Sounding the Atmosphere

BJÖRN REDECKER

INTRODUCTION

Sound plays a crucial role in creating virtual worlds. It is a vital part of digital games, filling them with life and undoubtedly enhancing the experience for players. Ever since Al Alcorn "poked around the sync generator to find an appropriate frequency or a tone" for PONG (1972) and created the bip that broke the silence that had left digital games incomplete, their virtual worlds have become livelier and more accurate.[1, 2] Above all, sound made digital games the *audio*-visual form of media as we know it today.

The very same can be said about "music, as the ordered succession of sound" that serves as "a vehicle for the transportation of atmospheric values."[3] Quite early on, ludomusical research identified game music's contribution to a given

1 Alcorn, Alan in Kent, Steven: *The Ultimate History of Video Games. From Pong to Pokémon and beyond… the story behind the craze that touched our lives and changed the world*, New York, NY: Three Rivers Press 2001, p. 41.

2 PONG (Atari 1972, O: Atari).

3 Herzfeld, Gregor: "Atmospheres at Play: Aesthetical Considerations of Game Music", In: P. Moorman (ed.): *Music and game. Perspectives on a popular alliance*, Wiesbaden: Springer VS 2013, pp. 147-157, here p. 147, cf. also Haffter, Christoph: "Das Andere der Musik. Weißes Rauschen, Ur-Geräusch", In: C. Hongler et al. (eds.): *Geräusch – das Andere der Musik. Untersuchungen an den Grenzen des Musikalischen*, Bielefeld: transcript 2015, pp. 7-17, here p. 9.

atmosphere as one of its central functions, [4] as Kristine Jørgensen points out: "[T]he atmospheric functions of game audio may still be regarded as one of the most central […]. Most mainstream games utilize music to emphasise certain areas, locations and situations."[5] This is not only the case with most mainstream titles, but has turned into a key design strategy for almost all digital games, small and big, triple-A and indie.

Then again, the term 'atmosphere' is hard to grasp. It is frequently used but rarely broken down to what it really means or implies. Gernot Böhme argues that the detection of atmosphere as an aesthetic concept was a huge step as "philosophy for the first time came to conceive of and to talk about a vague and rather subjective phenomenon."[6] The intersubjectivity of atmospheres makes it possible to even talk about this phenomenon in the first place. Atmospheres "are something out there, quasi-objective," as Böhme puts it.[7] By quasi-objective, he points towards Hermann Schmitz's concept of "subjective facts."[8] Such facts can be felt and identified by a larger number of individuals. Atmospheres can be defined as such subjective facts: They are not things in the sense of physical entities and are therefore only perceived subjectively. Still, it is possible to communicate about them, given the precondition that "a certain mode of perception" has been instilled "through cultural socialization."[9]

Similar to atmospheres, sound and music can be conceived as vague and subjective, especially when we talk about how they affect us. After all, "writing about music is like dancing about architecture,"[10] which further complicates the issue.

4 Ludomusical research, also referred to as ludomusicology studies sound and music in digital games. Cf. Kamp, Michel et al. (eds.): Ludomusicology. Approaches to Video Game Music, Bristol, CT/Sheffield: Equinox 2016, cf. also www.ludomusicology.org

5 Jørgensen, Kristine: "On the Functional Aspects of Computer Game Audio", In: *Proceedings of the Audio Mostly Conference, Piteå: Interactive Institute 2006*, pp. 48-52, here p. 50.

6 Böhme, Gernot: *The Aesthetics of Atmospheres*, Oxford/New York, NY: Routledge 2017, p. 6.

7 Ibid., p. 3.

8 Ibid., p. 2.

9 Ibid., p. 30.

10 This quote is often ascribed to Frank Zappa, although there is contention as to who said it and in which context-amongst the creditors are also musicians David Byrne, Elvis Costello and Thelonious Monk, producer Brian Eno, comedians Martin Mull and Steve Martin as well as performance-artist Laurie Anderson. It points towards the difficulty

This might be a first hint towards why sound, music, and atmosphere are so closely interwoven. With these complexities in mind, this paper provides a theoretical framework for the interrelationship between sound, music, and atmosphere. In doing so, it will discuss game music's origins, its close relationship to sound effects, and why it might be important to think of these phenomena as interlinked. It will then address the ontological similarities that sound and music share with atmospheres, with tractates written on the immediate nature of music over the centuries providing a theoretic foundation. Finally, it will close with an example from INSIDE that illustrates in which ways game music, game sounds, and atmosphere are interconnected within the virtual spaces of digital games.[11]

HARDWARE AS AN INSTRUMENT | GAME SOUNDS

Digital games were originally born silent.[12] Even the first examples of game titles that were able to visualize their virtual worlds, like NOUGHTS AND CROSSES or SPACEWAR!, had to do so without sound.[13, 14] However,

"[t]here had been some graphic demonstration programs before, namely ›Bouncing Ball‹ that ran on MIT's Whirlwind Mainframe or ›HAX‹, which displayed changing patterns according to settings of console switches and was designed for Whirlwind's successor, the TX-0. Both even had primitive sound support, i.e. timed beeps generated by the console speaker."[15]

It is debatable if these graphic demonstration programs can be understood as digital games. It is undeniable though, that SPACEWAR! was designed as a game, not a simple demonstration. It replaced early computer culture's prevailing work ethic

of communicating satisfactorily about music as an immediate, powerful emotional experience and express one's feelings about it in writing.

11 INSIDE (505 Games 2016, O: Playdead).

12 Fritsch, Melanie: "History of Video Game Music", In: P. Moormann (ed.), *Music and Game. Perspectives on a Popular Alliance*, Wiesbaden: Springer VS 2013, pp. 11-40, here p. 12.

13 NOUGHTS AND CROSSES (University of Cambridge 1952, O: Alexander Sandy Douglas).

14 SPACEWAR! (MIT 1962, O: Steve Russell et al.).

15 Weske, Jörg: "Digital Sound and Music in Computer Games", research assignment as part of the DFG project Neue Medien im Alltag, TU Chemnitz 2000, np., http://3daudio.info/gamesound/history.html.

with an ethic of play.[16] Jörg Weske reports that, following the primitive sound support of graphic demonstrations on early mainframe machines such as the Whirlwind I or TX-0, it was originally planned to have sound support for SPACEWAR!. Due to the limits of the PDP-1's processing capabilities, the idea had to be abandoned. The very first examples of game sounds were those of PONG and they were indeed comprised of "the sounds that were already in the machine."[17] When creating the game, Nolan Bushnell and Ted Dabney asked Al Alcorn to come up with an aural accompaniment of the gameplay. This illustrates how PONG's developers sensed that they would need audio to create an authentic atmosphere, in this case the one of a tennis court. Technical limitations prevented Alcorn from fulfilling the request of a more complex aural layer with booing, hissing, and cheering. However, the story of the game's development process illustrates that the vision of an atmosphere already existed, and that audio was thought to be a natural, self-evident part of its realization.

PONG's sounds ended up coming from the sync generator of the game's hardware. They were produced 'in the machine.' This means that the very computer hardware was becoming an instrument itself, a process based on the possibility of indirect sound synthesis in opposition to direct sound synthesis. Sound is, in a physical sense, mechanical radiant energy (vibration) being transmitted by longitudinal pressure waves in a material medium (sound can expand in different materials including metal, water, or air, which is most common to us). If we stick to air as the most common material medium humans experience sound through, it can be described as a vibration of air molecules. In direct sound synthesis, the vibration of air molecules is caused directly by the oscillation of strings, for example. With indirect sound synthesis, rather than manipulating the material medium directly (causing air molecules to vibrate), the vibrations of an oscillating circuit can be "electronically amplified and transduced into sound waves via a speaker,"[18] therefore indirectly manipulating the material medium. It is through indirect sound synthesis that early computer hardware produced sounds and music for games.

16 Cf. Stone, Allucquére Rosanne: *The War of Desire and Technology at the Close of the Mechanical Age*, Cambridge, MA: MIT Press 1995, p. 13.

17 A. Alcorn in S. Kent: *The Ultimate History of Video Games*, p. 42.

18 Thies, Wolfgang: "Der Computer – ein neues Musikinstrument?", In: G. Batel et al. (eds.), *Computermusik. Theoretische Grundlagen. Kompositionsgeschichtliche Zusammenhänge. Musiklernprogramme*, Laaber: Laaber-Verlag 1987, pp. 131-157, here p. 134f., own transl.

Whereas PONG's sound emanated from a sync generator on a circuit board, later game music was first produced by the same microchips that were responsible for handling gameplay and visuals, and then by dedicated sound chips (programmable sound generators, PSGs) with some of them gaining popularity among game composers and fans alike.[19] The indirect sound synthesis of all these hardware components and later dedicated sound chips caused the audio of digital games to develop a distinguished aural fingerprint, at least initially. Because of the technical implications of the various synthesis procedures,[20] game music from the early 1970s up to the late 1980s had a very distinctive aesthetic.[21] Some of the hardware components and sound chips even carved out a popular music genre of their own, chiptune music,[22] which is reminiscent of this aesthetic, while also being used outside the immediate context of gaming (i.e., when being performed at concerts or festivals not necessarily linked to digital games). Even though various compositional techniques and strategies were used (from small and simple loops to mickey mousing to original soundtracks to cover versions of both popular music and classical pieces), they were all defined by the distinctive sound aesthetic of the hardware producing them and therefore added to the atmospheres of games within that era in a distinct fashion.

This changed with advancements in technology. Especially with the possibilities that wavetable synthesis and digital signal processing (DSP) provided, sound and music did not need to be rendered in real time any longer. Now, pre-recorded material could be streamed from audio libraries. Subsequently, game music moved away from the distinctive chiptune aesthetics that it held before and

19 One of the most prominent was the SID-chip MOS 6581 used in Commodores C64, cf. Rettinghaus, Klaus: "Sidology. Zur Geschichte und Technik des C64-Soundchips", In: C. Hust et al. (eds.), *Digitale Spiele. Interdisziplinäre Perspektiven zu Diskursfeldern, Inszenierung und Musik*, Bielefeld: transcript 2018, pp. 269-280.

20 For more detailed remarks cf. Collins, Karen: *Game Sound. An Introduction to the History, Theory, and Practice of Video Game Music and Sound Design*, Cambridge, MA, London: The MIT Press 2008.

21 With the introduction of DSP (digital signal processing) and wavetable synthesis, using digital samples of instruments, game music began to sound more realistic and organic than previous synthesis models and heralded a significant alteration in its sound. Cf. K. Collins: Game Sound, pp. 45-46.

22 Although it needs to be said that there is contention as to how the term 'chiptune music' should be defined. For an introduction, see Fritsch, Melanie et al.: "Part I - Chiptunes", In: M. Frisch and T. Summers (eds.), *The Cambridge Companion to Video Game Music*, Cambridge: Cambridge University Press 2021, pp. 5-58.

diversified into a cacophonic cornucopia of sounds, styles, and musical genres. However, the catalogue of compositional techniques and implementation strategies of early game audio established an aesthetic identity that lasts to this day. Today's digital games perpetuate the heritage of early game music that transformed computer hardware into instruments; the blips and beeps of early sync generators, of PSGs, and later ever more sophisticated, dedicated sound chips. This is where game audio learned to walk.

Music and sound have a close, complex, and contested relationship. Due to their sonic heritage, this is especially true for sound and music in digital games. How one defines music is a point of contention not only within academic but also societal discourse. Therefore, it is problematic to draw a sharp line between, for example, dynamic sounds giving feedback to player actions in the form of simple sound effects and game music.

Sometimes these lines might be very clear and sharp, but what makes games interesting subjects of analysis in this field, is that within them sound, as a concrete phenomenon, and music, as an abstract art form, work closely together.[23] This is especially true when it comes to creating the atmosphere of a virtual space. When fulfilling this function, game sound and game music seem to interweave ever more intensely, which is why they need to be thought of together. I do not claim, however, that game sounds and game music are synonymous or ontologically the same. Clearly, there is a difference between a gunshot and a sparkling piano pattern. Game music is functional music that does not follow the formula of *l'art pour l'art*.[24] Serving a function or a purpose indeed anchors it more towards

23 There are other examples of developments and phenomena in which the concrete and the abstract formed an alliance before digital games became a popular media form; examples may include early electronic music in the middle of the 20th century or Pierre Schaeffer's musique concrète. Cf. Chion, Michel: "Die musique concrète ist nicht konkretistisch", In: Hongler et al. (eds.), *Geräusch – das Andere der Musik* (2015), pp. 21-32, and cf. W. Thies: "Der Computer – ein neues Musikinstrument?", In: Batel et al. (eds.), Computermusik (1987), pp. 131-157.

24 Functional music is best described as, nomen est omen, music that strictly follows a function or purpose outside the musical material, which dictates its form and nature. Cf. Rötter, Günther (ed.): *Handbuch Funktionale Musik, Wiesbaden*: Springer VS 2017. The biggest controversy in music aesthetics of the 19th century in the wake of the formation of musicology as a subject of the humanities revolved around the question whether music exists for its own sake, as summarized in the l'art pour l'art formula, or if music always pertains to some reference point outside of the pure musical material and therefore exists for something else's sake.

something concrete, and therefore away from the concept of the abstract. Game music as functional music needs to be understood as a musical form that concerns the entirety of a digital game's aural layer. Therefore, I will follow a unifying approach to game music and game sound.

THE IMMEDIATE NATURE OF SOUND AND MUSIC

Game sound and game music are key design elements in the creation of atmospheres and are neither an afterthought, nor a passing fad,[25] as "music is not a redundant echo of other aspects of the game, but […] a central part of the audiovisual experience."[26]

This is due to the immediate nature of sound and music, whose direct connection to our feelings and emotions has been a frequent talking point in historic musicology and music theory over the centuries, with writers such as Damon of Oa (5th Century B.C.), Anicius Manlius Severinus Boetius (ca. 480-524), René Descartes (1596-1650) and Eduard Hanslick (1825-1904), among many others, weaving the subject into their work.[27] How exactly this immediate connection works has never been clearly defined and remains a major point of contention within the musicological community. As mentioned before, writing about music is like dancing about architecture.

Baroque author Jean-Jacques Rousseau tries to explain the immediacy of music and its aesthetic difference in contrast to the other most prominent art form of his time, painting. He explains:

"It is one of the great virtues of the musician to be able to paint things that could not otherwise be heard, while it is impossible for the painter to depict those that could not be seen […]. Sleep, the stillness of the night, solitude and even silence find their representation in music."[28]

25 Cf. Karen Collins: *Game Sound*, p. 37.

26 Summers, Tim: *Understanding Video Game Music*, Cambridge, Cambridge University Press 2018, p. 6.

27 For an introductional overview, see Keil, Werner (ed.): *Basistexte Musikästhetik und Musiktheorie, Paderborn*: Fink 2007.

28 Rousseau, Jean-Jacques: "Essai sur l'origine de langues", In: Ibid. (orig. 1781, French), pp. 120-135, here p. 129, own transl.

Concepts such as sleep, stillness, and solitude are as hard to grasp as the concept of atmosphere—one could even argue that sleep, stillness, and solitude are indeed atmospheres. Although elusive and hard to put into words, these phenomena are experienced quite clearly. This can be said about all kinds of atmospheres. Their elusiveness lies in the fact that they are experienced as immediate phenomena. This immediate experience is made possible by music and sound which are—as has been argued—immediate phenomena themselves. It is precisely this immediacy that music and sound share with the elusive concept of atmosphere.

Immediacy is likewise the most important function of game music and game sound when it comes to contributing and evoking certain atmospheres in games: through their immediate nature, game music and game sound function differently from all other aesthetic components. Visuals, graphics, or narratives often need context, reflection, and prefabricated knowledge to function. Game audio influences the psyche (Damon) of players, appeals to their hearts (Boetius), and paints things that could not otherwise be seen (Rousseau) in an immediate, direct manner. As Rousseau writes about musicians and music in general, game music and game sound have the capacity to:

> "stir up the sea, quicken the flames of a fiery conflagration, make the streams flow, the rain fall and the stream swell; he [the musician] will also paint the abomination of a terrible desert, darken the walls of a subterranean dungeon, calm the storm, make the air calm and serene, and with his orchestra spread new freshness over the grove."[29]

Throughout the baroque period, theorizing on the immediacy of music became a major interest for music theorists like Michael Praetorius and Athanasius Kircher, who wrote tractates on the subject in the first half of the 17th century. One of the most popular and concrete models that would try to categorize the different ways in which music exercises an immediate effect on us was that of René Descartes, who designed a rational theory of affects[30] that influenced not only his contemporaries but also later authors such as Friedrich Wilhelm Marpurg, the aforementioned Jean-Jacques Rousseau, and Johann Mattheson. Mattheson was in turn one

29 Ibid.

30 Cf. Descartes, René: "Musicae Compendium", In: W.Keil (ed.): *Basistexte Musikästhetik und Musiktheorie*, Paderborn: Fink 2007 (orig. 1650, Latin), pp. 85-99.

of the first authors to explore and theorize the importance of sound color (*Klangfarbe*), or timbre, as a major constituent of music.[31]

Upon bringing timbre into the theoretical and aesthetic discourse in the early 18th century, Mattheson immediately pointed out its affective potential, its important influence on human emotion, thus marking it as a key component of affective topoi:

"The fifth piece of the natural doctrine of sound is the most distinguished or most important of all […] and examines the effects of well-ordered sounds, which they show on the emotions and sufferings of the soul."[32]

Mattheson's claims about the emotional impact of sound and music are crucial for exploring atmospheres, which—like sound and music—hold immense affective potential. One of the answers as to how exactly this is possible lies in Mattheson's discovery of timbre as a central component of musical material, having been largely ignored by music scholars for centuries. The study of game music and game sound takes these considerations into account, while also drawing from observations and theoretical works on film and theatre music that likewise underline the importance of timbre as a musical parameter.

ATMOSPHERE THEORY, GAME SOUNDS, AND THE AESTHETIC FUNCTIONS OF SUBTLETY AND IMMEDIACY

In the abovementioned research on game sound and music, functions of game music are often categorized depending on their respective tasks. As mentioned in the introduction, Kristine Jørgensen theorized on atmospheric functions of game music in the formative years of this research, writing that they are

"[w]orking in a more subtle manner […]. The music does not only work as pure information, it also emphasises mood […]. Players notice that the immersion decreases, and that the fictional world seems to disappear and that the game is reduced to rules and game mechanics when sound is removed."[33]

31 Cf. Mattheson, Johann: „Der Vollkommene Capellmeister", In: W. Keil (ed.): *Basistexte Musikästhetik und Musiktheorie*, Paderborn: Fink 2007 (orig. 1739, German), pp. 100-119.

32 J. Mattheson: „Der Vollkommene Capellmeister", p. 109, own transl.

33 Jørgensen, Kristine: "Functional Aspects", p. 50.

Subtlety is the keyword here. Following Jørgensen, I argue that atmospheric functions differ from their ludic and narrative relatives in the very way they work. Game music that contributes to the atmosphere of a given scenario in a game is less effect laden, less intrusive, and typically not to be found in the foreground of the aural layer, whilst game music with ludic functions accompanying a gameplay mechanic, for example, needs to be very concrete and sometimes quite bold. This does not preclude that music with ludic functions doesn't contribute to atmospheres too. My argument, however, is game music that contributes to atmosphere is often, albeit not always, of a more ambient nature.[34] Game music that builds atmosphere hinges on its ability to fulfil a function and therefore relies more heavily on texture than on harmonic or melodic movements, making it eligible for compositional techniques such as horizontal sequencing. As Tim Harbour explains:

"This means two separate pieces of music with similar structures but differing textures and dynamics need to be written that can be swapped in and out at any time. This kind of procedure works well for more ambient sections of a game."[35]

Among the functions outlined above, the task of game music is to establish or emphasize an atmosphere for the present setting and the overarching narrative, as well as the ludic processes taking place at any given moment. Game music with atmospheric functions fulfills this role by being immediate. In this sense, subtlety and immediacy are closely intertwined. The game music's subtlety does not render it powerless but rather resilient. Compared to its more conspicuous functions, may they be ludic or narrative, game music is much more consistent, as it subtly seeps into the player's subconscious. Although immediate in nature, such game music needs time to fully realize its potential as an enabler of atmosphere. These differences in types of game music, pronounced versus subtle, pragmatic versus aesthetic, apparent versus hidden, can be connected to Gernot Böhme's work. He argues that the aesthetic values of materials and objects exceed their practical use. Felix Zimmermann and Christian Huberts pick up this idea, explaining that when working towards a theory of atmosphere it is important to become aware of a potential divide

34 For a more detailed discussion on ambient music, see the contribution of Vadim Nickel in the present volume.

35 Harbour, Tim: *Music in Indie Video Games: A Composer's Perspective on Musical Approaches and Practices*. Master Thesis, Johannesburg 2016, p. 60.

"between how an object physically exists and how it acts, how it affects the world around it. Objects can produce specific atmospheres-of warmth, of ease, of naturalness-without being verified as being of congruent material origin."[36]

This theoretical divide can be summed up as an understanding of primary and secondary functions. Zimmermann and Huberts follow and build upon this idea, previously introduced by Umberto Eco, and connect it to Böhme's dichotomy of the object's materiality versus the object's aesthetic.[37]

This network of ideas can, in turn, be expanded to include primary and secondary functions of music and sound in digital games. Whereas the bang of a gunshot possesses the obvious, ostensible primary function of sonically illustrating what is seen on screen (the firing of a gun), it may also possess a hidden, secondary aesthetic function, creating an atmosphere of either shock, rage, and terror, or of menace and fear. This secondary function, however, becomes visible once the timbre of the gunshot as a sound phenomenon is considered: If it is fired near the player, it might be loud and, in its primary function, urge players to react in some way. If a gunshot or several of them are heard in the distance—their timbre modulated by distance or ricochet—it might be distorted and estranged. In its secondary function, it may create an atmosphere of menace that is determined rather by tension than horror. The modulated and reverberated sound of a gunshot in the distance introduces the uncertainty of not knowing who shot and how far away the potential danger is. This uncertainty is especially palpable in games that feature flight, rather than fight, mechanics, i.e., survival-horror titles that put players in the position of having to either hide or flee from enemies. In such games, players rely heavily on the sounds of virtual environments and their timbre when evaluating the danger situation.

In conclusion, the application of primary and secondary functions of objects to game music and sound helps articulate how music and sound build tuned spaces and contribute to atmospheres in digital games: in a primary, obvious, and ostensible manner, as well as in a secondary, hidden, subtle, yet immediate manner.[38] The primary functions of game music are often linked to more traditional

36 Zimmermann, Felix/Huberts, Christian: "From Walking Simulator to Ambience Action Game: A Philosophical Approach to a Misunderstood Genre", in *Press Start 5* (2, 2019), pp. 29-50, here p. 32.

37 Cf. Ibid.

38 Gernot Böhme conceives tuned spaces as spaces with a certain mood and suggests that atmospheres can be briefly described as such, cf. G. Böhme, *The Aesthetics of Atmospheres*, p. 2.

components of music such as rhythm, tempo, pitch, and volume, whereas the secondary functions of game music are linked to less obvious components such as timbre. In sum, not only is it important *what* kind of music and sounds ring out, but also *how* they sound, how they are conceived, what aesthetic values they transport, and how they affect us. This brings me back to Gregor Herzfeld's remarks from my introduction, who perfectly sums up the argument:

"Every sound has its atmosphere. Besides shapes, colours and odours, it is sound that contributes fundamentally to the atmospheric impression of a given object or situation [and one might add; a gaming situation]. Therefore music, as the ordered succession of sound, is, in addition to its structural qualities, a vehicle for the transportation of atmospheric values."[39]

To illustrate this, I will analyze a sequence from INSIDE that demonstrates an innovative and unique interconnection of game music and sound, and the atmospheres they produce.

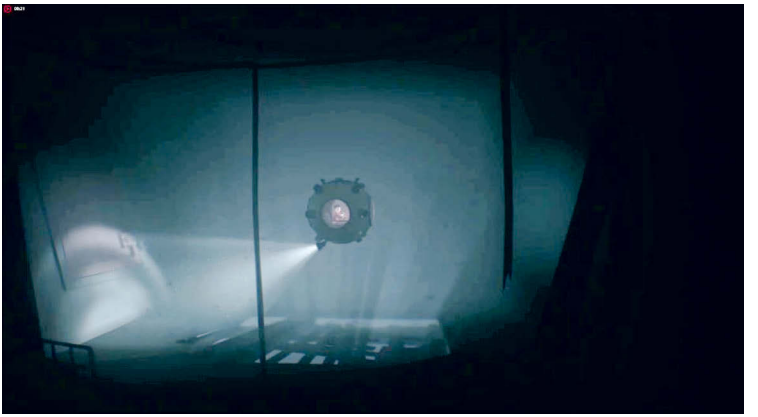
SOUNDING THE ATMOSPHERE INSIDE

INSIDE is a 2D-puzzle platformer about a child, presumably a boy, who is hunted by a fascist regime that rules over a monochrome dystopia. The title is a spiritual successor to the developers' previous surprise hit LIMBO (2010), including similar game mechanics such as puzzling, jumping, and running across platforms. INSIDE's overall game atmosphere is characterized by both the dread of being caught and the wonder of exploring a seemingly long-lost, industrial world. Parts of the game take place underwater in flooded areas of abandoned facilities. Some of these areas can be explored by diving, others with a small submarine. The aural layer of the entire game is relatively 'quiet,' with sound effects such as the echoing of footsteps, the clanking and creaking of dilapidated metal railings, and the bubbling of the submarine's oxygen output as the only sounds that punctuate the otherwise stifling silence. Rarely does the game resort to using nondiegetic sound.[40] When it does, however, the use of nondiegetic sound has an outsized impact on the game's atmosphere. This happens, for example, when players navigate the submarine from a small environment to a very large space.

39 Herzfeld, Gregor: "Atmospheres at Play", p. 147.

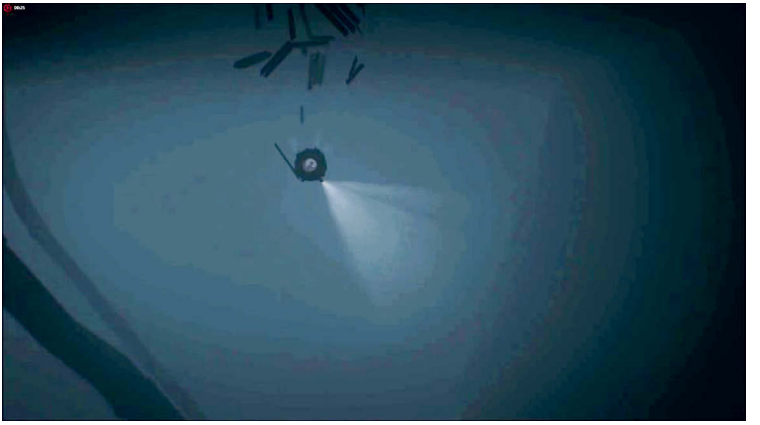
40 I refer to this terminology in the way that Michel Chion has presented it in his influential work on audio vision, see Chion, Michel: Audio-Vision: Sound on Screen, New York, NY: Columbia University Press 2019.

Figure 1: The submarine in a small environment



Source: Own screenshot from INSIDE

Figure 2: The submarine in a vast environment



Source: Own screenshot from Inside

The fixed 2D-sideview enables the developers to change the camera angle in a manner they deem necessary for the aesthetic experience of players. This camera movement is significant because it enables the game's audio to fully realize its potential. In this case, a synth pad is added as soon as the submarine enters into

the expansive space.[41] The rather vague harmonic and melodic structure of ambient game music is not unusual, especially not in the context of indie games. Game music composer Tim Harbour, for example, describes the music for another successful indie game, JOURNEY[42], as

> "on the whole extremely ambient and harmonically static, allowing for melodies and pitched sound effects to be introduced and removed without causing dissonance […] while there is sometimes a small amount of chordal movement, strong harmonic progressions are avoided during gameplay".[43]

Much of INSIDE's sparse use of game music follows a similar approach. The synth pad in this sequence adds a much more powerful dimension to the change of the camera-size-ratio. As the submarine breaks through some pieces of wood blocking the way, it enters the next area. The camera pans out, with the avatar and submarine growing very small, consequently showing players how vast the environment is.

Though restrained in nature, the nondiegetic sound becomes an integral part of the overall aesthetic experience of this sequence. In Rousseau's words, the synth pad makes a stream flow and darkens the subterranean environment—in this case, a flooded industrial dystopia.[44] Subtly and immediately, the synth pad stages the transition from one space to another. It tunes the space the submarine traverses, creating an atmosphere of awe and making players realize how small their avatar is compared to the expanse of the flooded industrial complex.

The synth pad achieves this effect through its unique timbre and sound. First, it is worth noting how INSIDE's composer Martin Stig Andersen decided to use a synthesizer for the nondiegetic music of the game. Andersen's choice is uncommon in the age of wavetable synthesis and DSP-technology. It reflects game music's synthetic heritage outlined above, underlying the argument that the timbre of (early) game music is of paramount importance. Second, it is also worth noting

41 The synth pad's harmonic structure is hard to determine but it appears to hover around a two-tone concept with an F# one octave down and its fifth C# serving as keynotes. As the section progresses, a V-IV-figure forms out with the F#-keynote never quite disappearing, always looming in the background of the almost melodic movement of C# to B.

42 JOURNEY (Sony Computer Entertainment and Annapurna Interactive 2012, O: thatgamecompany and Santa Monica Studio).

43 T. Harbour: "Music in Indie video games", pp. 61-62.

44 Cf. Rousseau, Jean-Jacques: "Essai sur l'origine de langues", p. 129.

how the unique timbre of the synthesizer sound in INSIDE was achieved. Here, the 'traditional' synthesizer approach deviates from its heritage of subtractive, additive, or frequency modulation synthesis-techniques, as Andersen admits that he

"didn't really want to hear synth music in the game. I tried to do it, but it felt too much like a statement […]. I don't think that's appropriate for a game like *Inside*, a small game that's all about creating its own unique world. But when I played them through a skull, the sounds acquired another quality."[45]

By using an actual human skull as an acoustic resonator, Andersen managed to create a fully unique, albeit morbid, timbre that is synthesized and organic at the same time. This unique synthesized-organic timbre relates to the immediacy of music. (Game) music and sound circumvent all diversions and detours when they affect us. The reason Andersen chose to use a skull was to demonstrate how different all sonic expression resonates inside one's own head—literally not metaphorically. According to Andersen, "[t]hings sound much softer in there, more full, in a way […]. So I had the basic idea of trying to recreate sounds as they would sound if they were happening inside your head."[46]

CONCLUSION

The difficulty in writing about subjective phenomena, such as atmospheres, multiplies when trying to think about the relationship of several vague and subjective phenomena such as sound and music and their relationship to atmospheres. Only approximations can therefore be presented and discussed, always humbly self-aware of the fuzziness and problematic nature of these theorizations. With that said, when thinking about the relationship of atmosphere, game sound, and game music, it is crucial to understand three things: First, we need to conceive the aural layer of digital games as a whole, considering the potential and the possibility of sound effects, concrete sound phenomena, and even noise to become ingrained in the musical material. We must do so not only because of the historical development of game sound and music but also because of the developments of music

45 Andersen, Martin Stig: "Audio Design Deep Dive: Using a human skull to create the sounds of Inside", In: *Gamasutra*, October 6, 2016, https://www.gamasutra.com/view/news/282595/Audio_Design_Deep_Dive_Using_a_human_skull_to_create_the_sounds_of_Inside.php.

46 Ibid.

aesthetics and theory that have dominated the academic as well as societal discourse in the 20th century. Second, we also need to be aware of the everchanging aesthetic discourse surrounding the immediate nature of sound and music. And third, the importance of timbre as an additional parameter of music must be considered as equally important to pitch, volume, or tempo. This pertains especially to the hidden potential of ambient music that often creates atmospheres by using unique timbres, giving the aural experience of digital games a holistic nature: just as the unique timbre of INSIDE's synth pad is an integral part of the game's aesthetic experience, helping to create an atmosphere of vastness and awe when traversing from a small to a vast surrounding inside a peculiar little submarine.

BIBLIOGRAPHY

Andersen, Martin Stig: "Audio Design Deep Dive: Using a human skull to create the sounds of *Inside*", In: *Gamasutra*, October 6, 2016, https://www.gamasutra.com/view/news/282595/Audio_Design_Deep_Dive_Using_a_human_skull_to_create_the_sounds_of_Inside.php

Böhme, Gernot: *The Aesthetics of Atmospheres*, Oxford/New York, NY: Routledge 2017.

Boetius, Anicius Manlius Severinus: "De Institutione musica libri quinque", In: W. Keil (ed.): *Basistexte Musikästhetik und Musiktheorie*, Paderborn: Fink 2007 (orig. ca. early 6th century A.D., Latin), pp. 32-42.

Chion, Michel: *Audio-Vision: Sound on Screen*, New York, NY: Columbia University Press 2019.

Chion, Michel: "Die musique concrète ist nicht konkretistisch", In: C. Hongler et al. (eds.), *Geräusch – das Andere der Musik. Untersuchungen an den Grenzen des Musikalischen*, Bielefeld: transcript 2015, pp. 21-32.

Collins, Karen: *Game Sound. An Introduction to the History, Theory, and Practice of Video Game Music and Sound Design*, Cambridge, MA, London: The MIT Press 2008.

Descartes, René: "Musicae Compendium", In: W.Keil (ed.): *Basistexte Musikästhetik und Musiktheorie* (2007, orig. 1650, Latin), pp. 85-99.

Fritsch, Melanie: „History of Video Game Music", In: P. Moormann (ed.), *Music and game. Perspectives on a popular alliance*, Wiesbaden: Springer VS 2013, pp. 11-40.

Fritsch, Melanie et al.: "Part I – Chiptunes", in M. Frisch and T. Summers (eds.), *The Cambridge Companion to Video Game Music*, Cambridge: Cambridge University Press 2021, pp. 5-58.

Haffter, Christoph: “Das Andere der Musik. Weißes Rauschen, Ur-Geräusch”, In: C. Hongler et al. (eds.): *Geräusch – das Andere der Musik* (2015), pp. 7-17.

Harbour, Tim: *Music in Indie video games: a composer's perspective on musical approaches and practices*. Master Thesis, Johannesburg 2016.

Herzfeld, Gregor: “Atmospheres at Play: Aesthetical Considerations of Game Music”, In: P. Moorman (ed.): *Music and game. Perspectives on a popular alliance*, Wiesbaden: Springer VS 2013, pp. 147-157.

Jørgensen, Kristine: “On the Functional Aspects of Computer Game Audio”, In: *Proceedings of the Audio Mostly Conference*, Piteå: Interactive Institute 2006, pp. 48-52.

Kamp, Michel et al. (eds.): *Ludomusicology. Approaches to Video Game Music*, Bristol, CT/Sheffield: Equinox 2016.

Keil, Werner (ed.): *Basistexte Musikästhetik und Musiktheorie*, Paderborn: Fink 2007.

Kent, Steven: *The Ultimate History of Video Games. From Pong to Pokémon and Beyond… the story behind the craze that touched our lives and changed the world*, New York, NY: Three Rivers Press 2001.

Kretschmar, Hermann: “Anregungen zur Förderung musikalischer Hermeneutik”, In: W. Keil (ed.): *Basistexte Musikästhetik und Musiktheorie*, Paderborn: Fink 2007 (orig. 1902, German), pp. 266-284.

Maempel, Hans-Joachim: “Medien und Klangästhetik”, In: H. Bruhn et al. (eds.), *Musikpsychologie. Das neue Handbuch*, Reinbek: Rowohlt 2008, pp. 231-252.

Mattheson, Johann: „Der Vollkommene Capellmeister“, In: W. Keil (ed.): *Basistexte Musikästhetik und Musiktheorie*, Paderborn: Fink 2007 (orig. 1739, German), pp. 100-119.

Mies, Paul: “Über die Tonmalerei [1]“, In: *Zeitschrift für Ästhetik und allgemeine Kunstwissenschaft* 3 (1912), pp. 397-450.

Rettinghaus, Klaus: “Sidology. Zur Geschichte und Technik des C64-Soundchips“, In: C. Hust et al. (eds.), *Digitale Spiele. Interdisziplinäre Perspektiven zu Diskursfeldern, Inszenierung und Musik*, Bielefeld: transcript 2018, pp. 269-280.

Rousseau, Jean-Jacques: “Essai sur l‘origine de langues”, In: W. Keil (ed.): *Basistexte Musikästhetik und Musiktheorie*, Paderborn: Fink 2007 (orig. 1781, French), pp. 120-135.

Stone, Allucquére Rosanne: *The War of Desire and Technology at the Close of the Mechanical Age*, Cambridge, MA: MIT Press 1995.

Summers, Tim: *Understanding Video Game Music*, Cambridge, Cambridge University Press 2018.

Thies, Wolfgang: „Der Computer – ein neues Musikinstrument?", In: G. Batel et al. (eds.), *Computermusik. Theoretische Grundlagen. Kompositionsgeschichtliche Zusammenhänge. Musiklernprogramme*, Laaber: Laaber-Verlag 1987, pp. 131-157.

Weske, Jörg: "Digital Sound and Music in Computer Games", research assignment as part of DFG project *Neue Medien im Alltag*, TU Chemnitz 2000, http://3daudio.info/gamesound/history.html

Zarlino, Gioseffo: "Institutioni harmoniche", In: W. Keil (ed.): *Basistexte Musikästhetik und Musiktheorie*, Paderborn: Fink 2007 (orig. 1558, Italian), pp. 52-81.

Zimmermann, Felix and Huberts, Christian: "From Walking Simulator to Ambience Action Game: A Philosophical Approach to a Misunderstood Genre", In: *Press Start* 5 (2, 2019), pp. 29-50.

LUDOGRAPHY

INSIDE (505 Games 2016, O: Playdead).

JOURNEY (Sony Computer Entertainment and Annapurna Interactive 2012, O: thatgamecompany and Santa Monica Studio).

NOUGHTS AND CROSSES (University of Cambridge 1952, O: Alexander Sandy Douglas).

PONG (Atari 1972, O: Atari).

SPACE INVADERS (Taito et al 1978, O: Taito).

SPACEWAR! (MIT 1962, O: Steve Russell et al.).