Best practices for guiding viewer attention in immersive feature with 360° video[1]

Buenas prácticas para guiar la atención del espectador en el reportaje inmersivo con vídeo en 360º

María José Benítez de Gracia. She has completed a bachelor's degree in Journalism (Universidad Europea de Madrid, 2000), a Master's Degree in Applied Media Research from Universidad Carlos III de Madrid (Carlos III University of Madrid) (2016), and a PhD in Media Research from the latter as well. She has received the Outstanding Doctorate Award, and the focus of her work has been on new narratives and the study of new technologies. She began her professional activity designing multimedia graphic environments for adapting educational content. In 2004 she joined the Axel Springer publishing group where she worked for nine years as Editor-in-Chief of the journal *Computer Hoy*, which specialises in computer science and new technologies.
University Isabel I, Burgos, Spain
mariajose.benitez@ui1.es
ORCID: 0000-0002-1101-004X

Susana Herrera Damas. She has a bachelor's degree in Audio-visual Communication (University of Navarra, 1998), as well as a BA in Sociology (UNED, 2004). Professor Herrera Damas also holds a PhD in Audio-visual Communication (University of Navarra, 2002), and was granted the Outstanding Doctorate Award. She is the author of five books and more than 80 articles published in prestigious academic journals. She has been a Visiting Professor at the University of Ottawa (Canada), the University of Texas in Austin (USA), and the Missouri School of Journalism (also in the USA). Since February of 2008, she has been working at the Universidad Carlos III de Madrid, where she is an Associate Professor of Journalism, and she also leads the Innovation on Digital Media Research Group and the PhD programme in Media Research.
Carlos III University of Madrid, Spain
dherrera@hum.uc3m.es
ORCID: 0000-0002-1755-1621

Abstract:

Immersive feature reporting with 360º video is a new way of presenting events that transforms the viewer into an eyewitness, or even the main character, of a reality that is being portrayed. Due to the immersive aspect it provides (both technical and narrative),

Resumen:

El reportaje inmersivo con vídeo en 360º supone una nueva forma de mostrar los acontecimientos que convierte al espectador en un testigo directo o, incluso, en el protagonista de una realidad se representa. Gracias a la inmersión que favorece, el espectador ac-

the viewer enters a 360° environment and acquires a first-hand perspective with a vantage point that he or she can control at will. In practice, however, this power is hindered by the fact that on many occasions the journalist is unable to direct the viewer's attention in the same way as can be achieved with conventional video. The aim of this study is to identify a series of practices that allow the viewer's attention to be directed without depriving him or her of the power to control the point of view. To achieve this purpose, an exhaustive review of the literature on the subject has been conducted, more than a thousand reports of this type have been viewed, and nine in-depth interviews with experts, professionals and academics have been carried out. As a result, we have identified four types of best practices that can help in achieving this purpose. This study justifies the need for each of them and illustrates their potential with real-life examples taken from reports produced by benchmark media.

Keywords:

Immersive journalism; feature reporting; 360º video; best practice; attention.

cede a un entorno de 360º y adquiere una perspectiva en primera persona cuyo punto de vista controla a su voluntad. Sin embargo, en la práctica, este poder se encuentra con un obstáculo ya que, en numerosas ocasiones, el periodista no puede dirigir su atención tal y como ocurre en vídeo convencional. El objetivo de esta investigación es identificar una serie de prácticas que permitan dirigir la atención del espectador sin privarle de la facultad de controlar el punto de vista. Para ello, hemos realizado una exhaustiva revisión de la literatura sobre el tema, hemos visionado más de mil reportajes de este tipo y hemos llevado a cabo 9 entrevistas en profundidad con expertos, profesionales y académicos. Con todo ello, hemos identificado 4 buenas prácticas que pueden contribuir a este fin. El presente estudio justifica la necesidad de cada una de ellas e ilustra sus posibilidades con ejemplos reales extraídos de reportajes producidos por medios de referencia.

Palabras clave:

Periodismo inmersivo; reportaje: vídeo en 360º; buenas prácticas; atención.

1. Introduction

Immersive narratives in journalism have made it possible to show events in a highly realistic way, thus bringing the viewer much closer to the story (De la Peña et al. 2010: 292). This new format allows the visual space to be represented in a way that is continuous and unbounded, thereby departing from traditional framing. The viewer is placed in the centre of a circular stage and obtains a first-hand view that can be freely controlled by moving and turning his or her head, thereby experiencing a sensation of actually being in the location where the action is taking place (Aronson-Rath et al., 2015; Dolan & Parets, 2015; Doyle et al., 2016; Sirkkunen et al., 2016; Sidorenko et al., 2017: 103; Hardee & Mc-Mahan, 2017: 4; Jones, 2017). This has been achieved mainly due to the driving force and convergence of a number of immersive technologies (Oculus, 2014 and 2015; Google, 2015 and 2016) which, in the last 6 years, have been heavily supported by the larger internet platforms (Google, 2015; Facebook, 2014 and 2015).

The combined use of a stereoscope viewer and a 360° video format provides the viewer with the illusion of accessing a three-dimensional space that offers a visual, auditory, and even tactile experience (Pryor, 2010). In addition, this representation is supported by the use of aesthetic and interactive narrative resources that shape the action that occurs between the spectator and the story (Domínguez, 2010). Diverse sectors such as education, real estate, tourism, and advertising (Clark, 2015) have started to use this new technology.

Since 2015, journalism has also harnessed this technology. Numerous media, both national and international, have adopted the format. Some of the most prominent organisations include *The New York Times, The Guardian,*

Associated Press, USA Today, The Washington Post, ABC News, The Wall Street Journal, Discovery Channel, National Geographic, BBC, Euronews, RTVE, and *El País. The New York Times,* for example, has a specific section called The Daily 360 (Hardee & McMahan, 2017: 2), which is dedicated to the daily production of immersive works. As of January 2018, it had a total of 371 features (Uskali et al., 2021: 14). Similarly, several independent journalists have also shown great interest in the production of this type of content (Sidorenko et al., 2020: 118).

At the same time, the innovation incorporated by this new narrative entails a complicated and costly production process (Uskali et al., 2021: 18), a radical change in the technical devices used to record and edit the content (Doyle et al., 2016; Hardee & McMahan, 2017: 6), 2016; Hardee & McMahan, 2017: 6), several new ethical challenges (Kent, 2015; Gregory, 2016; Kool, 2016; Madary & Metzinger, 2016; Nash, 2018; Sánchez Laws & Utne, 2019 and Pérez-Seijo & López García, 2019), the use of specific applications for its dissemination (Colussi & Reis, 2020: 29), and in short, a complete reassessment of the narrative structure itself (Lelyveld, 2015; Aronson-Rath et al. , 2015).

In return, the capability of visualising a more complete context through a 360° scenario offers new possibilities that we have not encountered to date in conventional audio-visual media. Removing the boundaries of traditional framing (Watson, 2017: 22; Marconi & Nakagawa, 2017: 3; Sánchez Laws, 2019: 33) allows the viewer to visualise events within a seamless space, depicted continuously in a 360° scenario that enhances their informative experience. This can lend greater credibility to the facts and help to regain an audience that is increasingly fragmented (Pavlik, 2005: 40), viral (Martínez Rodríguez & Torrado, 2017: 148), and inclined to consume information through mobile devices (Salaverría, 2015: 149).

The opportunity of the viewer to control the point of view thus emerges as one of the hallmarks of immersive journalism. However, this peculiarity encounters two obstacles in practice. On the one hand, the very novelty and handling of the viewing device can be distracting, yet this is a minor problem that diminishes as the viewer becomes more familiar with this type of equipment (Syrett et al., 2017: 206). The second difficulty arises in creating a coherent narrative, because with this mode, the director cannot control the viewer's attention or direct their gaze as can be accomplished with other conventional audio-visual narratives (Nielsen et al., 2016: 229).

However, doing so would undermine one of the basic features of this type of journalism. Moreover, on occasion the limitation in directing attention is even technical, as this format does not allow for the use of some of the resources used in traditional audio-visual narratives, such as close-ups, framing, and focusing or de-focusing on objects. In addition to these limitations, one must also bear in mind that movement not controlled by the viewer through the use of a moving camera can generate discomfort or motion sickness (Nielsen et al., 2016: 231; Hardee & McMahan 2017: 7; Bailenson, 2018; Fagan, 2018; Uskali et al., 2019: 52).

2. Methodology

In this context, the objective of this research is based on the need to identify a series of practices within immersive narratives that allow the director to guide the viewer's attention at certain moments without depriving them of control over the point of view.

To this end, we have carried out an exhaustive literature review on the subject in the following databases: Web of Science, ProQuest, Ebsco, and Google Scholar. Specifically, we used the following keywords in both English and Spanish: immersion, 360º video, virtual reality, presence, immersive journalism, and media innovation. The results of the review include several empirical studies conducted to date. Moreover, we have added the viewing of more than a thousand feature with these characteristics published by national and international media between 2015 and 2020.

In the second phase, we wanted to enrich the documentary research by conducting nine semi-structured, open-ended interviews[2], due to the precision and richness of detail provided by this research technique (Wimmer and Dominick, 1996: 158). In this way, we intended to triangulate the results "in order to fully understand the nature of the subject under investigation" (Wimmer and Dominick, 1996: 51).

The interviewees selected are from backgrounds with direct involvement in this type of format, either as professionals who produce immersive features or as academics who examine these in depth. After selecting the interviewees, we drew up a provisional guide with the possible questions we wanted to address, structured around the following four areas:

i. Personal background in relation to immersive journalism

ii. 360º video recording and production technology

iii. General narrative characteristics of immersive journalism

iv. The past, present and future of immersive journalism

This first questionnaire was reviewed by two PhD professors from Carlos III University of Madrid, who added some nuances, and also included ideas that had previously been left out. Once the corresponding adjustments had been made, we obtained the final list of questions. Next, we sent the questionnaire by email to the interviewees in order to give them a certain amount of time to contemplate their answers. In this way, an attempt was made to avoid having them answer spontaneously without allowing a minimum amount of time for them to consider their answers, because due to the novelty of the format, it was advisable for them to answer some of the questions based on previous reasoning. The interviews were conducted between December 2015 and June 2018. Each interview lasted approximately one hour.

After transcribing the interviews, we identified the nodes or key words in each of them, highlighting the different paragraphs or adding annotations that allowed us to easily recognise and identify the aspects addressed. The information

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2   The interviewees were: Xavier Conesa (director of *Visyon*), Adriano Morán (director of *93 Metros*), Miriam Hernanz (deputy director of *Lab RTVE*), Javier Coloma (director of *Zakato 360*), Ignacio Ferrando (director of *Ábaco Digital*), Daniel Rojas (director of *3GO Video*), Robert Hernández (professor and researcher on immersive narratives at the University of Southern California), Sara Pérez-Seijo (PhD student and researcher on the subject at the University of Santiago de Compostela) and Antonio Baía Reis (PhD student and researcher on the subject at the University of Porto, Portugal).

we obtained was arranged in cards previously categorised according to the issues addressed. We carried out this process several times so as not to leave out any important issues.

Once the results were triangulated, we managed to systemise four best practices to guide the viewer's attention in this type of narrative. Before presenting them, we will briefly describe the novelty of immersive 360º video feature, as this genre is the focus of our research.

3. Viewer attention in immersive 360° video features

Immersive features with 360º video, which has emerged since 2015 from the confluence of a series of technological innovations (Benítez and Herrera, 2018), can be defined as follows:

> "Model representation of reality that narrates and describes events and actions of human interest based on real images recorded with 360º video, which uses immersive techniques to give the viewers the illusion of being present at the event with a first-hand perspective from which they can better understand the circumstances, identify with the main characters, and even experience the emotions that accompany the reality being represented" (Benítez and Herrera, 2017).

As previously pointed out, one of the elements that allow this representation to be generated is the power given to the spectators to control the viewing and focus their attention on what they find interesting. In practice, this poses a difficulty, as reflected by the diverse testimonies of the interviewees.

For Javier Coloma, artistic director of 360º video at *zakato.com*, this presumably increased freedom of the spectator can encounter limitations, because at certain moments of the narration important segments of the action might be lost:

> "The traditional productions are designed in advance to guide the user and make them understand what is being narrated... In the new productions, the difficulty increases: the spectator is the one who chooses how to observe the 360º environment and might miss the action that takes place from another angle. Being able to direct their visual free will is the most difficult issue to resolve" (Coloma, 2016).

Likewise, this issue affects each of the different stages of the directing process. In this regard, several interviewees agree that planning the different sequences in a 360º narrative presents a number of challenges:

> "You have to approach the shots differently, know what system to use, try to avoid sudden movements, know where there might be action and where not. There is also an effect known as parallax that complicates things a lot. You have to unlearn everything you've learned" (Morán, 2016).

> "In a script, in any 360º shoot, you can never be sure that the user is going to have the experience you want them to have. Every experience is unique, because maybe you're putting a label there, and they're looking in the other direction, so they miss that information. For example, there are no close-ups in 360º. You will never be able to see the expression of a face in 3D" (Hernanz, 2016).

> "The big difficulty with 360º scripts is that the user can look wherever they want. It's not the same in a normal script where the scriptwriter decides what they're going to see. It doesn't work here. It just doesn't work. Here the user is basically going to look at wherever they want" (Ferrando, 2016).

Thus, for example, the preparation of the script must take into consideration that during the filming and subsequent editing phase, changes to the types of shots cannot be made, nor can resources like zoom or depth of field be used to focus or de-focus certain areas:

> "There are essentially no close-up shots, no zooming in and out. Tracking shots must make sense so that they don't make you dizzy. The 360º shots have to last longer in order to provide context, because the spectator needs to know where he or she is and be aware of the option of viewing at 360º" (Coloma, 2016).

In the same sense, editing by cutting is an additional obstacle, and consequently it is common to resort to the sequence shot:

> "Many times, we have fast movements and it's difficult to do the *stitching* if there is a lot of movement near and far from the camera. There is no area "behind" in 360º video... It's not enough to cut, it's not enough to have someone behind to tell you what the actors have to do. When you start filming, you record until the end. We work with sequence shots, normally, because you can't play with different cameras. You're always seeing everything around you" (Conesa, 2016).

For Xavier Conesa, project manager at *Visyon*, immersive storytelling implies a change in the way of narrating because despite "choosing the location of the camera, you can't prevent the viewer from seeing everything that is happening around it":

> "The classic storytelling of cinema is no longer useful. And the classic user experience of the TV, mobile or laptop doesn't work either. We are facing a new device where the user has experiences and there is nothing written, so we are paving the way... With 360º, the user is always free to look wherever they want. Everyone goes through their own experience within the video. It is not a directed experience. It accompanies you in the experience, but the viewer is free to do whatever they want" (Conesa, 2016).

Nevertheless, at certain moments it is necessary to guide the viewer's attention to a specific part of the scene. Several of these features have chosen to direct the camera, thus limiting the power that this format gives to the viewer. For example, the feature report "The Atomic Bombing of Hiroshima", published by The New York Times, forces the camera movement in order to guide the viewer through different areas of a map, which reduces the freedom given to the viewers and ends up confusing them. Moreover, this practice causes the viewer to experience a sense of discomfort or dizziness, which in turn diminishes their illusion of presence (Nielsen et al., 2016: 231; Hardee & McMahan; 2017: 7; Narciso et al., 2019).

To avoid this situation, it is advisable to review some contributions based on the process of human attention in the event that the lessons learned for conventional audio-visual content might shed some light when establishing valid criteria applicable to 360º video.

The word attention comes from the Latin root *attentus*, derived from *attendere*, and composed of the prefix *ad* (meaning proximity) and the verb *tendere* (to stretch or extend). The use of this term differs in Spanish and English. In the former, it refers to helping, and in the latter it is related to the act of being present. The latter is more in line with the definition we are looking for here.

According to Goldstein, attention is "one of the primary mechanisms we employ to focus on the important things in the environment that we would otherwise miss" (Goldstein, 2007: 131). Some studies have shown that at times we do not perceive the existence of stimuli that we look at directly without paying attention (inattentional blindness), or sometimes we have difficulty noticing changes between two scenes (change blindness). In this regard, Goldstein argues that one of the reasons we do not perceive these changes is because we have experience from the past, which tells us the following:

> "Sudden changes rarely appear in real life, and when they do, we usually notice them. Since the former are usually accompanied by a movement that creates a signal that attracts our attention, if we do not notice the movement, we miss the change" (Goldstein, 2007: 127).

Goldstein recalls the importance of "relating the different characteristics of an object, such as colour, shape, movement and location, so that when combined, they create the perception of a coherent object" (Goldstein, 2007: 131).

One of the theories that explain how this link is generated is the visual search, defined as "what we do every time we search for an object among a series of objects" (Goldstein, 2007: 134). According to the theory, there is a search based on one characteristic of the object, and a combined search that requires two or more characteristics to be joined.

From a similar perspective, Itti argues that "visual attention is attracted to visual attention is attracted to striking visual locations" (Itti, 2017: 3227). He uses the concept of visual relevance to denote "the subjective perceptual quality that makes some stimuli stand out from other elements or locations" (Itti, 2017: 3327). In his view, a red object isolated in a green field or an emergency triangle will stand out and draw attention to the point in the scene where they are located.

Audio-visual language has transferred this knowledge to film and television. In their proposal, Bordwell and Thompson systemise different cinematic techniques that allow the director to control the narrative and guide the attention. These techniques might refer to the filming process, staging , or the sound and editing of images. In particular, aspects of staging "attract our attention through changes in light, shape, movement and other elements of the image" (Bordwell and Thompson, 1995: 163). In turn, these authors divide into four categories the different ways in which the director can guide the spectator's attention through staging (Bordwell and Thompson, 1995: 164):

1) movement,

2) colour variation

3) balance of different elements

4) size variation

In reference to movement, these authors emphasise the ease with which moving objects attract attention. One example they offer is the act of waving a newspaper over a still scene. On the other hand, when several moving objects are present in the image, the spectator shifts his/her attention toward them according to other cues, or according to his/her expectations of the most striking parts of the narrative action (Bordwell and Thompson, 1995: 164). Differences in colour also influence the perception of space because bright colours, for example, attract the gaze more than faint

backgrounds. Likewise, the brightness of warm colours (red, orange, and yellow) attracts more attention than that of cool colours (purple, blue or green).

Neuroscience calls visual capture the "use of a series of neural and psychological resources to focus attention on a particular point" (Macknik and Martínez-Conde, 2012: 97). Following this idea, when faced with two movements, the human eye will follow the one that is more prolonged and visible. An example of the use of this resource is when magicians "show a dove strongly flapping its wings for the purpose of attracting attention to the bird and preventing people from looking toward the area where they are preparing the trick" (Macknik and Martínez-Conde, 2012: 98).

Likewise, through so-called joint attention it is possible to "share the experience of another person by following the direction of their gaze and gestures" (Macknik and Martínez-Conde, 2012: 89). To do so, the recommendation is that it should be framed "within a natural action (using the magician as an example) such as scratching one's head, taking a drink of water, adjusting one's glasses, or hanging up a jacket" (Macknik and Martínez-Conde, 2012: 103).

Although the application of these techniques to 360° video has still not been sufficiently studied, the academic literature based on experimental techniques offers promising results that allow several best practices to be drawn.

Studies carried out by Peck and his team confirm the suitability of integrating distracting elements in a natural way. As an example, they point to the flight of a butterfly over the stage as an appropriate resource for guiding attention to a specific point (Peck et al., 2009: 387). According to the above theories, the viewer's attention will be directed toward the moving element without reducing the freedom to control the point of view, which provides realism and promotes presence in the scene. In this regard, Nielsen and his collaborators propose three possible alternatives for guiding attention in a virtual environment (Nielsen et al., 2016: 229):

1) Make the scene long enough for the viewers to scan the scene with their eyes

2) Display objects within the viewer's field of vision

3) Add certain cues to direct their attention to relevant events and objects.

These ideas can be transferred to immersive feature with 360° video. The first refers to the usefulness of making the scene long enough to enable the viewer to go through it entirely, as Conesa points out:

> "The big handicap is the duration of the experiences. We don't know how long an experience can last without the user becoming tired of it. With the Samsung Gear VR, a normal 3-minute experience, the user only concentrates on what is happening for three, four or five minutes, which is fine. But after five minutes, it becomes tiresome" (Conesa, 2016).

Making a precise calculation is difficult, as it depends on the preferences of the viewer herself, who will be influenced in turn by a series of factors: her/his previous experience with the viewing system, interest in the topic of the report, the surrounding action in the 360º experience, and the characters or objects that attract her attention. On the other hand, it is important to bear in mind that a time extension might have the opposite effect if the viewer finds that nothing is happening after going through the scene. To avoid this situation, and the consequent disinterest and apathy it might generate, a voice-over should be added to guide and encourage them to continue.

The second alternative is to limit the number of objects located in front of user's field of vision. Experiments by Logan Dwight, director of the US production company The Soap Collective, suggest that attention is related to location and focus. Given that the spectator tends to view this content while seated, Dwight limits the action and recommends that it should not cover the entire spherical stage, as this would create confusion and noise (Dwight, 2016)[3].

Finally, the third alternative refers to the use of certain signals (implicit or explicit) to guide the viewer's attention to relevant objects (Nielsen et al., 2016). In turn, these cues can be part of the narrative (diegetic cues) or external elements (non-diegetic or extra-diegetic cues). In the latter case, the sense of presence could be broken by emphasising the mediated nature of the representation. This would be the case, for example, if a flashing or brightly coloured button or arrow were added. The authors also distinguish whether or not they limit the user's ability to interact within the setting (Nielsen et al., 2016: 229). When testing these resources on 45 participants, they found that introducing a guiding element such as a moving firefly triggered explicit cues and did not limit interaction, and consequently, they recommend practices of this nature.

Several studies have tested the effectiveness of other resources. Veas and his collaborators apply a technique known as "mediated reality". This involves modifying certain features of the real world during post-production with the intention of subtly directing the user's attention to an area, rather than using graphical cues such as arrows or buttons:

> "Increasing the contrast between some features such as, for example, light, colour, movement or audio transforms objects into more relevant or prominent parts of the scene, so that the viewer might direct his gaze at that point" (Veas et al., 2011: 11).

Brillhart (2016) calls a point of interest (POI) an element within the narrative that attracts the viewer's attention. This type of resource can be obvious - such as a red dot or a high intensity dot, or something even more complex, such as a figure or a character performing some action. However, the author also points out that the illusion of presence could be diminished if the signal is too explicit:

> "The more visible a sign is, the more likely the viewer is to direct his or her attention to it, but the experience of presence will be lower. Conversely, the less obvious the sign, the more likely the viewer is to be naturally drawn to it, which is the goal. However, in this case, the viewer is less likely to give it much consideration and respond to it" (Brillhart, 2016)[4].

The studies carried out by Tecnic confirm that in order to guide attention efficiently, 360° video production requires a combination of recording and post-production techniques. The former include gestures, voice guidance, and other types of sounds (Tecnic, 2018: 38). Among post-production techniques, Tecnic proposes use of the following:

a) Graphics (leader lines, text boxes, and titles)

b) Lighting (light/dark contrast and spotlight)

c) Colour (use of different colours or a highlighted red circle).

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3   In https://uploadvr.com/vr-film-tips-guiding-attention

4   Available at https://medium.com/the-language-of-vr/in-the-blink-of-a-mind-attention-1fdff60fa045, last accessed December 2020.

The results of Tecnic's research conclude that the use of graphics is one of the most appropriate techniques for attracting attention. It also highlights the use of leader lines, which can be complemented with other elements such as text boxes and titles. In terms of lighting techniques, directional spotlighting, and contrast change stand out. Directional spotlighting seems to be the most effective technique, while the simultaneous use of both techniques could be too forced for the viewer, taking away their freedom to explore the stage (Tecnic, 2018: 38).

Rothe and Hußmann conducted an experiment in which they applied light, sound, and diegetic movement effects to assess the extent to which they were effective in attracting attention. The results showed that moving objects and sound are more effective, even if the sound is not spatial or comes from another direction. Moreover, sound is more effective if it is joined to an object. Regarding lighting, static lights did not seem especially effective, yet a spotlight directed at a specific area was the second most effective (Rothe and Hußmann, 2018: 101).

To measure the effectiveness of all these techniques, they used sensitivity heat maps through a system of eye tracking of the participants' gaze in the different scenes they viewed. In the first, three objects with different light, movement and sound cues were examined: an illuminated light bulb socket, a moving ladle, and the sound of a drop of water. The heat map showed no significant attention directed at any of them. The second scene included three objects with different signals: a flickering lamp, a pot on the stove, and a ticking clock. The items that received the most attention were those accompanied by sound, while the lamp failed to draw the attention of the participants. In the third scene, objects with spatial sound appeared and disappeared: an alarm clock, a whistling kettle, and a cuckoo clock. In all three cases, the attention was equally significant, and each participant shifted their gaze when a new sound object appeared (Rothe and Hußmann, 2018: 107-109).

4. Best practices for guiding viewer attention in immersive 360º video features

Based on these findings and the reflections of the experts interviewed, we systemised a series of best practices aimed at guiding attention without diminishing the immersive capability or the illusion of presence. These are as follows (Benítez and Herrera, 2020):

    (i) Add movement to the scene

    (ii) Use appropriate lighting and colour techniques

    (iii) Incorporate graphic elements

    (iv) Apply spatial sound to objects.

4.1. Adding moving elements to the scene

In conventional video, the use of moving elements is an appropriate means of guiding the viewer's gaze to a specific point. However, this technique needs to be refined when it involves 360º video. Firstly, the recording technology itself prevents the use of certain techniques, such as focusing, zooming, or proposing scaled shots to focus attention on a

point or object (for example, an extreme close-up or detail shot). On the other hand, it is the spectator who controls the point of view.

Taking both factors into account, there are two ways of guiding the viewer's attention through the movement of diegetic objects in 360º video reporting:

1) GUIDING ATTENTION WITH A STATIONARY CAMERA: In these cases, the camera pedestal does not move and the movement of one or more objects, animals and/or people is used to try to direct the viewer's gaze to the desired location. In a report released by the BBC in November of 2016 entitled, "Snow leopards in 360°– Planet Earth II: Mountains", various animals appear in the area to the left that move to the right in an attempt to make the viewer look in that direction. This ensures continuity between the scenes, because when moving on to the next scene, the viewer will be looking toward an area of interest from where two people descend.

Focusing on nearby objects has been a key factor in human survival. As Itti argues, "it is important to quickly detect prey, predators or potential mates in a cluttered visual world" (Itti, 2017: 3327).

With this warning system in mind, another stationary camera technique involves bringing moving diegetic objects close to the lens in an attempt to generate a response in the viewer's gaze.

The feature entitled "Lions 360º", published in 2017 by National Geographic, uses this technique successfully. One of the scenes starts with a long shot of a lion cub approaching from the background and moving toward the front until it is in the foreground in front of the audience, so that it seems to be looking at the viewer. Once there, it stops for a moment and continues slowly to the left, a gesture that looks like an invitation to follow:

Figure 1: Frame from "Lions 360º"

Source: YouTube

However, due to the technical characteristics of 360° cameras, it is important to bear in mind the ideal distance at which the objects should be presented. For example, some recording systems do not allow for a close approach, as this can lead to parallax glitches. According to the production agency Jaunt Studios, objects should be placed at between 0.7 metres and 9.14 metres from the camera position (Jaunt, 2017: 38).

A different practice is to place the action in the foreground and exclude it from what John Mateer calls 'dead zones', i.e. "areas of the representation with little or no activity or visual interest in order to prompt the user to focus on the area where the action is concentrated" (Mateer, 2017: 17). For example, in the first scene of the report entitled "A harvest underneath the ice", published by The New York Times, the camera captures in close-up the activity of two Inuit in Canada digging a hole in the ice. Behind them, no action is taking place and only an extension of white can be seen, which does not add any narrative value, thus reducing the capacity for distraction.

2) GUIDING ATTENTION WITH A MOVING CAMERA: Immersive features can use three camera movements to direct the viewer's attention:

a) Hand-held camera movement: The journalist records while walking, carrying the camera in hand, on a support, on the head, or on a pole. The purpose of this technique is to obtain a subjective point of view that tries to recreate the viewer's own advance within the scene. If this movement is also paired with the image of a character pointing to a cer-

tain area through voices, gestures or his or her own movement, it is even easier to guide the viewer's attention to that area.

A production in which this technique is used appropriately is in the feature entitled "*En la piel de un refugiado*" (In a refugee's shoes), where one of the characters in the foreground "welcomes" the viewer. The character's role is to guide the viewer to the refugee centre. This is accomplished by combining the character's movement toward the front by using the voice and various gestures. This can be seen in the following screenshot:

Figure 2: Frame from "In a refugee's shoes"

Source: YouTube

b) Movement with the camera attached to a transport mode: another technique is to place the camera on a means of transport to direct attention to the front. Immersive features often make use of this option through various modes of transport such as planes, boats, cars, hot-air balloons, horses, etc. However, it is important not to overuse such techniques that include excessive movement, as this could have a negative effect and cause discomfort or motion sickness.

c) Movement with the camera placed on a guided or aerial system. Finally, the third technique consists of placing the camera on a remotely-controlled moving object, which can be placed on a robotic system, a tracking shot (travelling), or on a flying object such as a drone, aeroplane, or even a bird. In these cases, it is important to remember that even though the movement will guide the viewer's attention, the point of view obtained will not be that of a person, as the camera lens will not be at the same height as the viewer's eyes. This can create a conflict in terms of a sense of presence, as the viewer will never lose his or her identity and may find it difficult to accept such a different perspective. Moreover, as in the previous cases, there is also the risk of creating some type of discomfort, so it is wise to use this technique with caution and even to mention it at the beginning of the feature.

4.2. *Use of appropriate lighting and colour techniques*

In other audio-visual media such as cinema, lighting and colour play a decisive role in guiding the viewer's attention (Bordwell and Thompson, 1995: 152). In the case of immersive features with 360º video, the first difficulty is that the lighting is nearly completely restricted to natural light or ambient light, because the entire 360º scene is recorded. For this reason, it is necessary to hide all the technical lighting equipment usually used in filming, such as spotlights, cranes, screens, poles, etc.

To overcome this drawback, some producers recommend using lighting techniques during the post-production phase (Tecnic, 2018). However, if applied during filming, it can be better integrated into the story and gives a more natural look. Lighting added during post-production is more artificial, which can make mediation more obvious and lessen the sense of presence. Also, this practice might generate more than one ethical conflict due to the manipulation involved in the process. From a more practical perspective, there are three possibilities for incorporating lighting techniques in order to guide the attention during filming:

a) Create a lighting point from ambient light. To direct attention to an area located in a central point, this technique can be used to take advantage of natural light. It was used, for example, in the report entitled "Life on Mars: preparing for the red planet", published by The New York Times in 2017, which used zenithal lighting to guide the viewer's attention toward the exit of a tunnel through which two explorers are ascending.

b) Create a lighting point from artificial light. As in the previous case, this consists of highlighting an area of the image through a main light source and darkening the rest. However, in this case, the light source used is artificial. We find the appropriate use of this technique in the video feature entitled "Cervantes VR", published in 2017 by the RTVE Lab. At one point in the narration, the main spotlight is directed toward the bed where Don Quixote is convalescing.

c) Use a secondary light source. Some feature reports use an additional light source to direct the viewer to a secondary area. For example, in the feature entitled "At Kochi Biennale, Art imitating death: an artist at work", published by The New York Times in 2017, an intense spotlight is used to illuminate the protagonist of the scene while at the same time directing attention toward him.

Colour also helps to direct attention. In this sense, Bordwell and Thompson highlight the "limited palette" of colours and the use of black and white (Bordwell and Thompson, 1995: 164). These techniques can be effectively transferred to 360° immersive video features for the purpose of guiding attention in the following ways:

1) Contrast between brightness levels. Although studies in this regard have not reached conclusive results (Tecnic, 2018: 38), some feature reports use colour successfully. This is the case of "36 hours in Michigan's upper peninsula", published by The New York Times in 2017. Against a setting of predominantly cool tones (blue, green, and white), a warm tone (red) is used to highlight the lighthouse in the background and guide the gaze toward it. In addition, the railing on the bridge that connects the foreground with the lighthouse is also red, which acts as a guiding element integrated into the narrative.

Figure 3: Frame from the video feature entitled "36 hours in Michigan's upper peninsula"

Source: YouTube

2) Limited palette. This technique consists of combining a muted scale of colours - with hardly any contrast - with a different colour that stands out from the rest of the composition. It is seen, for example, at the beginning of the feature entitled, "India Parades: rehearsals ahead of Republic Day celebrations", published by The Associated Press in 2017. The yellow decorations on the hats of the soldiers marching to the left contrast with the grey of the buildings in the background, which encourages the viewer to look in the direction of their march.

3) Use of black and white. This can be used to draw attention to a lighter or darker area of the scene, depending on whether it dominates one or the other, respectively. The feature report "First-hand account: The assassination of Malcolm X", published by The New York Times in 2017, introduces black and white into the assassination scene in order to show a moment from the past using a present-day setting. In addition to black and white, the use of red on the figure of the political leader creates a higher level of contrast and draws the gaze toward him:

Figure 4: Frame from the feature video "Firsthand account: The assassination of Malcolm X"

Source: YouTube

4.3. Integrating graphic elements into the narrative

Adding graphic elements to the scene can also be an appropriate way to guide attention to a particular area. The results obtained by the researcher Tecnic confirm that this strategy is more effective than those related to lighting and colour. Regarding the graphics used in the researcher's study, what stands out is the use of leading lines, which he refers to as "animated lines that start at an extreme point and move towards the important area" (Tecnic, 2018: 16). These can be complemented using text frames and titles that "make viewers keep looking in the direction in which they are appearing, waiting for something to happen" (Tecnic, 2018: 32).

There are many feature reports that make use of this type of graphic element. Those published by The New York Times stand out as part of the series entitled "Seven Wonders of the World", which covers diverse places around the world. As these videos show different locations in which action is scarce and there is no narrator, the progressive appearance of these types of elements offers the support that guides the spectator's gaze.

However, these resources should be used with a certain amount of caution, as they are additional artificial elements that reduce the realism of the representation and can disrupt the illusion of presence (Slater et al., 2009: 202).

According to Nielsen et al., this artificial quality can be reduced through implicit diegetic elements, so even though the viewer is being guided, the spectator maintains control "without feeling forced and without losing the ability to interact freely through the scene" (Nielsen et al., 2016: 230). This is the case in "VR highline over an Arizona canyon", published by USA Today 2016. The feature shows an acrobat walking on a rope suspended between two mountain

peaks. In this case, the green rope on which the character is walking draws a straight line that guides the viewer's gaze in that direction.

4.4. Applying spatial sounds to objects

As previously mentioned, sound is essential in any audio-visual content. Bordwell and Thompson recall its importance, which has been acknowledged since the beginning of silent films (Bordwell and Thompson, 1995: 293). The authors highlight the capability of acoustic attention, as sound can create a "more complete sonorous perspective" (Bordwell and Thompson, 2018: 310).

In immersive 360° video features, sound can also be used to guide the viewer's attention. According to Biocca and Delaney, audio in 360º environments can "alert the user to virtual objects and virtual beings and make the viewer turn her head in one direction or another" (Biocca and Delaney, 1995: 81). Similarly, Anderson and Casey argue its importance in helping the user to orient herself in the virtual environment, and they note the desirability of such sounds being spatial (Anderson and Casey, 1997: 46).

When an object is behind the viewer, it should sound as if it is there. According to Aronson-Rath and those who collaborate with this researcher, "By perceiving the audio as coming from the direction where the objects are located on the screen, a consistent and more credible sensory response is generated in the viewer" (Aronson-Rath et al., 2015: 66). Likewise, Leyveld also considers that sound "allows the viewer to hear what is going on around him or her while looking in one direction" (Leyveld, 2015: 10), making it a crucial factor in guiding attention within the spherical stage (Rothe and Hußmann, 2018).

In 360° immersion, the way of creating an immersive, compelling, three-dimensional sound environment is different from the stereophonic and/or surround sound used in conventional video (Bordwell and Thompson, 2018: 311). On the one hand, it is difficult to use directional microphones, as the equipment used during filming must not be visible. This constraint can be overcome by incorporating very small audio systems that are hidden in the recording equipment and record high quality binaural[5] audio.

On the other hand, the freedom given to the viewer to change the point of view means that even though they are looking at one area of the stage, they must listen to what is going on around them, which would be the same case in a real situation. In other words, if a car appears from the left, the sound should come from there, but if the viewer turns to the right, the sound should come from behind the viewer, thus conveying the perception of being inside a complete 360° scene that changes in real time" (Jaunt, 2017: 50).

Rothe and Hußmann (2018) confirmed the effectiveness of using moving objects and diegetic sound in attracting and guiding the viewer's attention to a specific area in settings created with 360° video. In addition, they found that sound was more effective when attached to an object and the effectiveness was the same whether or not the sound was spatial, and whether or not it came from another direction.

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5   Binaural audio refers to the audio signal that the human brain uses to localise sound. When we hear sounds in the surroundings, the brain receives various signals provided by the ears that it uses to locate the origin of a sound in relation to the body, which is known as localisation (Jaunt, 2017: 51).

Interviewees have also highlighted the importance of audio in directing the viewer's attention:

> "Sound plays a fundamental role. There has been a lot of experimentation with am bidirectional sound. Not all media use it. It's true that they apply it in their videos, but I think it plays a crucial role because it's going to be the way to lead the listener in the narrated world" (Pérez-Seijo, 2018).

> "Audio is very important in guiding the attention because it works like the real world: when someone calls out to you, you turn around" (Sedano, 2018).

> "Audio is extremely important. Now they're doing stereoscopic audio, so if the action happens at one point, the sound comes from that point. Then you turn around because you've heard a noise behind you, and that's crucial. Then also, in part, the script can cause you to lead the gaze of the spectator where he has to look, and if suddenly you say in a voice-over, 'In a bar the sun is shining brightly this morning in winter', well, they are not going to look at the ground. Audio can help a lot. It's essential as a resource that can help immersion" (Hernanz, 2016).

Other interviewees pointed out the usefulness of combining audio with other narrative resources:

> "If it's well-edited, spatial sound lets you guide the attention to a specific point where the sound is coming from. But there are other ways of directing attention too. For example, colours in images. Human attention is attracted to bright objects, so accentuating the intensity of brightness and contrast in colours can help guide attention" (Baía, 2018).

> "Audio can lead in this area, but it is not a hundred per cent sure, because the viewer's curiosity is involved. This strategy can be visually reinforced by adding moving objects or characters. For example, we did this in one feature by placing a group of immigrants talking in one area of the scene so the viewer would look that way" (Hernández, 2018).

When transferring these considerations to immersive feature reporting with spherical video, two kinds of sounds can be used to guide attention: sound effects and voice resources.

1) Sound effects: In order to make the viewer look at a specific place, it is easier for the viewer to do so if there is a sound that attracts her attention, such as an explosion, the sound of footsteps, an ambulance siren, the sound of an engine, applause, etc.

There are different ways of applying this technique. One consists of incorporating such sounds into the post-production process through the use of software. This technique has been used, for example, in certain scenes from the feature film, "*En la piel de un refugiado*" (In a refugee's shoes). It starts with an explosion. Immediately afterward, this is followed by the sound of several sirens. Standing in front of a door, the spectator turns her attention to a loud noise in the street coming from a window just behind her. At that moment, a character appears and shouts at the viewer to "accompany" him in the escape. To see the character, the spectator has to look back towards the door. For the director, sound is very important in this type of production:

> "The audio recording system has to be located just below the camera where the stand is located, so it's not visible, and that's why it has to be spatial. Or at least it *should* be spatial. It must cover everything that's around it... But sound is very important. Noises can be added to guide the action to a point... If you have the glasses, you automatically direct your eyes there and you see the person who is shouting" (Morán, 2016).

There is yet another technique that can be used to guide attention. In this case, the audio is recorded as part of the ambient sound during filming but is intensified during post-production. We find an example of this technique at the beginning of the report entitled "Calais migrant camp in 360º: seeking home", published in 2015 by the production company Ryot. In the first scene, a black and white shot is used in which the sound of wind blowing against the canvas of a tent can be heard. The next scene shows a refugee coming out of the tent where he sleeps. The intense noise of the zip closing catches the viewer's attention.

Through more advanced techniques, some productions have used binaural sound to record the audio. This simulates the way humans perceive sound and allows the viewer to be aware of its location. This technique was used in "Dive into le Moulin Rouge", a work published by Jaunt in 2018. This feature shows a rehearsal of the dancers at the Moulin Rouge in Paris. The sound is located where it is generated, but responds in real time to the movements and turns made by the viewer as he/she changes his/her point of view: when moves his head, he not only changes the point of view of the image, but also detects a change in the direction of the sound.

However, incorporating binaural sound into an immersive 360° video feature is complex and costly. This is confirmed by USC professor Robert Hernandez, based on his own experience:

> "For the audio we bought an external microphone, but we don't get involved in 360º spatial audio. We know how to produce it, but we waste a lot time because it's a huge amount of work, and there's no guarantee that the audience will hear it in that form" (Hernández, 2018).

2) Voice resources. Another audio element that helps to guide attention is the human voice, which can come from a narrator or a character. Both can be diegetic elements, or in other words, they can form part of the action being represented, although in the case of the narrator, it can also be an extra-diegetic figure (omniscient narrator). In the latter case, mediation becomes more evident. By contrast, the intra-diegetic narrator is represented by a character within the story and allows the distance to be shortened so that his or her voice can be perceived as just another person in the story.

On occasion, the main characters themselves guide the viewer's attention by appealing to the viewer or directly addressing them so that they look at a certain area. This technique is used at different moments in the feature "*En la piel de un refugiado*" (In a refugee's shoes) (Benítez de Gracia and Herrera Damas, 2018b).

It is also common to use an extra-diegetic narrator. *El País* uses this resource in different features. In *"Así es la vida en los barrios más pobres de Dacca"* (That's the way life is in the poorest neighbourhoods of Dacca), from January 2017, the narrator addresses the viewer at several points and indicates where to look.

5. Discussion and conclusions

Immersive features with 360º video are a new way of reporting journalistic events, and they are linked to the evolution of immersive technologies in recent years. When these technologies are combined, they make it possible to represent events in an unprecedented way with a high degree of realism. By wearing the VR glasses, the viewer gains access to a spherical scenario with a three-dimensional appearance and a first-hand perspective through which he/she can navigate by moving and turning the head.

This innovation has been used by prestigious media outlets that are both national (*RTVE, El País, El Español, Castilla La Mancha Media,* and *Canal Extremadura*) and international (*The New York Times, The Guardian, Associated Press, Frontline, USA Today, BBC, RT*, etc.), which have published a large number of this type of feature on a wide range of topics. The format has also attracted the attention of a segment of the academic community which, over the last five years, has significantly increased its scientific activity in this area.

However, the production of such pieces remains complex and costly. The simplicity of the recording system used to film a scenario is only apparent, because the process faces a series of difficulties that are not present in a conventional audio-visual recording. Moreover, such difficulties arise from the very first moment of filming, which requires hiding the technical and human equipment, so it is not recorded in the 360º image. The experts we interviewed stated that this difficulty increases as the filming process progresses because as close-ups cannot be used, movement must be limited to avoid causing discomfort or dizziness in the audience. Moreover, it is not possible to zoom in and out, among other constraints in this area. All these factors require the director to rethink some audio-visual conventions. One of the most urgent questions is precisely how to guide the viewer's attention at certain moments.

The lack of previous experience with such productions obliged the first creators to learn as the work progressed, exploring the various possibilities on a trial-and-error basis, as stated in the interviews. Experts agreed on the importance of audio as a guiding element, although they reminded us of the importance of combining this aspect with other resources such as lighting or the movement of objects and/or characters.

Based on the reflections of the people interviewed and the findings in the academic literature, we propose four best practices that can be used independently or in combination. These include the movement of people or objects in front of the camera, lighting, colour, use of graphic elements, and employing spatial sound. The use of these techniques is more effective when they involve diegetic elements and are therefore integrated into the narrative, as this allows them to go unnoticed by the audience.

Our hope is that these best practices will serve as an initial guide for future producers who start using this format, though we are aware that the development of such narratives may lead to reconsideration of their use and the appearance of new ones.

In other respects, the proposal indicates the need for future experimental reception studies that might confirm the degree of effectiveness of these resources and others. At the same time, it also highlights the need for further academic research related to other phases of the production process such as scriptwriting, image recording, and editing.

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