virtual Reality (VR) tool to a group of South Sudanese refugees in Sydney, Australia. The aim of the pre-engagment is to understand how currently available support for the mental and emotional wellbeing of the refugee population can be further supported through psychosocial engagements using purposefully developed tools.** The EmbodiMap tool and experience, developed by the felt Experience and Empathy Lab (fEEL) at UNSW Sydney, is a creative approach that potentially offers a transformative experience as participants virtually reach into their bodies and draw or register their immediate or persisting feelings, sensations and emotions. As an arts-based approach, EmbodiMap provides an **innovative alternative to approaches that rely heavily on words, thus helping amplify the participants' self-expression.** Pre-engagement is used as a psychosocial engagement method, allowing for a small group of participants to experience EmbodiMap first-hand and engage 'hands on' with the technology **before providing insights into how the tool may be adapted, developed, or codesigned further to facilitate a meaningful experience for use with the broader community.** The pre-engagement with a small group of South Sudanese community members revealed scope for further engagement with the broader community, while adapting to the needs and issues identified.	10.1177/160940692 21123167	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2022	Rodriguez-Fidalgo, MI; Paino-Ambrosio, A	Progress or regression in the practice of immersive journalism? Immersive storytelling in the productions of the Samsung VR platform between 2015 and 2020	Article	virtual reality; 360-degree video; immersion; journalistic practice	Journalism has undergone countless changes in recent years, especially since the emergence of the network of networks. As digital technologies have gone from strength to strength, new ways of doing journalism have also gained traction, focusing on the potential offered by going digital. This perspective goes hand in hand with another linked to virtual reality (VR) and 360-degree video, with additional technical characteristics. Since 2010, there has been talk of so-called immersive journalism, which uses the above-mentioned technologies to narrate events, introducing a perspective into journalism that breaks with the classical concepts of working with information and making it available to the viewer, who now becomes an immersive user. This is the context of the present investigation, which focus **es on the change of immersive journalism over the last five years.** To this end, 1713 pieces available on the Samsung VR platform are analysed. **The results reveal that there have been some changes in terms of production**; however, in narrative terms, when it comes to reporting reality, the only evident change has been the way in which the functions of immersive storytelling elements have been updated.	10.14622/JPMTR-2108	360; VIDEO; STORYTELLING / 360; PRODUCTION / 360; PRODUCTION; STORYTELLING
2022	Torronen, J	Relational Agency and Identity Navigation in Life Stories on Addiction: Developing Narrative Tools to Analyze the Interplay Between Multiple Selves	Article	addiction stories; actor-network theory; narrative positioning theory; narrative semiotics; master narrative; justification; addictive self; recovering self; interactive self; normative self	In life stories **on addiction,** in which dependence is experienced as an antagonistic force, agency manifests as enigmatic. As narrators in these stories usually describe how they lost their agency to a substance, we may ask who then takes over the agency and is the actor. Can material things act with agency? By taking influences from actor-network theory, Bambergs' narrative positioning theory, Greimas' narrative semiotics, symbolic interactionism, and critical discourse studies, I propose that addiction stories can be productively approached with an ontology that conceptualizes actors' agency as relational. **According to this ontology, individuals develop addiction in relation to heterogeneous attachments that form an enabling assemblage.** Moreover, I propose **that life stories on addiction are narratives in which narrators navigate their addiction by negotiating with multiple selves.** These selves can be productively identified and analyzed from the perspectives of story, interaction, and identity claim. As a story, in which actors are positioned vis-a-vis one another, life stories on addiction can be approached as narratives that describe the confrontation between the trajectory of the self that is driven by addiction and the trajectory of the self that seeks mastery over one's life. As an interaction between narrators and interlocutors, life stories on addiction can be examined as performances of interactive selves who do positive face-work to neutralize, rationalize, and justify their deviant behavior. And as identity claims, life stories on addiction can be considered embodiments of ideal or normative selves that are articulated in relation to the dominant discourses and master narratives of surrounding culture. By using examples from life stories on addiction, the article aims to clarify with what kinds of concepts and narrative tools we can analyze the interplay between multiple selves in addiction stories.	10.1177/160940692 21078378	SOCIAL; VR; NARRATIVE
2022	Williams, T	Remembering and silencing complexity in post-genocide memorialisation: Cambodia's Tuol Sleng Genocide Museum	Article	Cambodia; complexity; memorialisation; narratives; perpetrators; victimhood	In genocide, complex political actors can take on changing roles of perpetrator, victim or hero at different points in time. In post-genocide societies, political actors seek to shape memory of the violent past to forward their own interests, often undermining this complexity and painting a more black-and-white picture that ties in with Transitional Justice practitioners' dichotomous assumptions about perpetrators and victims. **This article looks at how complexity is remembered and silenced in a post-genocide memorial space that included many complex political actors during its tenure as a security centre: Tuol Sleng Genocide Museum in Cambodia.** Here, the audio guide and permanent and temporary exhibitions (as well as changes to these) allow for a co-existence of competing memories, demonising the Khmer Rouge regime for its immense cruelty and simultaneously constructing victimhood for former Khmer Rouge cadres. This could serve as a starting point for discussing complexity, but instead silences in the exhibitions and audio guide create an ambivalence in attributing these roles that masks this complexity.	10.1177/175069802 11037288	SOCIAL; VR; NARRATIVE
2022	Tang, R	Research on Interactive Spatial Scheduling of VR Movie Based on Spatiotemporal Relational Narration	Article		**The application of virtual reality (VR) technology has revolutionized the aesthetic concept of traditional movies, which especially causes the evolution of the concept and form of time and space in movies that the space-time structure and narrative form of traditional movies are no longer suitable for VR movies.** Therefore, in this paper, **the space-time of VR movies is deconstructed and reconstructed, and the space-time consciousness is taken as the research background.** From the perspective of creative subject and audience experience, the space-time narrative characteristics, structure, and methods of virtual reality movies are discussed. At the same time, based on the dynamic scheduling principle of VR images, a **multisource scheduling model is established with narrative space, intention space, aesthetic empathy, emotional identity, time deconstruction, and music expression as the original data sets, which is of guiding significance to the creative practice of VR movies.**	10.1155/2022/7499 420	SOCIAL; VR; NARRATIVE / VR; EMPATHY; INTERACTIVE; / EXPERIENCE; EMPATHY; VIRTUAL REALITY

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2022	Rodriguez-Fidalgo, MI; Paino-Ambrosio, A	Progress or regression in the practice of immersive journalism? Immersive storytelling in the productions of the Samsung VR platform between 2015 and 2020	Article	virtual reality; 360-degree video; immersion; journalistic practice	Journalism has undergone countless changes in recent years, especially since the emergence of the network of networks. As digital technologies have gone from strength to strength, new ways of doing journalism have also gained traction, focusing on the potential offered by going digital. This perspective goes hand in hand with another linked to virtual reality (VR) and 360-degree video, with additional technical characteristics. Since 2010, there has been talk of so-called immersive journalism, which uses the above-mentioned technologies to narrate events, introducing a perspective into journalism that breaks with the classical concepts of working with information and making it available to the viewer, who now becomes an immersive user. This is the context of the present investigation, which focuses **on the change of immersive journalism over the last five years.** To this end, 1713 pieces available on the Samsung VR platform are analysed.**The results reveal that there have been some changes in terms of production**; however, in narrative terms, when it comes to reporting reality, the only evident change has been the way in which the functions of immersive storytelling elements have been updated.	10.14622/JPMTR-2108	360; VIDEO; STORYTELLING / 360; PRODUCTION / 360; PRODUCTION; STORYTELLING
2022	Torronen, J	Relational Agency and Identity Navigation in Life Stories on Addiction: Developing Narrative Tools to Analyze the Interplay Between Multiple Selves	Article	addiction stories; actor-network theory; narrative positioning theory; narrative semiotics; master narrative; justification; addictive self; recovering self; interactive self; normative self	In life stories **on addiction,** in which dependence is experienced as an antagonistic force, agency manifests as enigmatic. As narrators in these stories usually describe how they lost their agency to a substance, we may ask who then takes over the agency and is the actor. Can material things act with agency? By taking influences from actor-network theory, Bambergs' narrative positioning theory, Greimas' narrative semiotics, symbolic interactionism, and critical discourse studies, I propose that addiction stories can be productively approached with an ontology that conceptualizes actors' agency as relational. **According to this ontology, individuals develop addiction in relation to heterogeneous attachments that form an enabling assemblage.** Moreover, I propose **that life stories on addiction are narratives in which narrators navigate their addiction by negotiating with multiple selves.** These selves can be productively identified and analyzed from the perspectives of story, interaction, and identity claim. As a story, in which actors are positioned vis-a-vis one another, life stories on addiction can be approached as narratives that describe the confrontation between the trajectory of the self that is driven by addiction and the trajectory of the self that seeks mastery over one's life. As an interaction between narrators and interlocutors, life stories on addiction can be examined as performances of interactive selves who do positive face-work to neutralize, rationalize, and justify their deviant behavior. And as identity claims, life stories on addiction can be considered embodiments of ideal or normative selves that are articulated in relation to the dominant discourses and master narratives of surrounding culture. By using examples from life stories on addiction, the article aims to clarify with what kinds of concepts and narrative tools we can analyze the interplay between multiple selves in addiction stories.	10.1177/160940692 21078378	SOCIAL; VR; NARRATIVE
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2022	Tang, R	Research on Interactive Spatial Scheduling of VR Movie Based on Spatiotemporal Relational Narration	Article		**The application of virtual reality (VR) technology has revolutionized the aesthetic concept of traditional movies, which especially causes the evolution of the concept and form of time and space in movies that the space-time structure and narrative form of traditional movies are no longer suitable for VR movies.** Therefore, in this paper, t**he space-time of VR movies is deconstructed and reconstructed, and the space-time consciousness is taken as the research background.** From the perspective of creative subject and audience experience, the space-time narrative characteristics, structure, and methods of virtual reality movies are discussed. At the same time, based on the dynamic scheduling principle of VR images, a**multisource scheduling model is established with narrative space, intention space, aesthetic empathy, emotional identity, time deconstruction, and music expression as the original data sets, which is of guiding significance to the creative practice of VR movies.**	10.1155/2022/7499 420	SOCIAL; VR; NARRATIVE / VR; EMPATHY; INTERACTIVE; / EXPERIENCE; EMPATHY; VIRTUAL REALITY

Year	Authors	Title	Type	Keywords	Abstract	DOI	Tags
2022	Jiang, ZX; Meltzer, A; Zhang, XY	Using virtual reality to implement disability studies' advocacy principles: uncovering the perspectives of people with disability	Article; Early Access	Disability studies; virtual reality; VR; disability advocacy; advocacy tools	One central aim of disability studies is to shift understandings of disability, such **that disability comes to be understood as about the social disadvantage/oppression that people face when society does not cater to impairment of body/mind.** Nevertheless, there remains a need for more practical tools for disability advocacy, through which to transmit disability studies' ideas of disability to the general community. Drawing on a qualitative study of the perspectives of 23 people with physical and sensory impairments, this **paper proposes virtual reality as an advocacy tool to communicate the principles and beliefs of disability studies.** The findings highlight that, due to the nature of the technology, **participants feel virtual reality has clear potential as a disability advocacy tool that can facilitate empathy, perspective-taking and positive social change, with a particular focus on how it is the environmental barriers and social attitudes around people that disables them.** Points of interestMore practical advocacy or informal education tools are needed that align with the principles of disability studies.This research conducted **in-depth interviews with 23 people with physical and sensory impairments.The research finds that virtual reality has clear potential as a disability advocacy tool.** The participants reported that virtual reality can facilitate empathy, perspective-taking and positive social change.The research finds that virtual reality focuses on how environmental barriers and social attitudes around people with disability disable them, rather than focusing on impairment experiences.	10.1080/09687599.2022.2150601	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2022	Wang, YY; Chen, C; Nelson, MR; Sar, S	Walk in my shoes: How perspective-taking and VR enhance telepresence and empathy in a public service announcement for people experiencing homelessness	Article; Early Access	Empathy; perspective-taking; public service announcement (PSA); reactance; telepresence; virtual reality (VR)	This research explored how a virtual reality (VR) **public service announcement (PSA) in a first-person perspective** (vs non-VR PSA scripts: first-person perspective-taking, non-perspective-taking) impacted attitudes toward the PSA and attitudes toward people experiencing homelessness. **Participants first reported their attitudes toward people experiencing homelessness.** Seven days later, participants watched or read a PSA about the life of a person experiencing homelessness and reported their attitudes toward the people experiencing homelessness and the PSA. We explored how psychological processes (telepresence, empathy, reactance) related to persuasion. Results showed viewing or reading any of the PSAs led to more favorable attitudes toward the target group. The VR PSA was the most likely format to induce telepresence and empathy and the least likely to induce reactance. Attitudes toward the VR PSA were more positive than toward the script PSAs. **Overall, our study provides insights into the effectiveness of VR and narrative formats for persuasion.**	10.1177/14614448221108108	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2023	Wuebben, D; Rubio-Tamayo, JL; Barrio, MG; Romero-Luis, J	360 degrees Video for Research Communication and Dissemination: A Case Study and Guidelines	Article	360 video; immersive video; research dissemination; science communication; YouTube	Introduction: 360 degrees videos are increasingly popular channels for science communication and higher education; however, **time-limited 360 degrees videos that disseminate scientific research via platforms like YouTube remain underexamined.** To address this problem, this experience report reviews the creation and evaluation of six 2D video interviews and six 360 degrees video tours. About the case: The European Commission's Joint Research Centre (JRC and other public-facing organizations already publish 2D videos on social media channels and host 360 degrees video content on their institutional websites. **This case addresses the affordances and constraints of creating short 360 degrees videos for publication on public-facing platforms.** Situating the case: 360 degrees video content has been incorporated into science communication and pedagogical practices in **higher education.** The authors review these developments and show the need for further research on time-limited 360 degrees video. Methods/approach: Scientists researching energy-related technologies **were invited to record 2D video interviews.** Based on these interviews, six transcripts for 360 degrees videos were drafted and recorded in the same lab settings. When the videos were published, European researchers and communication professionals were recruited to complete a short survey evaluating the videos' relative merits. Results/discussion: The survey results (n = 32) suggest a similar overall quality of the 2D video interviews and 360 degrees video tours. Respondents ranked the interviewee or narrator as the best feature of both the 2D and 360 degrees format, and 47% said that they would prefer to have a 360 degrees video created about their research. Based on our experience, we provide guidelines related to the production and publication of short 360 degrees videos. Conclusion: Further research and practice are required to understand which specific features of the 360 degrees videos are most effective and whether this technology offers distinct advantages as a tool for dissemination. Further research and practice will establish more detailed approaches to 360 degrees video.	10.1109/TPC.2022.3228022	360; PRODUCTION
2023	Zhang, Y; Weber, I	Adapting, modifying and applying cinematography and editing concepts and techniques to cinematic virtual reality film production	Article	cinematic virtual reality; cinematography; editing; filmmaking; language; 3D previsualisation; transmedia journaling	**Virtual reality (VR) filmmaking** presents a unique cinematic experience requiring new and innovative ways to conceptualise and practice specific aspects of the production process. This article integrates a range of **adapted and modified filmmaking thinking,** approaches and components into the **cinematic virtual reality (CVR) language** and grammar in the two critical areas of cinematography and editing. This focus provides a range of possible strategies and tools for would-be VR film directors to engage more efficiently and effectively in VR film production. The article utilises an extended case study of the VR feature film Calling to present the director/editor's observations and experiences using transmedia journaling and three-dimensional (3D) CVR previsualisation as a simulation tool to create this dynamic, interactive CVR film.	10.1177/1329878X211018476	CINEMATIC VR INERACTIVE EXPERIENCE
2023	Royal, C	Design Implications for a Burgeoning Digital Product Ecosystem: Roles, Culture and Engagement	Editorial Material	**Product**; design; engagement; media platform; algorithms	The **news** product ecosystem has quickly grown to encompass a range of offerings, including interactive editorial products, mobile applications, newsletters, podcasts, games, immersive storytelling and artificial intelligence applications, social media strategies and tools to support journalism functions. Product practices more commonly associated with software development have become necessary in creating and launching digital properties, but these approaches need to integrate the special case of **journalism,** reflecting the speed of news, particular ethics, responsibilities to the audience and role in democracy. This commentary considers three areas that unite design and product related to media: **shifting professional roles, emerging product culture and the relationship between product and engagement.**	10.1080/21670811.2022.2163676	360; VIDEO; STORYTELLING
2023	Galeazzi, F; di Franco, PD; Toulson, R; Camporesi, C; Patel, S	Earthquakes, communities and heritage: Telling stories of resilience through co-designed immersive media	Article		In this article, we discuss the **experimental application of iterative co-design, community-based and place-centred approaches in the** *creation* **of 3D immersive experiences** of places that have been badly damaged or destroyed after natural catastrophic events. We take as our case study the community of Senerchia, hit and partially destroyed by the 1980 Irpinia earthquake in Italy. The main purpose of this paper is to **analyse and discuss the co-creation process** we undertook with residents of the town **for the making of an immersive documentary** Italia Terremotata which explores life before, during and after the earthquake. Our approach is based on design-thinking and aims to define an ethical framework for the creation of reflexive and multi-vocal 3D immersive storytelling systems that consider 'vulnerability' and 'empathy' as central design values of the iterative prototyping and co-creation cycle.	10.1080/1472586X.2022.2102539	360; VIDEO; STORYTELLING

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2023	Zhang, Y; Weber, I	Adapting, modifying and applying cinematography and editing concepts and techniques to cinematic virtual reality film production	Article	cinematic virtual reality; cinematography; editing; filmmaking; language; 3D previsualisation; transmedia journaling	**Virtual reality (VR) filmmaking** presents a unique cinematic experience requiring new and innovative ways to conceptualise and practice specific aspects of the production process. This article integrates a range of **adapted and modified filmmaking thinking**, approaches and components into the **cinematic virtual reality (CVR) language** and grammar in the two critical areas of cinematography and editing. This focus provides a range of possible strategies and tools for would-be VR film directors to engage more efficiently and effectively in VR film production. The article utilises an extended case study of the VR feature film Calling to present the director/editor's observations and experiences using transmedia journaling and three-dimensional (3D) CVR previsualisation as a simulation tool to create this dynamic, interactive CVR film.	10.1177/1329878X2 11018476	CINEMATIC VR INERACTIVE EXPERIENCE
2023	Royal, C	Design Implications for a Burgeoning Digital Product Ecosystem: Roles, Culture and Engagement	Editorial Material	**Product**; design; engagement; media platform; algorithms	The **news** product ecosystem has quickly grown to encompass a range of offerings, including interactive editorial products, mobile applications, newsletters, podcasts, games, immersive storytelling and artificial intelligence applications, social media strategies and tools to support journalism functions. Product practices more commonly associated with software development have become necessary in creating and launching digital properties, but these approaches need to integrate the special case of **journalism**, reflecting the speed of news, particular ethics, responsibilities to the audience and role in democracy. This commentary considers three areas that unite design and product related to media: **shifting professional roles, emerging product culture and the relationship between product and engagement.**	10.1080/21670811.2 022.2163676	360; VIDEO; STORYTELLING
2023	Galeazzi, F; di Franco, PD; Toulson, R; Camporesi, C; Patel, S	Earthquakes, communities and heritage: Telling stories of resilience through co-designed immersive media	Article		In this article, we discuss the **experimental application of iterative co-design, community-based and place-centred approaches in the** *creation* **of 3D immersive experiences** of places that have been badly damaged or destroyed after natural catastrophic events. We take as our case study the community of Senerchia, hit and partially destroyed by the 1980 Irpinia earthquake in Italy. The main purpose of this paper is to **analyse and discuss the co-creation process** we undertook with residents of the town **for the making of an immersive documentary** Italia Terremotata which explores life before, during and after the earthquake. Our approach is based on design-thinking and aims to define an ethical framework for the creation of reflexive and multi-vocal 3D immersive storytelling systems that consider 'vulnerability' and 'empathy' as central design values of the iterative prototyping and co-creation cycle.	10.1080/1472586X. 2022.2102539	360; VIDEO; STORYTELLING

2023	Greber, H; Lecheler, S; Aaldering, L; De Haan, Y; Kruikemeier, S; Goutier, N; De Bruin, K	Feeling the News? The Differential Effects of Immersive Journalism on Emotional Response	Article	Immersive journalism; emotional response; empathy tendency; inclusion; interactivity; immersive narrative	**Immersive journalism** (IJ) is often assumed to be inherently emotion-inducing. Through using inclusive technology, interaction possibilities and immersive narratives, the audience should ideally experience what feels like to be in a certain situation. However, for the most part we do not know to which extent and in what form IJ influences the experience of emotions. **We wanted to investigate, whether, and if so, which characteristics of IJ are related to the experience of emotions, and which role the personality trait empathy tendency plays in this respect.** This is important, as the evaluation of IJ often relies on the emotion-inducing assumption thereof. Four different experiments comparing one immersive journalistic characteristic (level of inclusion, interaction possibilities, immersive narratives) to the respective non-immersive counterpart were conducted. Results indicate that while the level of inclusion and interaction possibility increase the intensity of the experience, the immersive narrative influences the valence dimension of emotions. Additionally, empathy tendency is found to be a relevant moderator for these effects. Conclusions are threefold. First, the narrative form of IJ is key; second, the analysis of IJ needs to go beyond the level of inclusion; third, including emotions when assessing IJ is fundamental to understand its impact.	10.1080/21670811.2022.2155205	EXPERIENCE; EMPATHY; VIRTUAL REALITY
2023	Perez-Seijo, S; Vicente, PN; Lopez-Garcia, X	Immersive Journalism: The Effect of System Immersion on Place Illusion and Co-Presence in 360-Degree Video Reporting	Article	immersive journalism; 360-degree video; VR storytelling; immersive storytelling; place illusion; copresence; social interaction; immersive witness	Immersive journalism has been promoted as an **alternative way of producing content that allows users to experience first-hand the events depicted in the news story**. This mixed-method study examines how immersive journalism impacts the user experience of non-fictional narratives **in news practices**. A between-subject experiment (n = 104) was conducted to inspect the effects of system immersion on place illusion and co-presence. Using a 360-degree video news report produced by the Spanish newspaper El Pais as a stimulus, two viewing conditions were compared: magic window and 360 degree with a VR headset. The results show that VR technologies determine the effective potential of immersive journalism, namely the experience of place illusion and co-presence and that audiences do not actually explore the so-called whole picture, as a 90-180 degrees movement for exploration prevailed.	10.3390/systems11010001	SOCIAL; VR; NARRATIVE
2023	Lopezosa, C; Codina, L; Fernandez-Planells, A; Freixa, P	Journalistic innovation: How new formats of digital journalism are perceived in the academic literature	Article	360 degrees videos; augmented reality; immersive journalism; journalistic innovation; newsgames; structured journalism; systematic literature review; virtual reality	This article carries out a systematic **review of the literature analysing the following new journalistic formats: structured journalism, immersive journalism, 360 degrees video reports, virtual reality and augmented reality applied to journalism, newsgames and docugames**. To do so, the scientific production examining these formats is first analysed to determine the academic impact of these studies, while identifying their characteristics and tracking their evolution over time. Second, the leading researchers in this field are identified and interviewed to ascertain their opinion about the future of journalism and changing trends in journalistic formats. The results show that the number of academic publications about journalistic innovation peaked in 2019, above all in the three journals - Digital Journalism, Journalism Practice and Profesional de la Informacion - that lead the way in this discipline. The 23 academics interviewed reported that innovation impacts primarily on four aspects of journalism: information and content; audience; methods and resources and news media companies.	10.1177/14648492 11033434	360; PRODUCTION
2023	Bengtsson, LR; Van Couvering, E	Stretching immersion in virtual reality: How glitches reveal aspects of presence, interactivity and plausibility	Article	Virtual reality; immersion; presence; gender; interactivity; glitches; work life; plausibility	**Virtual reality (VR) immerses users in others' lives, creating empathy and understanding long after the VR scenario has finished.** As VR technology has matured, VR scenarios have begun to be used in complex real-world areas such as education, health and organisational change. **These scenarios can be of variable technical quality, with limited interactive capacity, unrealistic environments and clunky or absent avatars. In this study, three scenarios related to gender inequality training were constructed with glitches in the core immersive qualities of presence, interactivity and plausibility in order to understand their effect on the immersive experience.** Using a **multi-step in-depth series of qualitative interviews to examine the whole immersive process, the results show that immersion is not compromised but changed by glitches.** Limited interactivity led to uncomfortable interactions that allowed participants to process difficult emotions; implausible situations surfaced buried norms and prejudices; and avatar variation gave rise to a sense presence that also included distance, which gave the user opportunities for critical reflection. These results point towards immersion as a robust and richly textured concept, while interactivity, plausibility and presence can best be understood as dimensions rather than goals. Totally seamless and immersive experiences may not only be utopian but also unnecessary. The glitches in low-end productions can produce powerful communication without expensive technology.	10.1177/135485652 21129530	VR; EMPATHY; INTERACTIVE; / EXPERIENCE; EMPATHY; VIRTUAL REALITY
2023	Vera, CRP; Gutierrez, JS	THE BLURRED LINES BETWEEN SPECTATOR AND CHARACTER: NARRATIVE INTEGRATION OF THE USER IN CINEMATIC VIRTUAL REALITY	Article	Virtual Reality; Immersion; Cinematic Virtual Reality; Focalization; Presence; Agency; Character; User	In spite of the intense sense of immersion that Virtual Reality (VR) can incite, **the interactivity of the user is always limited**. In traditional narrative VR pieces, also known as cinematic VR (CVR), **users can witness a story but can hardly impact it. This limitation creates a paradox in which users feel immersed in a virtual world but cannot interact with it.** This article focuses on the narrative strategies used in CVR to integrate spectators within the diegesis. This paradox of immersion behooves scholars and creatives to rethink traditional narrative paradigms to apply them to this new medium. In this sense, **the user's limited ability to interact needs to reinforce the overall narrative premise**. By analyzing a corpus of live-action CVR pieces, this article proposes a typology of users: **different ways in which the spectator can be integrated in the story, navigating the overlaps be-tween user, character, and focalizer successfully.**		VR; CINEMATIC; INTERACTIVITY
2023	Rodriguez, JL	THE SPECTATOR'S SEAT: MOVEMENT AND THE BODY IN IMMERSIVE CINEMA	Article	360-degree Cinema; Immersive Cinema; Panorama; Body; Movement; Train; Travel	The way that **conventional cinema guides the spectator around the image constitutes a very different form of immersion from the interactive immersion of all-encompassing media experiences.** By considering such differences when studying immersive media, we can explore the full range of its potential benefits and how they can be combined to create new narrative formulas. Beyond virtualizing scenes, every immersive medium repositions the movement and the body of the spectator in the represented space. How these elements are redefined in each production is central to the viewing experience. **This article studies immersive audiovisual storytelling, particularly in 360-degree video, from the perspective of the frictions between conventional cinematography and immersive media.** These tensions are expressed through the different ways in which movement is depicted and the different positions of the spectator's body in the image.		360; PRODUCTION; STORYTELLING / 360; PRODUCTION
2023	Greber, H; Aaldering, L; Lecheler, S	The Worthwhileness of Immersive Journalism-Taking on an Audience Perspective	Article; Early Access	Immersive journalism; worthwhileness; factorial survey; virtual reality; augmented reality; audience studies	A growing number of **studies in journalism research are concerned with the effects of immersive journalism** (IJ) on audience perceptions and behaviors. This interest in IJ is logical, because IJ has the potential to become **an impactful innovation for the industry**. However, we have largely neglected the question of whether audiences want this form of emotional journalism. This study fills this gap and investigates whether people consider IJ worth their while. Using a factorial survey design, **we presented a sample of 2000 German citizens** with descriptions of an immersive production about protests in Belarus, in which we manipulate the use **of inclusive technology (VR vs. AR vs. video), immersive narratives (first person vs. third person), agency (choice of perspective vs. no choice of perspective and control of location vs. no control), and emotionality (positive vs. negative vs. neutral tone).** The analyzes reveal **that an immersive narrative perspective, control and emotionality do not predict worthwhileness perceptions.** However, productions that present people with inclusion and technological agency render this production more worthwhile in the eye of the individual user.	10.1080/17512786.2 023.2177711	360; PRODUCTION