

# Notes on the role of immersive sound in contemporary cinema

## *Notas sobre o papel do som imersivo no cinema contemporâneo*

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### ABSTRACT

The main objective of this article is to examine the role of sound in the stylistic strategies of contemporary filmmakers who are interested in expanding the multisensory engagement of viewers in feature films through immersive techniques, an emerging trend in the 21st century. This essay starts from a conceptual review of the idea of immersion in cinema, discusses the innate potential of the cinematographic device for immersion, and analyzes scenes from many films from the last 50 years, describing and discussing some of the main stylistic tools used by sound designers to build or enhance sensory immersion through sound.

**Keywords:** Immersion, sound studies, sound design, multisensory, synesthesia

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### RESUMO

O objetivo deste artigo é examinar o papel do som nas estratégias estilísticas de realizadores contemporâneos, interessados em ampliar o engajamento multissensorial de espectadores através de técnicas imersivas, uma tendência emergente no século XXI. O artigo parte de uma revisão conceitual da ideia de imersão no cinema, discute o potencial inato do dispositivo cinematográfico para a imersão e analisa cenas de filmes dos últimos 50 anos, descrevendo e discutindo algumas das principais ferramentas estilísticas utilizadas por *sound designers* para construir ou reforçar o senso de imersão sensorial através do som.

**Palavras-chave:** Imersão, estudos do som, *sound design*, multissensorialidade, sinestesia

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<sup>1</sup>Guia Folha is a section on the best-selling newspaper in São Paulo which, for over 20 years, offers a cultural guide of the city, featuring restaurants, bars, concerts, theaters, museums, and other leisure options.

IN EARLY 2020, the main cultural guide of São Paulo, named Guia Folha<sup>1</sup>, carried out an evaluation of all the exhibition spaces in the city. The trophy for best movie theater was given to three spaces, one located at Multiplex UCI Anália Franco, another at Espaço Itaú Pompeia, and the third at Cinépolis JK Iguatemi (Nadaletto & Sanchez, 2020). These three spaces have state-of-the-art digital technology in image and sound reproduction: an IMAX system with enormous screens occupying an entire wall (635 x 866 inches) and a sound system capable of operating 24 dedicated speakers.

Most sound and image reproduction technologies, both in commercial rooms and in domestic use (home theaters, soundbars, binaural headphones, etc.), have gained prominence for one main reason: they enhance users' sensory experience. Cinephiles have been familiar with terms like IMAX, 4DX, and D-BOX<sup>2</sup> for a few years. These are acronyms which refer to the multisensory aspects of audiovisual reproduction systems: more intense low bass sounds, accurate spatial sound distribution, bigger image resolution and size, and devices that activate chair movements. All these seek to offer the viewer a synesthetic experience<sup>3</sup> through seats that vibrate, speakers that emit sounds coming from the ceiling (both theater-developed technologies now available for installation at home), low bass sounds capable of shaking internal organs and cause people to feel nauseous, giant screens that curve over the audience, and so on.

<sup>2</sup>IMAX is a projection system that reproduces the image on giant screens. 4DX is a South Korean technology that adds sensory effects to the projection, including moving seats, strobe lights, and simulations of wind, rain, and scents. D-BOX is a company that produces, since 2009, motion control systems in chairs, providing this service for movie theaters, home theaters, and video game consoles.

<sup>3</sup>The term "synesthesia" comes from the Greek, from the union of the words "sin" (meaning "with") and "aesthesis" ("sensation"). It is an involuntary neurological condition in which many of the five human senses are merged in a single sensory experience.

Multisensory display devices are part of a phenomenon that has prominently affected the audiovisual market since the massive introduction of digital technologies in production, storage, and circulation of feature films in the early 1990s. The *digital revolution* (Cousins, 2013, p. 455) brought changes to all stages of the production chain, from planning and production to film viewing in theaters or home screenings. Within this context, many filmmakers have turned to ways of filming and types of narratives that promote multisensory stimuli. Hollywood filmmakers such as James Cameron, Peter Jackson, and Michael Bay (Cooper, 2017; Pierce, 2010; Schmidlin, 2012) have synthesized this phenomenon through insistent mentions of an ambivalent and controversial term: immersion.

In fact, the exhibition market has invested a lot of money in the aforementioned technologies, as there is currently tough competition between studios, production companies, streaming platforms (Netflix, Amazon Prime, Disney+, etc.), and other forms of audiovisual consumption (DVD, Blu-Ray, Pay TV, video games). All this contributes to the audiovisual culture being in a kind of *turbulence zone* (Gaudreault & Marion, 2016, p. 16), within which the very concept of film (as well as cinema) has become nebulous and multiform.

By stimulating hearing, vision, touch, smell and taste, the multisensory integration achieved in a scene is able to create an immersive experience. Immersive sound, in particular, can give the listener the feeling of being inside the scene. (Roginski & Geluso, 2018, p. 1)

Studies on immersion have increased fast since the 1990s. Google Ngram Viewer Stats (<https://books.google.com/ngrams>) show that the appearance of the term “immersive” has increased tenfold in the last 30 years. Research on immersion has advanced in disciplines such as cognitive psychology, artificial intelligence, and virtual reality. In film studies, authors such as Casetti (2015), Elsaesser and Hagener (2018), and Roginski and Geluso (2018) have been studying the development of narrative tools to reinforce immersion in audiovisual media.

It is also important to highlight that, in Brazil, film studies are largely linked to Departments and Scientific Societies in the study area of Communication (Ramos, 2010). Therefore, a significant part of immersion studies (C. Costa et al., 2021; Mesquita & Massarolo, 2014) is developed in the context of postgraduate programs, research groups such as the Study Group on Interactive Media in Image and Sound (GEMInIS), and scientific societies located in the study area of Social Communication, such as the National Association of Graduate Programs in Communication (COMPÓS).

In film theory, researchers have been addressing the issue of synesthetic stimuli offered by contemporary audiovisual techniques. Vivian Sobchack (2004, p. 67) even coined a term to name the trend: *kinesthesia*, which rewrites the word “synesthesia” (sensation perceived by many physiological senses at the same time), combining it with the notion of cinema. Robert Stam (2003) highlighted, in what he calls the *cinema of the senses*, that films are, in the last 50 years, closer to video games and theme park attractions than to classic Hollywood narratives because, when seeing them, “the spectator is *inside* the image, instead of being confronted by it” (p. 348). Michel Chion (2011, p. 119) referred to this type of audiovisual show using the term *sensory cinema*. Francesco Casetti (2015), in turn, praised the audience’s participation in the filmic spectacle: “Spectators spring into action, constructing for themselves, with their own hands, the object and the mode of their seeing” (p. 13).

Thomas Elsaesser and Malte Hagener (2018) defend the thesis that the quest to engage the audience through the physiology of the body has always been in the sphere of concern of filmmakers since the end of the 19th century. They claim that the potential to stimulate a certain type of immersion is present in the very ideological basis of the cinematographic device, as described by Jean Louis Baudry (1983). Elsaesser and Hagener point out that the predisposition of cinematographic media to synesthesia has intensified since the introduction of the digital element in the audiovisual chain:

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The idea of the body as a sensorial envelope, a perceptive membrane and a material and mental interface in relation to the cinematographic image and audiovisual perception is, therefore, more than a heuristic device and an aesthetic metaphor: it is the ontological, epistemological and phenomenological basis of film theories today. . . . At the limit, film and spectator are like parasite and host, one occupies the other and is, in turn, occupied, to the point where there is only one reality, which develops at the same time as it gets involved, and vice versa. (Elsaesser & Hagener, 2018, p. 21)

Although these researchers had coined different terms and developed arguments anchored in distinctive conceptual perspectives, such as phenomenology, semiology, cognitive sciences, and psychoacoustics, the researchers cited in the previous paragraphs (and many others) all agree on one point: contemporary audiovisual works – not just feature films but also TV and streaming series, video games, musical video clips, short films, and experimental pieces, – offer a privileged place for the human body and for physiological sensations, often obtained through the aforementioned exhibition technologies, and, in other cases, through stylistic techniques that reinforce the sense of physiological immersion within the narrative. This potential has even been pursued by some filmmakers at the expense of narrative coherence and density.

In this sense, little attention has been given to the role of film stylistics in this wave of multisensory and multimodal impact. In particular, the role of film sound in the immersive experience has been scarcely mentioned and studied, although it is crucial for the physiological engagement of the audience, as Agnieszka Roginski and Paul Geluso (2018) attest:

Through sound, vision, touch, smell and taste, multi-sensory integration into a scene can create an immersive experience. Immersive sound can give the listener an experience of *being there* through sound. Compared to vision, sound provides a fully immersive experience and can be perceived from all directions simultaneously. In fact, sound has the ability to anchor a listener to a fixed location while other sensory information changes simultaneously. Filmmakers are well aware of this effect, often using sound to establish a fixed location in a scene while having the visual perspective change frequently. (p. 1)

It should be noted that digital recording, editing, mixing, and reproduction technologies currently provide the necessary tools to produce, with a reasonable degree of verisimilitude, the immersive experience both in movie theaters and home exhibitions. Since the early 1990s, the use of these technologies has helped sound designers, sound editors, and mixers to use sound for the task of positioning audience members within the dramatic space of the film, helping them

to have experiences close to those felt by fictional characters through resources such as the use of off-screen sounds – a space that Michel Chion (2011, p. 119) called *superfield* and, more recently, Mark Kerins (2010, p. 92) renamed *ultrafield*, as we will see later –, the adoption of subjective hearing points and sound hyperrealism (Opolski, 2015, p. 1).

A cinematic moment, which became paradigmatic for the idea of immersion in diegesis through sound, is the scene of the Normandy landings in *Saving Private Ryan* (Spielberg, 1998). The viewer feels like a recruit under heavy fire from the Nazis, with bullets whizzing around, explosions that sound both near and far, and screams of pain and fear coming from all sides. Sound immersion reinforces and gives multisensory contours to the strategy of filming the entire scene from the point of view (and also hearing) of a soldier who is in the midst of chaos, alternating subjective points of view, close-ups, and extreme close-ups (Figure 1). With the help of a shaking camera, the immersive sound positions the audience inside the diegesis.

This mixing strategy was made possible by the creation of the Dolby Digital reproduction system, available since 1992. The spatial distribution of sound generated (and still generates) physiological reactions in many members of the audience who instinctively lower themselves to avoid being “hit” by gunshots, cover their ears with their hands, experience motion sickness, and so on. An American critic called the film “a dizzying and exhausting assault on the senses” (Berardinelli, 1998).

### Figure 1

Frames from *Saving Private Ryan*



Note. Spielberg (1998).



Examples of feature films which explore immersive sound tactics to trigger multisensory responses, emotions, and affects have been accumulating, including *Irréversible* (Noé, 2002), *Gravity* (Cuarón, 2013), *San Andreas* (Peyton, 2015), *Dunkirk* (Nolan, 2017), *Blade Runner 2049* (Villeneuve, 2017), and *A Quiet Place* (Krasinski, 2018). I will analyze scenes from these and other titles throughout this essay, whose main objective is to examine the role of sound in the stylistic strategies of contemporary filmmakers who desire to expand the audience's multisensory engagement in feature films, almost always resorting to immersive strategies. I will also seek to explore the relation between sound technologies and stylistics.

The article is structured in two sections, followed by final considerations. In the first one, it will make a conceptual review of the idea of immersion in cinema in order to understand how scholars analyze the effects that immersive devices produce in audiences in addition to explaining how filmmakers understand the term. The section will analyze the innate potential of the cinematographic device (Baudry, 1983) and a possible taxonomy of immersion, as proposed by Dominic Arsenault (2005). The following section will attempt, from the analysis of scenes of films from the last 50 years, to describe and analyze some of the stylistic tools used by sound editors, sound designers, and mixers to build or enhance the sense of sensorial immersion.

### IMMERSION IN CINEMA

France, December 28, 1895. The brothers Auguste and Louis Lumière organize an exhibition in Lyon to present the cinematograph, an equipment capable of reproducing moving images. The short film *The Arrival of the Train at the Station* caused panic (Brownlow, 1979; Toepfritz, 1979; Toulet, 1995): people got up from their seats, afraid that the train seen on the screen would invade the auditorium. According to Oliver Grau (2003, p. 180), fear reactions like that are still common in places where films are shown for the first time; the very same short feature was shown in a rural village in Romania in 1931, with a similar panic reaction.

This allows us to conclude that audience members slowly naturalize the immersion effect but it never completely disappears (Grau, 2003), as it is related to audiovisual forms since their genesis (Elsaesser & Hagener, 2018). Oliver Grau (2003) states, in fact, that there is an innate potential in audiovisual media – far beyond cinema, including television, multimedia installations, video games, etc. – for immersion.

The cinema apparatus, as described by Jean-Louis Baudry (1983, p. 183), contains the seed of immersion: a dark room, closed to external sounds and other stimuli, in which the audience must sit in front of a giant screen

and learn that they should remain motionless and in silence for the entire duration of the projection. Baudry (1983) believes that this device works so well for storytelling, especially fiction, because it is able to forcefully capture the audience's attention to the events that occur in the diegesis, preventing its members from being clearly aware of the technical apparatus that allows the operation.

In this sense, it is important to note that the filtering of attention offered by other audiovisual media may fluctuate but the ability to capture it is always there. Home television, for example, offers less potential for immersion due to external stimuli (household noises, phones ringing, neighboring sounds, etc.). Virtual reality games engage attention more energetically, in part because they require the use of headphones that block out some of the external stimuli. The control of attention will be, by virtue of the apparatus, concentrated on the narrative that unfolds on the screen (and through the sounds around it). If the immersive potential is used creatively, the audience's critical awareness of what is happening in the environment is reduced:

Despite being an intellectually stimulating process, immersion, in the present as in the past, is in many cases mentally absorbing in the unfolding of a process, a change, a passage from one mental state to another. It is always characterized by decreasing critical distance from what is shown and increasing emotional involvement with what is happening. (Grau, 2003, p. 30)

After all, what do I really mean when I mention the word "immersion?" Arlindo Machado (2014) states that the term suggests "multiple interpretations and distinct associations and applications, whether in the academic environment or in the common sense of the word" (p. 1). To eliminate possible ambiguities, I use the concept proposed by Janet Murray (2003):

The experience of being transported to an exquisitely simulated place is pleasurable in itself, regardless of fantasy content. We refer to this experience as immersion. "Immersion" is a metaphorical term derived from the physical experience of being submerged in water . . . the sensation of being enveloped by a completely alien reality, as different as water and air, which seizes all our attention, our entire sensory system. (p. 102)

To address the different levels of immersion that a member of the audience can experience, I evoke the taxonomy developed by Dominic Arsenault (2005), according to which there are three levels of immersion in a narrative dimension. In the first level, which the author calls *fictional*, immersion occurs from a purely

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mental relationship with a narrative – a memory, a thought, a dream. Immersion occurs exclusively within the subject's mind.

*Systemic* immersion occupies the next level, in which the narrative is constructed carefully and drives the subject's cognitive involvement with the immersive instance. To enter it, the subject must enter a fictional reality through a voluntary suspension of perception and the fulfillment of some rules of conduct. Listening to music and reading a book provide experiences of systemic immersion.

Finally, immersion is *sensory* when the subject experiences multiple physiological senses; that is, when it is synesthetic. Playing a video game characterizes this type of experience. Watching a movie, whether on television, on a smartphone or in a movie theater makes it happen too. This type of immersion can have many degrees of intensity, depending on the affective relationship that film and audience establish with each other with the help of audiovisual reproduction and consumption devices.

In fact, the aesthetic model developed since the beginning of the 20th century by Hollywood filmmakers, which Bordwell (1985) calls *classical continuity*, is strongly based on the search for techniques that, by concealing the narrative instance, favor a strong degree of sensory immersion.

Most of the stylistic tools available to contemporary filmmakers were developed to create, enhance or expand narrative immersion with the help of technology and the cinematographic apparatus. The traditional system of continuity (Bordwell, 2006) – which determines the creation of an axis of 180° so the variation of camera angles does not alter the direction of the gaze and the movement of the characters through the cuts – aims at the spatial and time continuity of dramaturgic action. The choice of angles and cut-off points, therefore, reduces the perception of the narrative instance and favors immersion in the plot.

We can take as an example a sequence in *Star Wars: The Last Jedi* (Johnson, 2017), in which the characters Kylo Ren (Adam Driver) and Rey (Daisy Ridley), who mastered telepathic abilities, communicate this way for the first time. They are on different planets but the editing minimizes this fact, as the conversation is set up in symmetrical medium shots in which the characters seem to look at each other (Figure 2). The sound reinforces the illusion of spatial and temporal continuity as the film's sound designers remove the sound environments from the two physical locations, making the two characters share the same empty virtual space, which sounds as a kind of vacuum (obtained by applying to the speakers a reverse echo effect along with a large amount of reverb).



This stylistic strategy isolates Kylo and Rey from their respective physical environments and positions them both in a virtual dimension. That strategy makes the viewer immerse themselves, along with them, within that space. The audience shares the intimacy of the duo in a way that no other character does. We are inside the diegesis while remaining oblivious to the stylistic strategies which lead to this sensorial immersion, as our attention is focused on what Kylo and Rey say and do. In this sense, the analyzed scene follows the principle of classic narrative continuity (Bordwell, 1985) while using sound to obtain the audience's sensorial immersion, as described by Lisa Coulthard (2017):

This focus on immersion by filmmakers, producers and technological specialists suggests a shift in ideals for spectatorship that stresses experience over emotional investment. *What is repeatedly invoked is the idea that the spectator should feel as if they are in the space of the action* [emphasis added] — this is prioritized over the spectators' sentimental attachment to characters or events. (p. 54)

## Figure 2

Frames from Star Wars: The Last Jedi



Note. Johnson (2017).

The use of neo-romantic music imported from Europe, in the golden age of Hollywood (1927-1945), exemplifies another tool that favors a certain degree of narrative immersion. Claudia Gorbman (1987) states that cinematographic music from the classical period was inserted in films not to be noticed but to enhance the sense of continuity through the maintenance of a stable, continuous background

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sound that did not draw attention to itself. That would help, according to Gorbman, to mask possible visual discontinuities, a procedure that helped to keep the viewer immersed in the narrative.

The genres and narrative functions of music in audiovisual media have changed a lot since that period (Carreiro, 2018, p. 106) but the loops and drones of electronic music help to blur the boundary between music and sound effects (Burwell, 2013; Carreiro, 2019; F. M. Costa et al., 2016; Kassabian, 2003; Opolski, 2013; Sergi, 2006; Smith, 2013) to the point that we cannot identify one from the other, and that technique continues to fulfill its classical role.

An example of the use of music mixed with sound effects to generate an immersive environment can be experimented in *Dunkirk* (Nolan, 2017). In the scene in which a British soldier and three civilians aboard a speedboat sail toward the city and witness the passage of a German plane, which will bomb the Allied rescue ship further on, the rhythmic noise of the speedboat's engine merges with the music and gradually turns into a martial percussion that underlines the growing threatening noise of the enemy plane approaching the ship (Figure 3). The scene is narrated from the point of view of the speedboat and the environment in which the event takes place is as deafening as it is immersive.

**Figure 3**

*Frames from Dunkirk*



*Note.* Nolan (2017).

## IMMERSION AND SOUND

Although it is a consequence of the cognitive and ideological construction by the cinema apparatus, immersion has been more valued in the last three decades. In this period, when consumer devices and audiovisual entertainment modalities multiplied – TV, pay-per-view television, streaming platforms, DVD, Blu-Ray, video games, and social networks such as YouTube –, the economic survival of the classic model of cinematic exhibition has come to depend, in part, on the creation and improvement of immersive technologies.

Thus, as had occurred during the 1950s, when Hollywood studios felt threatened by the competition from television, the production companies concentrated their efforts on developing technologies that proposed greater sensory immersion. The idea was to provide an audiovisual consumption mode more difficult to reproduce at home. For most filmmakers, this translated into immersion, hence the success of the IMAX system and 3D projection, among others. In the field of sound reproduction, multichannel surround reproduction systems<sup>4</sup> (Dolby Digital, Dolby Atmos, Aura 3D, etc.) were responsible for, from 1992 onward, presenting ways to make the audience dive into diegesis and stimulating their physiological senses.

<sup>4</sup>Surround channels have sounds played on the side and rear walls, ceiling and floor of the screening room, surrounding the audience.

Recognizing these facts, many researchers evoke the same image to describe sensory immersion: films made in the 21st century do not just want to place the audience in front of a window (or maybe a screen) through which they watch the dramatic action unfold, but to place them *inside* the diegetic space, making them have the impression of being together with the characters. Arlindo Machado (2002, p. 11), Robert Stam (2003), Mark Kerins (2010, p. 130), and Lisa Coulthard (2017) all used the very same metaphor: “the spectator is no longer the deluded master of the images, but its inhabitant” (Stam, 2003, p. 348). Frances Dyson (2009) observed the power that sound has to immerse the audiovisual consumer in films for both psychoacoustic and physiological reasons:

sound is the immersive medium par excellence. Three-dimensional, interactive, and synesthetic, perceived in the here and now of an embodied space, sound returns to the listener the very same qualities that media mediates: that feeling of being here now, of experiencing oneself as engulfed, enveloped, absorbed, enmeshed, in short, immersed in an environment. . . . Immersed in sound, the subject loses its self, and, in many ways, loses its sense. Because hearing is not a discrete sense, to hear is also to be touched, both physically and emotionally. We feel low sound vibrate in our stomachs and start to panic, sharp sudden sound makes us flinch involuntarily, a high pitched scream is emotionally wrenching: sound has immediate and obvious

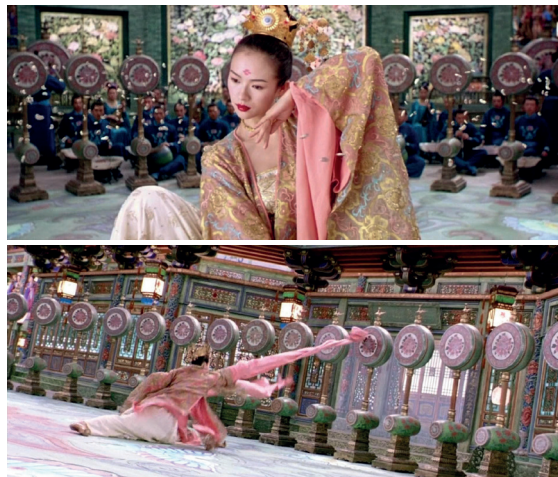
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physical effects. In listening, one is engaged in a synergy with the world and the senses, a hearing/touch that is the essence of what we mean by gut reaction – a response that is simultaneously physiological and psychological, body and mind. (p. 4)

In *The House of Flying Daggers* (Yimou Zang, 2004), a scene exemplifies how the creative use of a multichannel system can place the viewer at the center of the dramatic action, as well as allowing them to perceive sensually the sonic details in the acoustic texture of the film through hyper-realistic techniques. In the scene, a blind dancer (Zhang Ziyi) has her physical skills tested by a police officer (Andy Lau) who forces her to participate in a sound game. He places the girl in the center of a circle formed by drummers and throws beans at the instruments, forcing her to perform an improvised dance to follow the direction of each bean, even as they ricochet. Creating a mixture of dance and fight that has vast sound dynamics – moments of quietude in which we can only hear the dancer's hyperrealistic breathing (Carreiro, 2020) interspersed with explosive percussive choreography and noisy acrobatic movements –, the Chinese director explores every minimal noise, including mixing in the foreground the rustling of the dancer's clothes. In addition, bean grains beating on drums located in different positions along the circle expertly explore the spatiality of the room, using reverberation to highlight the movement of sound on the horizontal axis, which makes the surround speakers work in isolation in order to make the audience feel at the center of the dance floor, next to the girl (Figure 4).

**Figure 4**  
*Frames from The House of Flying Daggers*



Note. Zang (2004).

Within the taxonomy developed by Arsenault (2005), scenes such as the dancing from *The House of Flying Daggers* provide sensory immersion because they use available technology to stimulate physiological and multimodal aspects of the human stimuli apparatus. The combination of subjective hearing points, hyperrealism, and generous use of surround sound is able to stimulate all human body's senses.

Another example of multisensoriality is the French feature *Irréversible* (Noé, 2002), in which the director inserted a constant hum, at a low frequency of 27 Hz, during the entire first 60 minutes of projection (Wilson, 2015, p. 85). This frequency is so low that the sound is not really heard, but rather felt as a constant vibration. The sound provokes an internal shaking of human organs, causing some people to feel nauseous. In the case of this film, therefore, the director and the creative team used a sound design technique to excite all the spectator's body, working hearing and touch in unusual ways. It is a sensory manipulation operated by creative processes.

This technique, like many others, is developed with the intention of generating physiological responses in the bodies of the audience. Therefore, it is able to produce sensory immersion experiences. There are visual techniques to create the same type of effect: according to Laura Wilson (2015), images of tactile parts of the human body – especially when filmed very closely, in hyperreal close-ups – can generate a self-awareness of the audience for the existence of the bodies that inhabit it, evoking the haptic dimension through sensory memory. The eye gouged out in a famous scene from *Hostel* (Roth, 2005) leads the audience to a feeling of revulsion and nausea, which goes beyond the purely visual experience.

In the case of sound, there is a direct relation between high fidelity multichannel reproduction technologies and multisensory pulse-generating techniques. Digital systems that exploit surround channels, in particular, are capable, as stated by Mark Kerins (2010, p. 133), of creating three-dimensional extensions of two-dimensional images, in which the audience is surrounded by a kind of sound envelope, which Kerins calls *ultrafield* (p. 92). The term updates the concept of *superfield*, developed by Chion (2011, p. 119) in the early 1990s, but now applying it to digital multichannel reproduction systems, such as Dolby Digital (six loudspeakers distributed on a horizontal axis of 360° view that surrounds the listener) and Dolby Atmos (up to 64 sound reproduction channels which surround the audience like a semisphere, in horizontal, vertical, and diagonal axes).

For Kerins (2010), using Chion's term literally would be a reductionist attitude since the French author's concept referred to a four-channel stereo sound reproduction system (Dolby Stereo<sup>5</sup>), with only one of them – the rear channel – providing the sounds of the superfield, corresponding to the diegetic space on the sides and back of the screen. This would be the acoustic space constituted by acousmatic sounds – animals, traffic, murmurs, music, voices of

<sup>5</sup> Created in 1975, Dolby Stereo consists of a sound mixing and reproduction system in four channels, three front ones (right, center, left) and a surround one (side/rear).

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characters who are not shown on screen, etc. – whose origin in diegesis lies outside visuals. As digital sound reproduction systems have multiple channels distributed throughout the exhibition hall, Kerins preferred to modify the term.

The most popular sound reproduction systems of the last 30 years were released by Dolby. In 1992, the company made Dolby Digital available; 20 years later, it was Dolby Atmos' turn. The first allows the movement of sounds along the horizontal axis; the latter goes a step further and moves sounds in any direction, including vertical and diagonal axes. By being able to position the audiovisual consumer at the center of the diegetic space, from which he can audibly follow any action that takes place around him, Dolby Atmos (as well as competing multichannel systems, such as Aura 3D and DTS-X) works as a sound counterpart of the notion of *scenic box*, a term coined by Céline Tricart (2017, p. 226) to name the three-dimensional space in which 3D diegetic action takes place. From this point on, I will use Tricart's term to designate the three-dimensional diegetic space that is sounded by contemporary sound designers and within which the listener is positioned.

The sound construction of this scenic box begins with the script and goes through the creation of environments in which the narrative takes place in acoustically detailed environments, preferably in which dramatic events include the movement of actors and objects in different directions. Take, for example, the scene from *A Quiet Place* (Krasinski, 2018) in which two children are trapped inside a corn silo while a blind monster climbs the metal walls of the place, trying to locate the boys through the sounds made by the duo who are also trying not to submerge themselves in the sea of corn grains that surrounds them.

### Figure 5

*Frames from A Quiet Place*



Note. Krasinski (2018).

The discreet noises – a creaking metal door, wind, crickets, the rustling of bodies in the cereal – create a stable sonic environment which guarantees the sonic continuity of the scene but the element that really generates tension and, even more importantly, inserts the audience in the middle of the dramatic action, is the scratching of the monster’s claws on the walls; and then his footsteps over the corn mountain. The movement of these sound effects through the room’s speakers, from the descent through the silo to the approach of the children, crystallizes a moment of horror and sensory immersion – and horror, before being a filmic genre, is a human emotion (a mixture of fear and repulsion) that triggers multiple physiological sensations:

In relation to art horror, some of the sensations – or physically felt flurries, or automatic responses, or feelings – are muscle contractions, tension, cringing, trembling, recoil, numbness, freezing, chills (hence, “chills down the spine”), paralysis, shivering, nausea, an apprehension reflex or a physically heightened alertness (a response to danger), perhaps involuntary screaming etc. (Carroll, 1999, p. 41)

Many researchers agree with the immersive potential of using off-screen sounds to enhance audience immersion. Débora Opolski (2015) cites the use of acousmatic sounds as one of the most important techniques that the sound team can use to position the viewer within the diegesis. Opolski also mentions the use of subjective hearing points and the use of hyperrealistic sound textures, techniques already mentioned and present in the scenes of *Saving Private Ryan*, *Dunkirk*, *The House of Flying Daggers*, and *A Quiet Place*.

The concept of hearing point is, for Chion (2011, p. 74), analogous to the notion of point of view from the visual perspective. According to the author, the notion can have two complementary meanings, one being strictly spatial (sound recording seeks to preserve acoustic characteristics – reverberation, timbre, and spatiality – and provides acoustic indices that allow the body hearing systems in the audience to locate the origin of certain events in the geography of the diegesis), and the other, subjective. In the latter case, filmmakers manipulate the sounds to give the audience the same geographical and emotional perspective as a given character. The multichannel technologies used in recording, editing, mixing, and reproduction stages of audiovisual chain works allow the creative use of subjective hearing points.

The opening sequence of *Apocalypse Now* (Coppola, 1979) contains perhaps the best-known use of this technique and constitutes a paradigm for

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film sound design. The scene shows Captain Willard (Martin Sheen) in his hotel room in Saigon (Vietnam). Drunk, he waits for the next mission he is to fulfill while remembering scenes of destruction he has already witnessed in the war to the sound of the song “The End” (The Doors). Sound designer Walter Murch took advantage of the scene to introduce the first six-channel sound system (in 5.1 format, that is, three front channels, two in the rear, and one to reinforce the low bass sounds), though analog and experimental, created for the cinema – only in 1992, as I have already said, a six-channel system was made commercially available.

In the scene, the military helicopters which bomb a beach revolve around the listener while the song gains reverberation and echo and becomes distant like a fading memory. At the end, Willard realizes that the recollection was induced by the noise produced by the blades of a fan (Figure 6). That is, we hear the diegetic space around us the same way the captain hears it: delusional, distant, distorted.

**Figure 6**

*Frames from Apocalypse Now*



*Note.* Coppola (1979).

Another technique used in the production of immersive sensory experiences is the creation of hyperrealistic acoustic textures. These appear in the soundtrack when sound designers amplify sound actions and events that, in real life, would go



unnoticed. In the classic Hollywood golden period (1927-1945), low-pitched sounds, such as the rustle of clothes, the clinking of ice in a glass, or the breathing of a secondary character, were usually left out of the mix because the reproduction systems in commercial rooms had a single sound output channel, which would be occupied with more intelligible sounds.

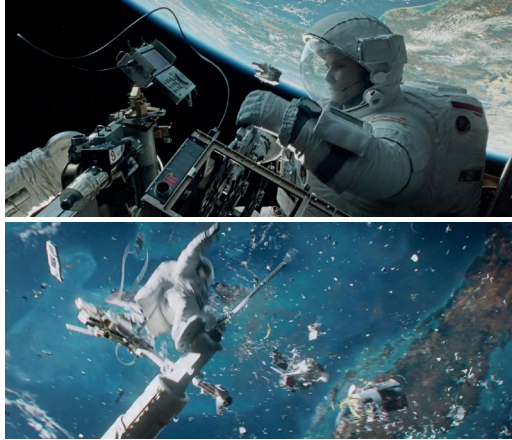
For some researchers (Capeller, 2008; Carreiro, 2019; Costa, 2011), these sounds should be called hyperreal because, in ordinary life, we do not pay attention to them and, therefore, we do not perceive them, although they are there. In the wake of the appreciation of the concept of hyperrealism, which emerged in the visual arts in the second half of the 20th century, to name works that highlighted the richness of detail of certain images (Mello, 2012, p. 367), the term became applied to cinematic sounds.

Hyperrealism, as indicated by Phillippe Dubois (1994, p. 274), has, as its objective, not the exact reproduction but the representation of a state, of an atmosphere. In the case of sound, Ivan Capeller (2008, p. 66) suggests that hyperrealism appears when “the sound record presents itself as if it could possibly be more faithful to reality than reality itself.” Such a technique would be able to expand the sensorial and multimodal potential of the represented sounds, transforming them into multisensory elements.

An example of sonic hyperrealism in contemporary cinema can be found in the soundtrack of *Gravity* (Cuarón, 2013). The film tells the story of two astronauts hit by space debris, during a mission to repair the Hubble telescope, and they must find a way to return to Earth. In pursuit of sonic realism, Alfonso Cuarón and sound designer Glenn Freemantle established that no sound that could not be truly heard in outer space should be included in the soundtrack. That is why they use the astronauts’ subjective hearing points throughout the whole film.

Inside the spacesuit, the only sounds that can be heard, in addition to radio communication with each other and with the Earth, are those produced by the body itself: voice, heartbeat, breathing, noises produced by the contact of parts of the body rustling the suit. For this reason, minimal noise predominates in the soundtrack, along with music, which is responsible for sounding out the events that occur outside the suits and the space station (explosions, clashes of metal parts), using the old *mickeymousing* technique<sup>6</sup>, as in children’s animations of the 1930s. Subjective hearing points, wide use of ultrafield, and hyperrealism are present. The use of long shots filmed in 3D helps to position the audience within the diegesis, as if they were participating in the dramatic action (Figure 7).

<sup>6</sup>The mickeymousing technique has been used by composers since the 1930s and consists of sounding events shown in the image with musical instruments (Carreiro, 2018).

**Figure 7***Frames from Gravity**Note.* Cuarón (2013).

The frequent use of very low-frequency sounds is also multisensory (Kerins, 2010, p. 134). These sounds, often situated below 200 Hz on the sound frequency scale, are reproduced in movie theaters through a special speaker called subwoofer. The aforementioned case of *Irréversible* denotes an example of an extreme use of this technique. It has been so explored in recent years that researcher Jeff Smith (2013, p. 338) cites the use of low bass sounds as one of the most important features of the sound aesthetic of *intensified continuity*, a term created by David Bordwell (2006) to name the repertoire of stylistic practices used by filmmakers to make the audiovisual consumer's experience more visceral and affectively engaged.

Films such as *San Andreas* (Peyton, 2015) present a favorable scenario for the use of this technique, with the creation of an acoustically detailed scenic box (Tricart, 2017). The sequence in which an earthquake destroys the city of San Francisco (USA) is underlined, for three minutes, by a strong rumbling that comes from all sides, envelops the spectator and makes their chest cavity resound, accompanying a multiplicity of breaking glass, cracking concrete, and people screaming sounds. The sound mix heard in surround systems is capable of causing nausea in some members of the audience. It is also important to note that the sound tactic of sensorial immersion is reinforced (or vice versa) by shaking images of destruction, almost always filmed with a shaking camera which frequently loses the horizontal axis, defying the sense of stability of the bodies in the audience (Figure 8). Visual stylistics help position the audience in the diegesis, which enhances the sense of immersion.

**Figure 8***Frames from San Andreas*

Note. Peyton (2015).

### IMMERSION IN THE PRACTICE OF SOUND DESIGN

As we have already seen, sound immersion is achieved through the combination of three main tools: (1) the extensive use of off-screen sounds, surrounding the audience; (2) the establishment of a hearing point that corresponds to the subjective point of view of a given character; and (3) the prominent use of amplified sounds of everyday life, characterizing sound hyperrealism, which occurs when the sound heard in audiovisual production “provokes a sense of increased presence” (Stam, 2003, p. 239).

It is precisely to pursue these characteristics that engineer Brett Leonard (2018, pp. 347-348) wrote an essay listing technical ways to achieve the goal of amplifying sensory immersion effects. In the sound mixing stage, for example, positioning the music on front speakers, but with a different output angle than voices and sound effects (in feature films mixed with Dolby Atmos, it is already part of the technical convention to place the music above or below the horizontal axis of the camera; never just *above* it).

To increase the sense of immersion in the scenic box (Tricart, 2017), sound effects and foley<sup>7</sup> can be treated in a similar way to music, but with a more open spatial distribution, with attention to the displacements of sound events – that is, the panning effects. Leonard (2018) emphasizes that the movement of sound through different speakers, in horizontal, diagonal, and vertical axes, constitutes one of the most prominent techniques for providing the listener with the sensation of being physically present in the diegesis.

<sup>7</sup>Foley are the sounds produced in the studio, in sync with the images, that arise from the interaction of bodies with the surrounding environment: footsteps, doors and windows, rustling clothes, etc.

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Almost all the scenes analyzed in this article combine these three sound tools. The music and panning effects in *Gravity*, for example, work exactly the way Leonard (2018) describes it. The attention to the panning movement of more outstanding sound effects exerts an enhanced immersive effect in *Apocalypse Now*, *Saving Private Ryan*, *The House of Flying Daggers*, and *A Quiet Place*, among others. The movement of sound events within the exhibition hall has been one of the most important techniques to ensure an immersion effect with synesthetic impact.

Another feature film that uses the movement of sound events to reinforce the audience's sensory immersion is *Baby Driver* (Wright, 2017). In its very first shot, with a low camera, two cars cross the screen, going in opposite directions (Figure 9). We can hear each one moving, from left to right and vice versa, while a song plays in the background. Suddenly, the protagonist, a young man who drives with headphones, starts singing the very same song, making it diegetic. Many cars, including police vehicles with sirens on, cross the field of vision, in multiple directions, and the movement of each of these cars can be perceived.

**Figure 9**

*Frames from Baby Driver*



*Note.* Wright (2017).

Surround channels, positioned on the sides and rear (i.e., the superfield) are used to position ambient sounds (backgrounds, or BG, in audiovisual industry parlance) which anchor the listener's spatial position in the screening room whether at home

or in a movie theater. The sound mixer can explore diagonal axes to emphasize the movement of helicopters or planes or to simply insert noises from birds, waterfalls, and animals in a forest environment, for example. This is what happens, once again, in the analyzed scenes of *Apocalypse Now*, *San Andreas*, and *Gravity*.

Brett Leonard (2018, p. 348) also highlights the importance of using equalization, reverb, and delay effects<sup>8</sup> to reinforce the three-dimensional effect of ambient sounds, foley, voices, and sound effects. The author highlights the importance of adding the “real dimension of height” to the sounds (Leonard, 2018, p. 349) in the mixing stage to give greater spatial precision to the sound displacement.

All these techniques are capable of enhancing the multisensory potential of the soundtrack. This set of tools allows the creation of complex, multimodal, and multidimensional sound environments, with sounds that spread across all six sides of the stage box. *Blade Runner 2049* (Villeneuve, 2017), whose action takes place in a post-apocalyptic world — in which the rain never stops, flying cars circle in all directions, and a female robotic voice can be heard all the time, even outdoors —, has very detailed sonic environments (Figure 10). We can hear rain falling and engulfing us; the movement of vehicles can be perceived on many diagonal axes; the characters’ footsteps have a wet, hyperreal texture of haptic quality. The surround channels also reproduce discreet reverbs of sounds heard on the front channels.

<sup>8</sup>Equalization is the technique in which the sound mixer accentuates or reduces certain frequency ranges of a sound event. Turning down the volume of the lower frequencies, for example, can give the sound more clarity, while reducing power. Reverberation is the physical persistence of a sound wave, after the emitting source ceases to produce the original sound but it continues to be heard because of the reflections of the sound waves on walls and objects close to the point of emission. Delay is an effect of delaying the reverb of a given sound, measured in milliseconds.

### Figure 10

Frames from *Blade Runner 2049*



Note. Villeneuve (2017).

## FINAL CONSIDERATIONS


In 1990, two years before the first digital multitrack reproducing sound systems (Dolby Digital and DTS) were launched, Michel Chion published the book *Audio-Vision*, where he coined the concept of superfield and claimed that Dolby Stereo gave filmmakers the sound equivalent of an eight-octave grand piano. He claimed that, until then, sound designers had only a “five-octave upright piano” (Chion, 2011, p. 121). What the surround channels presented in superfield, he said, was the possibility of generating “an increase in sensoriality” (Chion, 2011, p. 120).

Since then, the emergence of digital recording, editing, mixing, and reproducing technologies have further expanded multisensory and multimodal creative opportunities; hence the proposal to update Chion’s term to ultrafield, made by Mark Kerins (2010, p. 92). As I try to assume in this article, filmmakers are using the stylistic tools available to invest harder in the concept of immersion. As stated by Lisa Coulthard (2017, p. 54), this investment has been so intense that, in many cases, films have started to focus less on the emotional involvement and more on the synesthetic experiences of the spectators.

Sound, as I seek to establish in this essay, occupies a prominent role in this scenario. Several researchers, such as Frances Dyson (2009), Mark Kerins (2010), Robert Stam (2003), and Lisa Coulthard (2017), have been unanimous in confirming the multisensory, multimodal, and immersive function of the soundtrack. Immersing the audience in diegesis, giving it the opportunity to experience the fictional world as if the spectators were next to the characters, feeling similar sensations, affections, and emotions, seems to be more important than narratively engaging the audience.

In the specific case of sound, all this has been highlighted by filmmakers themselves. In February 2020, Oliver Tarney, leader of the sound team of the war drama *1917* (Mendes, 2019), gave a statement to *Post Perspective Magazine*, saying that “we wanted the audience to *feel* [emphasis added] everything from their perspective [i.e., of the characters]” (Birk, 2020). The use of the verb “feel” underlines the emphasis given by filmmakers to the importance of using stylistic tools in order to activate the audience’s multisensory experience.

Finally, it is essential to observe that the stylistic tools of sound immersion depend on a cohesive integration with the visual conceptions of cinematography of each film. Without the shaking camera that runs along with the soldiers in *1917*; that revolves around the astronauts of *Gravity*;

that assumes the pilot's point of view and "controls" an airplane cockpit in *Dunkirk*; that revolves around the hotel room of the drunken officer in *Apocalypse Now*; that slides in the mud to escape the bombs in *Saving Private Ryan*, perhaps the immersive sound strategies would generate more estrangement than multisensory and multimodal engagement. 

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