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**IMMERSIVE VISUAL MUSIC: HOW CONTEMPORARY VISUAL MUSIC PRACTICES
HAVE EVOLVED AND HOW IMMERSIVE TECHNOLOGIES CAN BE EMPLOYED
TO COMPOSE VISUAL MUSIC WORKS**

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Declaration

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All participants provided written informed consent prior to enrolment in the study and for any associated datasets to be utilised within this thesis.

The datasets that support the findings of this study are available from the author, Emmanouil Kanellos, upon reasonable request.

Following initial supervisory ethical discussion, full ethical approval from the Bath Spa University Ethics Panel was not required. The research has been conducted in line with requirements in place at the time of this decision. Follow-up validation for this ethical approval was awarded on 12/11/2024 by the Bath Spa University Ethics Committee. Should you have any concerns regarding ethical matters relating to this study, please contact the Research Support Office at Bath Spa University (researchsupportoffice@bathspa.ac.uk).

Abstract

This thesis explores contemporary visual music and its evolution. It addresses recent trends and explores audio-visual relationships, practices, and aesthetics. Visual music has a long tradition of negating representational elements in relation to sound, image, and space, to the degree that the term is often used interchangeably with abstract animation and absolute film. In recent years, immersive experiences have become more prevalent as an aesthetic tendency in art practices and media. This shift towards representation, reality, interactivity, simulation, and immersion has often been directed by new and available technologies. The research presented here investigates how immersive technologies can be employed effectively to compose visual music artwork and explores whether the shift to immersive technologies that seem to naturally emphasise representation is likely to raise a challenge regarding the traditional abstraction of visual music.

This study consists of both practice and qualitative research. The literature and contemporary practice review investigate visual music's evolution and current field by discussing key theories and practices. This investigation includes identifying image and sound-making techniques, technologies and media that can be experimented with in the immersive visual music practice.

Supplementary interviews conducted with experts in the field of visual music provided important insights into the process, tools and methodologies used in contemporary visual music. The data extracted from these interviews and their analysis played a significant role in

the creation of a new framework of visual music classifications, which is part of my contribution to the field.

The insights, when compared with the secondary research, identified gaps or less explored areas in the visual music practice and guided the direction of my visual music practice submitted for this thesis. This practice involves experimenting with immersive technologies and representational aesthetics. A series of experiments were conducted to explore different technologies and practices identified in the research on producing immersive visual music. By observing and comparing the experiments, several principles of effective practice were proposed. A final piece incorporating these principles was produced to demonstrate how immersive technologies can be effectively employed in creating immersive visual music.

Keywords: immersive visual music, visual music, immersive technologies, immersive spaces, Virtual Reality, 3D animation, electroacoustic music.

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Chapter 1: Introduction, Research Questions, and Methodology

1.1 Introduction

The research carried out in this thesis investigates contemporary visual music; it mainly explores visual music works from the 2000s onwards, but also considers changes brought about by the late 20th-century digital revolution. More specifically, it explores how existing immersive technologies might be employed to compose and contribute to the visual music genre and considers how these developments might change how we view and understand this genre visually and acoustically. The research explores the status quo of contemporary visual music by trying to find answers to several interconnected questions: What is contemporary visual music and what does it look and sound like? Does abstraction continue to be the norm in visual music? Has contemporary visual music changed in the last few years, with regards to immersion (space) and representation (visuals and sounds)? Finally, can current technologies enhance the immersive and representational qualities of visual music? If so, in which ways?

This research will address several different elements that have contributed to and influenced the changes and evolvement of visual music. These include aesthetic shifts, technological advancements and the impact of changing ideas and concepts in interdisciplinary academic research (Literature Review chapter). Additionally, culturally

constructed narratives, social and historical phenomena have also impacted and informed visual music composition, including its creation, presentation, and experience (Contemporary Practice Review chapter).

Both theory and practice have equally contributed to this study's aims and objectives. The research conducted for this thesis is a combination of the following: an analysis of selected theoretical works that derive from the established body of knowledge related to this area; a discussion on contemporary visual music artworks and an analysis of current practices; data accumulated from experts in the field through an interview process (transcripts) and an evaluation of key findings; my own visual music practice which consists of a series of visual music experiments and a final project that puts earlier findings into practice. The combination of these different elements aims to formulate a clearer picture of contemporary visual music, illustrates the shifts that are taking place in the field more widely, and identifies new directions and gaps for future development in the field.

As a term, *visual music* can describe a variety of projects that combine visuals with music in any number of configurations. Hence, definitions can vary from project to project. Generally speaking, visual music refers to the practice of producing a visual analogue to musical form, by adapting musical structures for visual compositions; this can include silent films. It can also refer to methods and devices, which translate or convert sound and/or music into visual forms.¹ The reverse occurs in a number of contemporary visual music works, in which the composition translates sound into images (graphical sound).² Already, this is a

¹ The systems which convert or translate music or sound into visual forms can include: film, video, CG, installations and live performances. This can be achieved by means of a mechanical instrument (that can do this directly or indirectly), the visual artist's interpretation, or through a computer.

² See Analysis Chapter.

much broader understanding of visual music that differs, substantially, from its original use and coinage by artist and critic, Roger Fry, in 1912. Fry used the term to describe abstract paintings that visually represented music. The first use of the term can be found in the Preface of the catalogue for the second Post-Impressionist Exhibition that Fry organised at Grafton Galleries.³ Fry describes the abstract aesthetic of Post-Impressionist painters, stating that:

They do not seek to imitate form, but to create form; not to imitate life, but to find an equivalent for life [...] they aim not at illusion but at reality. The logical extreme of such a method would undoubtedly be the attempt to give up all resemblance to natural form, and to create a purely abstract language of form — *a visual music*; and the later works of Picasso show this clearly enough.

(Fry, 1920, p.157; *my emphasis*)

During the early twentieth century, the emerging art form of visual music followed in the general direction of many other influential movements of that time (Dadaism, Futurism, Symbolism, and Surrealism.); that is, towards abstraction. Although the aesthetic of abstract art is often discussed as a style or movement, when considered in the context of various art forms, it is neither one nor the other.⁴ Abstraction has traditionally been the most prevalent

³ See Stephen J. Bury and Andrew Mellon's article: *The Second 'Second Post-Impressionist Show'* (Frick, 2014) The exhibition included the artworks of Picasso, Cezanne and Matisse, English painters Duncan Grant, Vanessa Bell, Stanley Spencer, Wyndham Lewis and Russian artists Natalya Goncharova and Mikhail Larionov among others.

⁴ Definitions of abstraction and/or abstract art are often ambiguous and do not necessarily describe one thing: "Strictly speaking, the word abstract means to separate and withdraw something from something else. The term can be applied to art that is based on object, figures, or landscape, where forms have been simplified or schematised. It is also applied to art that uses forms, such as geometrical shapes or gestural marks, which have no source at all in an external visual reality. Some artists of this 'pure abstraction' have preferred terms such as, concrete art or non-objective art, but in practice the word abstract is used across the board and the distinction between the two is not always obvious" (Tate, n.d.)(Accessed: 27 June 2024)

aesthetic used in the production of visual music and is crucial to its practice and theory. Although the following chapter explores the associations between visual music and abstraction, it is significant to note here that abstraction is often thought of as the polar opposite of representation. For Fry, art aesthetics (in poetry, music, and painting) fall into one of two categories: representation or abstraction. He states: "In one group, great use is made of the representation of objects, of people and situations and even of ideas such as the ones found in everyday life. In the other group, representation of these things is often totally rejected or else of minor importance" (Fry, 1996, p. 380). Fry here, juxtaposes abstraction to representation in a strict description that sets the two terms in opposition to one another.⁵ As we shall see in later chapters, however, visual music no longer adheres to a purely abstract aesthetic. The incorporation of representational or figurative elements, in both the visuals and sound, are often combined with abstract elements to produce what this thesis names a hybrid aesthetic or works of *hybrid visual music*.

The reaction against representation in images, which is found in a wide range of debates and across many different fields of study. It is noteworthy that in the history of philosophy, from Plato (Plato and Lee, 1974) onwards, representation is viewed as a form of mimesis (that obscures truth and distorts our reality).⁶ Representational art uses mimetic techniques by

⁵ Although this opposition is not as unambiguous as Fry makes it seem (see following chapter), when abstraction or representation (figuration) are used as general terms in this thesis, it will be in a similar manner to the way Fry describes them above.

⁶ See Plato's Allegory of the Cave. Representation in philosophy has been understood as a form of mimesis that is viewed as problematic in critical thinking and has been taken to task from various perspectives. Representational images are thought to be mediated by language, bringing about the problem of interpretation and the issue of culturally constructed narratives that are inherited through tradition and naturalised through repetition, a tendency that, it has been argued, distorts our view of reality. At the same time, it has also been questioned whether abstraction manages to overcome the issues of representation. See Bolter and Grusin later.

borrowing elements from the real world to render an image.⁷ It is not within the scope of this thesis to investigate the notion of representation in detail. However, theories of images and “imaging” (the process of generating images) are often tied up in this type of debate that creates a dichotomy between abstraction and representation; the process of creating images (art forms) that either aspire to abstraction or simulate reality as closely as possible.⁸

Visual music has a strong connection to abstract animation and absolute film. During the early twentieth century, visual music emerged and developed by a group of experimental abstract animators who explored the relationship between sound and image in the visual and aural arts. The associated movement came to be known as *absolute film*.⁹ Experimental animators, including Oskar Fischinger, Norman McLaren, and John Whitney (among others) composed visual music: “creating a colour music for the eye, comparable with auditory music for the ear” and they devised techniques for the production of sound by marking the optical soundtrack of the film (Moritz, 1997, p.1). Absolute film, William Moritz suggested, is the visual analogy to absolute music (Moritz, 1997, p.162).¹⁰ From its inception, visual music has been informed by philosophical and theoretical concerns that underlie both the notion of the image, as well as music (or sound); I return to this discussion in more detail in the Literature

⁷ The meaning of the word ‘representation’ is the creation of an image that resembles something else that may, or may not, already exist in the real world. Mimesis is derived from Greek, mimesis (μίμησις) “imitation,” from *mimēsthai* (μιμῆσθαι) “to imitate,” and the original meaning persists in English, in words such as: “mime,” “mimic” and indirectly, “image”. More broadly, it has been interpreted in various philosophical contexts as receptivity, the act of resembling, the act of expression, the presentation of self.

⁸ The terms upon which these arguments are made have changed throughout the ages and particularly from the twentieth century onwards, where there is a preoccupation with the theorisation of the new. For further reading on this topic see the dichotomy (chiasm) between Modernism and Postmodernism for instance.

⁹ See discussion on Absolute Film and the distinction between the *Formal* and *Spiritual Absolute* in the following chapter.

¹⁰ Igor Stravinsky defines absolute music as: “Music [that] means nothing outside itself” (Stravinsky, 1956, p79; cited in Evans, 2005, p12). Absolute Music describes a kind of pure music, or as Peter Kivy describes it, “music alone”, in that it bears no reference to external reality and refers only to itself. (Kivy, 1996, p 157).

Review Chapter. This relationship between abstraction and absolute music is important to the tradition of visual music. As this thesis develops, however, we consider ways in which contemporary works of visual music differ from this tradition. This leads to the following question: how might we define visual music in a way that reflects contemporary practices? According to Brian Evans, “visual music can be defined as time-based visual imagery that establishes a temporal architecture in a way similar to absolute music. It is typically non-narrative and non-representational (although it need not be either). Visual music can be accompanied by sound but can also be silent” (Evans, 2005, p.11). If visual music has “typically” been composed in visually abstract forms, as Evans notes, it is because the practice of visual music has been informed by theories of absolute music, which view music as inherently abstract. This thesis argues, like Evans, that contemporary visual music does not need to be “non-narrative” nor “non-representational”. Brian Evans’ definition highlights the relationship between sound and image as being key to our understanding of visual music, over and above the continually adapting forms of presentation and various styles (aesthetics) that are used within the creation of visual music works.

The concept of immersion can be applied to visual music works as far back as the mid-twentieth century, and therefore is not necessarily new to visual music practice (see Literature Review Chapter). Despite this, more recent technological advancements in the area of immersion, such as Virtual Reality (VR), have yet to be explored in relation to visual music. The research conducted for this study demonstrated that there is a gap in this particular area of visual music (see transcript responses in Analysis Chapter) and it is this gap that inspired this research. This thesis investigates how immersion might be developed further in the composition of visual music practice. This study does not claim to investigate every aspect of

immersion in relation to visual music. Instead, it aims to address its presence in current visual music practices, formulate questions, and investigate possible configurations through my own practice. Moreover, the practical component of this thesis explores alternative audio-visual aesthetics that deviate from the more common abstract aesthetics of visual music and introduces representational elements that enhance the immersive characteristics of the artwork. Finally, the research conducted for this thesis (and particularly, the interview data analysis) has enabled a new framework of visual music classifications to be proposed as part of this thesis's contribution to the existing pool of knowledge. Among the topics and questions raised in this thesis, I provide a discussion of the artistic processes involved in creating immersive visual music using VR and SAR technologies, as well as an analysis of the challenges faced and final outcomes. To conclude the Introduction of this thesis, I briefly summarise each chapter that will follow.

Chapter 1: Methodology

The Methodology Chapter provides a detailed discussion of the research methods used to conduct the interview component of this thesis. It addresses the connections between practice and research in this thesis, the selection of participants, the data collection strategy, and the analysis tools that have been selected to evaluate the accumulated data.

Chapter 2: Literature Review

The Literature Review Chapter outlines a selection of theoretical works that are relevant to this thesis' scope and topic. This chapter presents an overview of the various definitions of

visual music and its common associations, including abstraction, Absolute Film, and synaesthesia, among others. It explores how classifications have expanded and developed to include contemporary aesthetics and practices. Also, it includes an inquiry into the two main components of visual music: sound (music) and image (visual) and their relationship. It discusses the change in perspectives, concepts and ideas that have impacted visual music composition. The relationship between immersion and visual music is investigated throughout.

Chapter 3: Contemporary Practice Review

The Contemporary Practice Review Chapter analyses several contemporary visual music artworks. It addresses recent trends in visual music, and explores audio-visual relationships, practices, concepts, and aesthetic features that are characteristic of contemporary visual music artwork. This review focuses on current examples of immersive visual music. This chapter aims to complement the literary framework and the various discussions and issues raised in the previous chapter.

Chapter 4: Analysis

The research presented in this thesis is partly qualitative. Interviews have been conducted with experts in the field of visual music, all with diverse experience and areas of expertise. The Analysis Chapter provides an in-depth analysis of the interview responses and is primarily concerned with identifying what is new in contemporary visual music practices.

This part of the research has contributed to this thesis in several ways. First, the information obtained is useful to my own visual music practice and played an important role in the direction(s) taken to compose the immersive visual music experiments created for this research. Second, it allows for a comparative study of visual music classifications to materialise. Here, the interviewees' responses relating to contemporary visual music have been compared to, and analysed alongside, several traditional (or, canonical) visual music classifications. This helps to identify what is new in the field, as well as propose a framework of classifications as part of my contribution to the field.

Chapter 5: Practice

The Practice Chapter discusses my own work and practice in immersive visual music. As part of the research for this thesis, I have composed a series of immersive visual music works, which aim to put research into practice. These are split into two categories: a series of early experiments (that are informed by the findings discussed in the Analysis Chapter) and a final project that derives from the outcomes of the initial experiments as well as the theoretical work conducted in this thesis.

1.2 Research Questions

Existing theoretical discourses on visual music history illustrate that aesthetics not only follow the trends and tendencies of a given period but are also informed by the features and possibilities enabled by new technologies. As I trace this history in the following chapter, it

can be found that a number of shifts have taken place until now. Although presentations of visual music are (still) commonly screen-based, and very much embedded in the (conventional) film genre, contemporary visual music has expanded to include installations and live performance. Nowadays, visual music is an experimental field of practice open to various art forms, aesthetics, discourses, and fields of study. Brian Evans' definition highlights the relationship between sound and image as being key to our understanding of visual music, over and above the continually adapting forms of presentation and various styles (aesthetics) that are used within the creation of visual music works. Research into contemporary visual music confirms that the ideas and aesthetics tied to the field have progressively moved beyond those associated with tradition; since the latter illustrates an opposition to real life and/or simulation of recognisable objects, sounds, and three-dimensional spaces.¹¹

Several writers discuss contemporary visual music compositions that combine abstract and representational elements to create what this thesis will call hybridity. Andrew Hill, in his Ph.D. thesis *Interpreting Electroacoustic Audio-visual Music* (2013), examined an audience's interpretation of various fixed-media visual music works. Several of those works incorporate recognisable mimetic sounds and (sometimes corresponding) visuals. The works discussed by Hill do not merely use recognisable materials (sonic and/or visual) to simulate reality. Instead, such materials are edited and blended to create hybrid audio-visual compositions. Some of these works are inclined towards mimesis (or representation), and others towards abstraction. Holger and Cornelia Lund's (2006-2017) prolific research into contemporary visual music engages with a number of works that make use of recognisable visuals and

¹¹ See Literature Review Chapter.

sounds, not only in fixed media but also in live performances. These images are often video recordings that depict actors, objects, machines, or performers, which have been edited, cut, looped, and sometimes blended with abstract graphics or intentional glitches. The same occurs with the sound compositions in the works that these authors examined; Holger and Cornelia Lund discuss works with real-world recordings, referential sounds, and diegetic sounds (of the video footage), which have been edited, looped, scratched (as DJ performance fashion), and blended with music or noise. The aim of these visual music artworks is not a coherent, sequential narrative, or even a simulation of reality. Rather, they aim to create a rhythmical, dance-like outcome that hovers somewhere between abstraction and representation. This type of visual music frequently incorporates physical spaces as part of the presentation, to simulate a live music performance or a dance scene, rather than a space.¹² Julie Watkins, in her research and practice, investigates visual music projected onto physical spaces, with the intention of producing new immersive experiences. The graphics do not attempt to simulate reality, and are usually abstract, while the sound in her work is more mimetic.¹³ Finally, David Glowacki's ongoing research in *Danceroom Spectroscopy* and Susan Broadhurst in *Digital Bodies: Creativity and Technology in the Arts and Humanities* (2017) investigate interactive audio-visual arts that encompass dance and performance. Both Glowacki and Broadhurst demonstrate that visuals and sounds can create immersive three-dimensional spaces. Again, however, these are mainly abstract.¹⁴ The research conducted and presented in this thesis investigates the representational elements present in contemporary

¹² For further reading, see: <http://lundaudiovisualwritings.org/> (Accessed: 24 June 2024)

¹³ Julie Watkins work is discussed in the Contemporary Practice Review Chapter.

¹⁴ See: <https://glow-wacky.com/danceroomspectroscopy/> (Accessed: 27 June 2024)

visual music and aims to bridge the gap between the simulation of recognisable objects and sound, and the simulation of three-dimensional space.

The various manifestations of this audio-visual artform, and the continuous experimentation that underlines the associated practice, illustrate that the developments in contemporary visual music affect how we understand, compose, and experience such art. For example, early visual music works that belong to the genre of film often involved a sequence of scripting, shooting, and editing (post-production for the synchronisation or precise calibration of image and sound/music). In cinema the audience is considered a passive and reactive spectator whose reactions are, “pre-programmed by the director, crew, cast and writer” (Mackintosh, 2003, p.2). On the other hand, visual music installations and live performances create a type of “hybrid event” (Lund, 2017, p.2; [2009]). Here, visual music becomes a performative art form in which the audience may take part or become involved (often being a significant part of the performance). The event can include multiple slides and film projections, (multicoloured) light shows, dancers, or performers. As a real-time performance, the artwork is no longer (fully) under the control of the artist. In fact, the artist can become part of the performance (as often occurs in VJing) and what might otherwise be referred to as errors are part of the performance (within the bounds of improvisation). Here, visual music is a singular event that cannot be directly replicated. These approaches to visual music often aim to produce an experience that relies (to different degrees depending on the artwork) on participant/audience interaction.

In contemporary visual music practice, the concept of immersion has increasingly been used to describe a number of different works and approaches in the composition of visual music artworks. Immersive techniques can vary from artist to artist, and from artwork

to artwork. The Literature Review Chapter will illustrate that immersive practices in visual music have gradually been incorporated since the mid-twentieth century. These were enabled by developments in technology and evolving perspectives on the consumption of art (see later). Despite this, the association between visual music and immersion has been received, by some, as controversial. Philip Sanderson in *Resisting Immersion in Visual Music* (2017) argues that:

“In contemporary visual music practice the term immersive is increasingly being used, denoting an all-enveloping synaesthetic experience [...]. Whilst the case for an absolute correspondence between colour and harmony has been repeatedly debunked, not least by practitioners themselves, see Lee Grice’s (2001) mathematical reasoning why such a correspondence is fanciful, the terms synaesthetic and especially immersive continue to be used [...]”.

(Sanderson, 2017, p. 1).

Sanderson connects visual music and immersion to two ideas associated with visual music: synaesthesia and colour music. Although both of these correlations are associated with the history of visual music, contemporary visual music has many different types of outputs that move away from these ideas.¹⁵ In contrast to Sanderson, this thesis does not hold the view that visual music should be “reflexive” as opposed to immersive; what Sanderson calls

¹⁵ It's also important to emphasise that these terms (colour music and synaesthesia) are approached differently in various theoretical works, leading to ambiguity in both the terms themselves and their interrelation (see Literature Review).

an “all-encompassing synaesthetic melding of the senses”.¹⁶ This thesis argues that a visual music work can be immersive if there is an effective simulation of space and time that creates a feeling of presence.¹⁷

Audiovisual technology has altered drastically since the 1990s and significantly more so in the past two decades. Immersive technologies, including spatial audio (immersive soundscapes¹⁸, binaural audio, and ambisonics) and advanced visual technologies that have enhanced colour reproduction and provided greater dynamic range have been adopted for wide-scale applications for consumer products (gaming, entertainment, and broadcasting). Immersive design using VR (Virtual Reality), AR (Augmented Reality) and MR (Mixed Reality) have further contributed to immersive experiences, simulating the way we naturally experience or perceive sounds and visuals. The current application of immersive technologies (like in the example of gaming) mostly highlights ideas of representation and narration. Despite this emphasis on technology, the concept of immersion can be discussed as an experience that is equally applicable to the activity of reading (despite limited sensory

¹⁶ Although I do not take up Sanderson’s argument in its entirety here, it is important to mention that immersion does not necessarily oppose reflection. The opposition that Sanderson sets up in this paper views immersion as an illusion and reflection as truth. These terms and arguments will be discussed in later chapters.

¹⁷ The concept of immersion encompasses various theories and disciplines. The concept of immersion that this thesis will use derives from media and technology theories as also, art historian Oliver Grau (See Literature Review). For further reading see: Berkman and Akan’s *Presence and Immersion in Virtual Reality* (2018) and Zhang et. al *Spatial Immersion versus Emotional Immersion* (2017).

¹⁸ Initially introduced by Michael Southworth, the term “soundscape” gained popularity through the work of R. Murray Schafer. It’s crucial to distinguish soundscape from the broader acoustic environment, which encompasses all natural and artificial acoustic elements within a specific area, as altered by the surroundings. A soundscape constitutes a sound or amalgamation of sounds emerging from an immersive environment. The concept of soundscape encompasses both the natural acoustic environment (natural sounds, collective habitat expression, sound of natural elements, and environmental sounds created by humans and industrial/mechanical sounds) but also importantly, includes the listener’s interpretation of the sounds they hear as an environment and thus mediates their interactions. The term “soundscape” can also denote an audio recording or performance that simulates the sensation of being within a specific acoustic environment. Finally, it can also refer to compositions created using “found sounds” (mimetic) from an acoustic environment, either used independently or alongside musical elements.

simulation compared to multisensory audiovisual experiences), or to viewing art (abstract or representational) in a gallery, or to the act of listening to instrumental music in a concert hall. Immersion is therefore not limited to a particular type of aesthetic or entirely dependent on technology. The experience of immersion refers to the “feeling of spatial presence, defined as the sense of ‘being there’ in both a real and a remote environment. [...] Therefore, spatial presence encompasses the ability of users to experience a sense of presence in any environment in which they are transported” (Khenak, Vezien, Thery and Bourdot, 2020, p. 1).

Definitions of immersion usually centre around two primary aspects: the experience of immersion and the rendering systems used to create immersive environments (technology or devices). A notable definition of immersion that stresses the experience aspect, comes from Janet Murray who argues that immersion is a metaphorical term that is, “derived from the physical experience of being submerged in water. We seek the same feeling from a psychologically immersive experience that we do from a plunge in the ocean or swimming pool: the sensation of being surrounded by a completely other reality” (Murray 2017, 99). From the user’s perspective definition of immersion that emphasises “presence”: “immersion evokes a series of parallel intertwining psychological changes at the attentional, emotional, cognitive, sensory, perceptual and memory level, that synergically mark the uniqueness of this experience” (Zhang, 2020, p. 3-4). Key aspects of this definition include envelopment, transportation, simulation, sensation, attention, and perception. Witmer and Singer (1998) argue that this sense of “presence” is in a constant state of “perpetual flux” and depends on the interaction between sensory and environmental simulations, as also, individual inclinations. Immersion is a complex process, intricately entwined with psycho-somatic

mechanisms that can be triggered by technology and/or (non-technological) devices utilised by an artist.

The correlation between immersion and embodiment relates to the experience of immersion and suggests one's sensorimotor capability in adopting: "the spatial locus of the virtual character(s) and update their ego-centric frame of reference from the virtual character's point of view" (Zhang, 2020, p.4). Zhang argues that embodiment involves empathy (cognitive and emotional identification with a virtual character). Here, the attentional resources and mental faculties are drawn toward the virtual space through immersive stimuli and cues. This involves several different physiological and psychological processes and pathways, which are activated simultaneously (i.e., sensorial and perceptual motor responses, and cognitive/affective processing), "indicating the interactions and synergies of these psychological components in contributing to the overall experience of immersion" (Zhang, 2020, p. 5). In this context, immersion is conceived as a process in which a user's engagement with the constructed virtual environment triggers both physical and psychological mechanisms simultaneously. The experience of being "present" (being immersed) can be viewed as a mental shift that leads to the illusion of a physical one. For Zhang, immersion entails the notion of "embodiment" within its very fabric and the mental shift that is involved "is enhanced by the rendering systems employed by the artist".¹⁹

The relationship between art and immersion brings into focus the notions of participation and interaction. Lisecka and Constantin claim that, "The concept, that intuitively

¹⁹ This can include specific technologies or specific devices (including literary and affective ones). Zhang, in fact, argues that the "immersive experience emerges and grows alongside the development of storytelling" (Zhang, 2020, p. 2). Storytelling in this context, however, can be interpreted either as narrative (in the conventional sense) or as an affective/emotional journey. I will come back to this in later chapters.

seems to be closest or very close to the concept of immersion – at least on the aesthetic level, [...] is participation” (Lisecka and Constantin, 2022, p. 161). In the twentieth century, the concept of art as a "sanctified object" waned in significance prompting artists to embrace instead the "ritual of art experience" (Grammatikopolou, 2016, p. 41–42). As we shall see in the Literature Review Chapter, the evolving perception of how art ought to be experienced and comprehended during the twentieth century, prompted artists to produce works that experimented with the idea of immersion and interactivity. No longer was it, “the public’s role [...] to see and ‘worship’ the art object; people had to become part of the ‘ritual’ and the creative process of art making. Through participation, the experience of art unfolds within a broader life experience. Instead of maintaining a critical distance from the artworks, people are expected to intervene in them” (Grammatikopolou, 2016, p. 42). Here, immersion entails an exchange between the spectator or participator and the artwork, and this interaction is understood as having the potential to transform both the artwork and its audience. Nietzsche uses the term ‘Dionysian aesthetic’ to describe the appreciation of an artwork or performance from within by being part of it (Nietzsche, 2012). This feeling of immersion arising from the collective experiences is analogous to the experience the audience has during live performances or festivals (Farrell, 2019). The simultaneous shared experience of the audience creates a feeling of interconnection, empathy and unity. This can be traced to tribal groups, where participants enter a trance-like state during spiritual and ritual experiences and feel possessed by a collective sense of unity (ibid).

It is significant to note that these aesthetical and conceptual changes in how art is understood, created and received, impacted and informed the evolution of visual music composition (see later).

The definitions and theories discussed play an important role in the type or level of immersion an artist wants to achieve. This research mainly focuses on the technologies and methodologies used to evoke a compelling sense of presence in the environments simulated in a visual music work. This investigation into immersive technologies and contemporary visual music led to the development of the main question of this research:

- Can current technologies enhance the immersive and representational qualities of visual music? If so, in which ways?

As the research progressed to explore the status quo of contemporary visual music, several interconnected sub-questions were posed and addressed, including:

- What is contemporary visual music, and what does it look and sound like?
- Does abstraction continue to be the norm in visual music?
- Has contemporary visual music changed in the last few years in terms of immersion (space) and representation (visuals and sounds)?

With these questions in mind, we may now turn to a discussion of the core methods employed throughout the thesis; since the research combines theory and practice, various different methods are employed which require an introduction.

1.3 Methodology

There were three central methods employed within the research. The first was an interpretivist method, based on reviewing existing literature, terminology, concepts, and

practices of historic (Chapter 2) and contemporary (Chapter 3) visual music works. This method was essential to identify image and sound-making approaches and consider immersive technologies that can be used to produce immersive visual music works. The second method included qualitative research, which consisted of conducting interviews with visual music practitioners. These interviews provided important information about production methods, image-sound relationships, technologies, media and innovations in contemporary visual music. The interview transcriptions and associated data from the analysis of those transcriptions have helped in developing methods and ideas about the practice of visual music and the notion of immersion (Chapter 4). The third central method involved practice-based research, informed by the findings from the interpretivist and qualitative stages. This research involved conducting experiments to investigate immersive technologies and visual music production methods. By comparing the outcomes of the experiments, several principles were proposed on how immersive technologies can be used to create effective immersive visual music. Finally, a piece was produced demonstrating these principles in visual music practice.

1.3.i Interpretivist Method

The core method that guided the theoretical and practical research conducted for this thesis followed the interpretivist framework. The literature related to contemporary visual music is limited, most of it showcases visual music artworks, rather than examining theories surrounding the subject. The impact of researching an under-investigated topic has its benefits and limitations. For instance, defining some of the core concepts such as, 'What is

visual music?’ or, ‘What can be included in visual music practice?’ may appear ambiguous and problematic with the limited amount of literature available. Additionally, more complex concepts discussed in this research (such as ‘representational’; ‘abstract’; ‘immersive visual music’), are perhaps even more difficult to understand. Even so, this complexity provides one with an opportunity to expand the existing pool of knowledge and, significantly, engage with the current state of contemporary visual music, its progress, and development.

After assessing what type of paradigm should direct the research, an interpretivist (as opposed to a positivist) framework was found to be more suitable; a positivist method assumes that there is a well-established piece of information regarded as a fact, which can be tested and measured.²⁰ The researcher is external to the research site, and acts as the director and regulator of the research process (Creswell, 2008; in Taylor and Medina, 2011). An interpretivist paradigm stresses the need to position the analysis within a context. This framework is concerned with understanding the research topic by taking into account the lived, subjective experiences of individuals.²¹ An interpretive research paradigm uses meaning, as opposed to measurement-oriented methodologies (Thanh and Thanh, 2015).

In order to gain a better understanding of the evolution and current state of the concepts, theories and aesthetics around visual music, primary and secondary research were conducted. Primary research included a review of three contemporary visual music case studies, analysing their content in relation to immersion, and comparing theories and

²⁰ Creswell defines a positivist research paradigm, stating that: “This [positivist] scientific research paradigm strives to investigate, confirm and predict law-like patterns of behaviour, and is commonly used [...] to test theories or hypotheses.” (Creswell, 2008; Cited in Taylor, P.C., and Medina, M., 2011)

²¹ According to Kaplan and Maxwell, “Interpretive research does not predefine dependent and independent variables but focuses on the full complexity of human sense making as the situation emerges (Kaplan and Maxwell, 1994; Cited in Antwi and Hamza, 2015).

methods identified in the Literature Review. The observations and interpretations of the analysis have been included in the Contemporary Review Chapter. Both the Literature Review and Contemporary Review chapters helped identify gaps and less developed areas in contemporary visual music practice, guiding the experimentation of this research towards this direction. Secondary research involved the analysis and interpretation of existing literature related to visual music, image, sound and immersive technologies. The Literature Review Chapter examines how visual music practice expanded historically from being abstract, flat, non-narrative, silent or musical to incorporate real world recordings, representational images and 3D spaces.

1.3.ii Qualitative research

The primary research carried out for this dissertation consists of two components: interviews (structured questions), and practice (experiments). In terms of qualitative research, interviews are an effective data-gathering technique that seeks to explore the participants' understanding of the research topic at hand. For this study, interviews were particularly useful in identifying underdeveloped research (gaps) in the area of visual music. As the participants were already knowledgeable (with different areas of expertise) in this field, the interviews enabled the setting up of a contemporary visual music framework and the question of what can be included within its scope. From the interview data collection, current developments in visual music were identified, particularly those that include immersion (through immersive technologies and aesthetics). As we shall discover, this was deemed to be an underdeveloped area in both the practice and theory of visual music.

1. Theory of Data Collection/Analysis Approach

This study has taken a qualitative data collection and analysis approach. Interpretivist paradigms and inductive reasoning are often linked with the qualitative method of analysis since both are more open in the investigation and acceptance of new concepts and theories that form out of research (Thanh and Thanh, 2015). In contrast, quantitative data analysis is most often linked with the deductive approach, which starts with a proposition or a hypothesis (Crowther and Lancaster, 2009) and is considered to be closer to the positivist paradigm and natural sciences since it provides rigorous numerical data where numbers typically imply precision (Berg and Lune, 2015, p.15). This does not mean that qualitative data cannot be rigorous or systematic. On the contrary, it can methodologically examine various emerging patterns and it can be designed in such a way that subsequent researchers can reproduce it (ibid, p.9).

Since the aforementioned research questions do not seek numerical, but rather narrative information about current events, a qualitative methodology seemed to be the most suitable approach, as it looks at concepts, meanings, and symbols, amongst other characteristics (Khaldi, 2017). Qualitative research allows for further examination of data as it appears in its essence, rather than in comparison to other data and their correlation and relationship (Berg and Lune, 2015, p.3). It also allows access to non-measurable facts that can be objectively observed, such as people's personal traces (letters, recordings, documentation) (ibid). It also has the benefit of treating each individual's experiences as a unique source of data (Daymon and Holloway, 2011).

The main reason for using a qualitative research method is that it is most suitable when examining the nature of things (Dabbs, 1982, p.32). The research conducted for this thesis focuses on the nature of contemporary visual music by examining qualitative features such as, immersion,²² sound-image relationships, innovation, and so on.

2. Sampling

The sampling of this research is non-probable but purposive. Purposive sampling is a method that identifies participants (or, other units that can produce primary data, such as documents) that have specific knowledge of the examined field and are likely to have first-hand experiences and opinions that will answer the research questions (Bryman and Bell, 2015). The purposive strategy of this study is based on 'criterion sampling' - a sampling strategy, which involves selecting cases that meet some predetermined criteria of importance (Patton, 2001, p.238). In the case of this study, the main criterion was first-hand empirical knowledge of traditional and contemporary visual music practice. The sampling of this research is based on the expertise of the selected population in relation to the purposes of the research. The seven interviewees (curators, academics, and artists) have many years of experience in curating, researching, or making visual music. They shared knowledge relating to the theories and practices of this genre by answering questions designed for this research.

²² As mentioned, immersion in this thesis primarily focuses on spatiality (i.e. spatial/three-dimensional sound and three-dimensional visuals).

3. Data collection

The data collection method of the interviews was conducted via email – a method that can offer an asynchronous communication setting, allowing all those participating to reply at different times, and in their own time. The primary reason for choosing this method was due to the vast majority of the participants living and working in different countries.²³ The interviews were structured, and every participant received the exact same questions (see Appendix 5). In this way, the participants had the same stimulus, so that their answers would be easier to compare to one another when composing the analysis (Babbie, 2007; cited in Berg and Lune, 2015). For instance, Question 4.i) asks: *‘From your experience as an organiser, (as an artist, or as a visitor) how would you characterise most contemporary visual music works? (You can classify them in different types if you wish)’*. The questions aimed to cover a wider (yet, targeted) audience, so as to encompass the diverse forms of expertise and exposure that reflected the participants’ own knowledge and experience in visual music.

Data, from the above process, was gathered with the use of standardised interviews.²⁴ All participants were provided with an additional document of clarifications, so as to help them answer the questions in the clearest way possible and avoid any misconceptions in relation to the terms that were used. There were no additional questions (other than the ones provided in the interview). The interview questions were divided into two categories:

²³ The writing of this research has occurred during the Covid-19 worldwide lockdowns. Due to the pandemic, online communication has become more common than ever, with many new platforms supporting online meetings and video calls.

²⁴ See Berg’s Model of Standardised Interviews (Berg, 2009, p152). The only deviation from Berg’s Model of standardised interviews was that for this study, participants were given the option to ask for further clarifications if required.

a) The first category (Questions 1-3) used open-ended questions that: introduced the participants to the subject; asked for an overview of their experience in visual music; created the framework for discussion. This line of questioning aimed to allow new patterns to emerge and provide an updated definition of current visual music and observe how contemporary understandings of visual music employ terms and concepts.

b) In the second category (Questions 4i-6ii), the questions were more focused and examined the participants' personal experiences within visual music practice. Curators and artists were asked to discuss their observations regarding contemporary visual music practices²⁵ and give their insights and opinions that have been shaped through years of experience. In this way, certain qualities and features of contemporary visual music, which are the focus of this research, were established, including innovation, immersion, abstraction/representation, and image-sound relationships. Importantly, the answers to these questions enabled the examination and identification of the reasons behind specific creative decisions and preferences in contemporary visual music and their comparison with the conclusions of the Literature Review and Contemporary Practice Review Chapters.

Information about the research demographics, data protection, limitations and risk assessment can be found in Appendix 2.

4. Data Analysis

A process of coding followed data collection. Thematic analysis was used to allow for the discovery of emerging patterns within the qualitative data (Braun and Clarke, 2006), and

²⁵ Their own, or other artists' practice.

grounded theory was used to help render the relationships between patterns and how they connect. (Floersch et al, p.2010). Commonly, thematic analysis is used as a qualitative method that identifies, reports and analyses data for “meanings produced in and by people, situations and events” (Braun and Clark, 2006; Patton, 2002; Boyatzis, 1998; Riessman, 2008; cited in Floersch et al, p.2010). Themes are determined throughout and from patterned responses or meanings within the dataset. Grounded theory analysis is often distinguished from thematic analysis by the unit of coded text (Charmaz, 2006; Strauss and Corbin, 1990). In grounded theory, a text is often coded either, line by line, or word by word. Contrastingly, thematic analysis does not specify a coding technique for associating a particular length of text to code; nor does it utilise a continual comparative method, or describe coding strategies (Boyatzis, 1998).

Since this research examines the current state of contemporary visual music it has been deemed worthwhile to revisit what visual music is, how it is interpreted, and what can be included in visual music practice. In order to find answers to these questions, a thematic analysis approach has been taken, as it seemed more suitable; offering more flexibility and freedom in forming new ideas from the data. Patterns of repetitive codes have been extracted from the raw data (Walsh et al, 2015) without taking into consideration prior themes, literature and concepts²⁶. The interpretation of data also allowed for new information to be generated; information, which was not included or previously considered when forming the research questions.

²⁶ The combination of themes may produce fewer distinctive themes that will include a number of subthemes.

The extracted quotes from the interviews were collected, labelled and categorised into codes, to filter the important, or interesting patterns from the rest of the data and for the purpose of making sense of them (Maguire and Delahunt, 2017). The coding stage has effectively helped in the reduction of the data and its organisation (Coffey and Atkinson, 1996). By labelling the quotes and arranging them into codes according to concepts (e.g., immersion, current technologies, etc.), their analysis and comparison became easier and more efficient. For further, and more organised analysis, the coded data has been arranged into working concepts, maps, grids and/or tables. The next step was to combine the related codes and their categorisation into proposed²⁷ and emerging themes. Themes can be both semantic and latent; for this thesis, both semantic and latent approaches were used. The *semantic* approach develops themes from exact words or phrases that the subjects have used (Javadi and Zarea, 2016) while the *latent* approach goes beyond what has been stated and develops themes from explicit or implicit ideas identified in the data (Guest et al, 2012).

1.3.iii Practice-based research

Research that involves practice or is practice-related is often labelled as practice-based or practice-led. The terms describe a conceptual framework that enables a researcher to incorporate creative practice, methods and outputs into the research design as part of the research findings. The terminological distinction between practice-based and practice-led frameworks is often considered problematic, as there are no clear guides to what these terms stand for, and they have been theorised in different ways by different researchers (Niedderer

²⁷ Potential themes proposed by the researcher that are relevant to the research questions.

and Roworth-Stokes, 2007, p.2). This is especially true when considering numerous other terms used to describe similar types of research. For example, design-based, art-based, and studio-based.

According to the book *Practice-Led Research, Research-Led Practice in the Creative Arts* (Smith and Dean, 2009), practice-led research arises out of two interrelated ideas. First, “that creative work in itself is a form of research and generates detectable research outputs” (p.5). The product of the creative work here is viewed as contributing to the outcomes of the research process and contributing to the answers to the research question. Second, “creative practice - the training and specialised knowledge that creative practitioners have and the processes they engage in when they are making art - can lead to specialised research insights which can then be generalised and written up as research” (Smith and Dean, 2009, p.5). For Linda Candy (2006) practice-led research deals with the nature of practice and how that can lead to new knowledge which, in essence, has a functional significance for practice.

According to Niedderer and Roworth-Stokes (2007), the terms practice-led and practice-based research are not clearly defined and often display multiple uses and interpretations. They provide a categorisation of these terms (See table below) describing the research/practice relationship.

Category (with reference to terms identified)	Context	Purpose
Research involving practice (practice-based research, studio-based research, practice-centred research, practice-led research, arts-based research, design-based research)	Research process based on or rooted in practice, or where practice plays a lead role in the investigative process Interventions/experiments are 'framed' investigate how practice can be enhanced or improved	Research outcomes make a direct contribution to, or are of direct relevance for, the advancement of practice Practice informs theory building within research to gain new insights, knowledge or understanding
Critical inquiry (critical inquiry, investigative practice)	Research is a systematic inquiry [Creative] practice is a variable process, usually seen as un-systematic [inquiry]	'Critical' aspect used to demonstrate objectivity, and distance from personal opinion, often supplemented with evidence through data gathering
Practice by reflection and/or research (investigative practice, reflective practice, evidence-based practice, research-informed practice, research-led practice)	Focus on creative practice as means to develop new insights and understanding through deliberate inquiry Recognition of the dynamic and reflexive nature of interactions and conceptual development	Reflection used to gain new insights and understanding upon practice – as post rationalisation on 'ordinary' practice Use of outcomes to refine practice and observe 'best practice'

Using the above table as a guide, the relationship between research and practice in this thesis includes “research involving practice” and “practice by reflection and/or research”. It includes 1) a series of visual music works that experiment with immersive technologies and associated aesthetics, aimed at gaining new insights and new knowledge in the field, and 2) a final visual music work that encompasses (some of) the identified effective technologies and aesthetics in immersive visual music, with the aim of further development within this field. These practical works aim to inform visual music theory and are used within my research to gain new insights into the current state of visual music (and its various forms and expressions as they unfold at present).

Chapter 2: Literature Review

The Literature Review Chapter provides an overview of the primary theoretical works and debates relating to visual music that are relevant to this thesis. The term *Visual Music* is pertinent to a wide range of creative fields and practices, including art, film, installation, animation, architecture, colour music, and live performance. Significantly, visual music often adapts and alters in conjunction with technological advances. Throughout its history, visual music has often shifted from medium to medium, where “all possible new media had been added to the [visual music] repertoire” (Lund, 2017, p. 5). Most visual music writers agree that many different types of work might be classified as visual music. Jack Ox and Cindy Keefer state that: “there are differently formed visual structures that can be called visual music” (Ox and Keefer, 2005, p.1). Andrew Hill expresses a similar view, claiming that: “Many different types of work might be classified as visual or audio-visual music works and the subjective nature of classification means that each individual will define works in reference to a unique ideal of visual music” (Hill, 2013, p.6). Aimee Mollaghan echoes a similar sentiment, stating: “The term visual music is vague and amorphous, defying traditional categorisation. However, it is this very ambiguity and ability to transcend disciplinary boundaries that makes visual music such a unique entity” (Mollaghan, 2015, p.14). This thesis also views visual music as an interdisciplinary field of study and practice that incorporates and combines a variety of creative fields and practices. Clearly, the term displays nuances and contemporary visual music writers illustrate that the numerous definitions and associations tied to visual music practices will continue to change in parallel with developments in the field. This research investigates the directions that visual music has taken in recent years and, as these unfold,

explores what is new in presentation and aesthetics alike. This chapter will establish a theoretical framework for examining aspects of contemporary visual music practice by investigating some of the key concepts that relate to the tradition of visual music, alongside some of the primary characteristics that this thesis has identified as novel in contemporary works. This is particularly important to the Analysis Chapter of this thesis, where classifications of visual music are analysed in detail in conjunction with the interview responses; and have enabled this thesis to put forth an updated (or extended) framework for contemporary visual music.

The search for equivalences between the time arts (music) and the spatial arts (plastic) has a long history. Visual music writers often draw a historical line from Pythagoras and Aristotle to oscilloscope techniques, to Fry's use of the term to describe Post-Impressionist (and Kandinsky's) paintings, to the "absolute film genre" and "visual symphonies" of rhythmic images that emerged in the early twentieth century, to contemporary audio-visual installations, and live performances. The *Visual Music Award* website defines visual music in the following description: "Visual music refers to the transposition of melodic, harmonic and rhythmic coherences in pictures through the composition of space and time. It's a dynamic art form in which a special effect is achieved by the equal-footed interaction of visual and musical material" (Visual Music Award, n.d.). As we shall see, variations of this definition can be found in a number of different visual music writers (see later), but first, I address some of the more prominent associations tied to the tradition of visual music.

2.1. Visual Music: Abstraction and Hybridity

Aimee Mollaghan

In *The Visual Music Film* (2015), Aimee Mollaghan traces the main visual music aesthetics that materialised in the previous century and finds significant differences between visual music works of the 1920s and 30s, and works that emerged in the 1960s. Mollaghan argues that visual music is inherently hybrid by its dual nature. She states that visual music, “announces its inherent nature by virtue of conjoining the senses of vision and hearing within its constituent words. This implies that it requires the characteristics of at least two disciplines, one of which must be musical in nature and one that is primarily visual in order to be classified as visual music” (Mollaghan, 2015, p.14).

A number of early examples that Mollaghan reviews are, in fact, silent films. One might say that this contradicts the classification above, since these do not incorporate a musical accompaniment. Silent films can still be classified as visual music, however, because the visuals may be analogous to music by possessing expressly musical characteristics. Thus, Mollaghan classifies a work as visual music if it possesses musical analogies and/or musical form, such as movement arrangement, counterpoints, and rhythmical successions (Mollaghan, 2015, p.11, 28).

Absolute Film

Mollaghan explains the correlation between visual music and abstract aesthetics by evoking an analogy between visual music and absolute music (Mollaghan, 2015, p.6).

Absolute music is understood as self-referential; this type of musical composition does not try to represent anything but itself, and can be described as ‘music for music’s sake’ (ibid).²⁸ Filmmakers and composers imitated and expanded on the idea of absolute music by attempting to produce visual music that was non-mimetic, non-narrative, non-representational, and non-referential (ibid). Hence, Mollaghan illustrates that the abstract aesthetics of early visual music naturally developed from the tradition of abstract painting, is aligned with the concept of absolute music, and subsequently expanded to include motion and film.

The visual music works discussed in Mollaghan’s research have a common characteristic – they are all considered abstract, or absolute (Mollaghan, 2015, p.5).²⁹ What Mollaghan’s research reveals, however, is that by the 1960s visual music had changed to incorporate elements that were increasingly immersive and noticeably less abstract than those composed in the earlier part of the twentieth century.³⁰ Mollaghan classifies absolute visual music aesthetics by differentiating between two main categories: the formal and spiritual absolute. This is a significant distinction that illustrates the evolution of visual music. I now turn to this distinction in Mollaghan’s work.

²⁸ As mentioned earlier, absolute music refers to what Peter Kivy describes as, “music alone”, in that it bears no reference to external reality and refers only to itself. (Kivy, 1996, p157). As we shall see further down, music tends to bypass linguistic associations, conveying “narrative” as an experiential journey, through dynamic structures, movements and shifts in temporal progression and its expression is primarily emotive or affective (see later)

²⁹ Mollaghan’s thesis focuses on abstract (absolute) visual music. However, this does not mean that she does not acknowledge that visual music can incorporate representational or figurative elements. Instead, she notes that she deliberately omits these styles from her specific research focus.

³⁰ Although, as we shall see Mollaghan does not necessarily describe them as such.

Formal Absolute

The formal absolute in visual music refers mostly to the Modernist works of European (mainly German) composers of the 1920s and 1930s (Mollaghan, 2015, p.35). Modernism is known for its experimentation with abstraction and non-representational art; its exploration with new forms and techniques, across various media, which departed from realism in representation and focused on form itself. This is aligned with Greenberg's philosophy of abstract art. In Greenberg's *Towards a Newer Laocoon* (1940), the formal absolute in visual music is seen as an extension of avant-garde painting, where the artist attempts to make something new and original, or from scratch, like a God. Abstract art is seen by Greenberg as similar to a natural landscape, that has its own aesthetic value by virtue of its own form; unlike a painting (or representation) of a landscape, that derives value from the way it depicts such a landscape. According to Greenberg, the Formal Absolute Image is different from other plastic arts because it is flat and two-dimensional. In order for an image to be absolute, it needs not only to reject the representation of physical forms but also the representation of physical space: three-dimensionality (Mollaghan, 2015, p.44).

The Spiritual Absolute

Mollaghan discusses the Spiritual Absolute by reviewing a number of visual music works created by two of the most influential American West Coast filmmakers of the 1960s: Jordan Belson and James Whitney. She discusses their work in relation to the notion of transcendence and the Kantian sublime; a feeling of insignificance or powerlessness when encountering an overwhelming event, landscape, or thing (Mollaghan, 2015, p.68). The

Kantian sublime consists of two separate (and conflicting) aspects: a disturbance (displeasure) and an overcoming of that displeasure (which transforms displeasure into pleasure). In Kant, the mathematical sublime describes the encounter with something large in scale (i.e., the pyramids) that can create a feeling of awe. The initial unpleasant feeling of not being able to fully comprehend it in its entirety transforms into pleasure when we use logic to try to understand it.

In contrast, the Kantian notion of the “Dynamic Sublime” evokes our sense of reason in order to deal with (powerful or awesome) phenomena that we perceive as frightening (i.e., thunderstorms, volcanoes, and tornados) and make us feel displeasure. However, the feeling of pleasure comes about in the realisation that our rational and moral capacity makes us greater than nature (Mollaghan, 2015, p.68). Mollaghan claims that the gaseous films of John Whitney and Jordan Belson (and particularly Belson’s film *Samadhi*) provide excellent examples of the dynamic sublime at work in visual music. She argues that the dynamic sublime, here, evokes simultaneous feelings of fear and beauty. *Samadhi’s* (1967) depictions of “hazy intimate visceral images redolent celestial bodies, that at times reference dying stars and violently burning suns, conjures up W.B. Yeats’ idea of a terrible beauty” (Mollaghan, 2015, p.114).

Synaesthesia

Visual music is often associated with the notion of synaesthesia. The term synaesthesia refers to a rare neurological condition or trait, that occurs: “[...] when a stimulation of one sensory modality automatically triggers a perception in a second modality, in the absence of

any direct stimulation of this second modality” (Harrison and Baron-Cohen 1997; cited in Mollaghan 2015, p.12). For instance, a specific sound or taste could trigger a visual perception of a colour. Some visual music artists may have indeed been synaesthetes. When it comes to hybrid forms of art, however, the term ‘synaesthesia’ commonly refers to pseudo-synaesthesia (ibid). In the case of visual music, music and visuals stimulate both senses (hearing and sight) simultaneously and imitate a synesthetic experience (ibid).

Another form of pseudo-synaesthesia that Mollaghan finds more relevant to visual music is that of *metaphor* (ibid). Here, the audio-visual correspondence is not a direct translation of sound to image. For instance, Mollaghan notes that it is common for artists to use vibrant and bright colours to resemble the loud parts of a musical composition and soft muted hues for the quiet ones – a good example of such a composition is McLaren’s *Synchronomy* (1971). The colour here is not a direct translation of sound. Rather, as McLaren himself notes, the colour-sound associations that he uses in this work, are pseudo/cultural synaesthetic associations. According to Nicholas Cook, the relationship between audio and visuals in cross-media interaction is in fact based on the precondition of “metaphor”. He states that metaphor is “what I shall call an enabling similarity [...] Rather than simply representing or reproducing an existing meaning, it participates in the creation of a new one’ (Cook, 2000, p. 70). Metaphorical associations between image and music can dynamically complement one another (as they are not similar to the point of redundancy or excessively different to the point of conflict) and their interaction gives rise to new meanings as opposed to reproducing existing meanings (ibid).

Mollaghan’s thesis draws on the notion of music, and the (absolute) visual music film as having transcendental qualities and examines how aesthetics and technology in visual music

film evolved concurrently. For Mollaghan, the ideal language that underpins the workings of both image and music is mathematics, arguing that there is a one-to-one correlation between the two senses in sharing the same mathematical code. In the subsequent section, I will explore further various instances in the history of visual music that shed light on issues of referencing and representation.

2.2 Twentieth Century Visual Music: Representation and Immersion

The majority of writers and practitioners in the visual music field do not reject the existence of reference or representation in visual and/or audio. Ox and Keefer note, “while the majority of Visual Music work to date has been abstract, it is not exclusively so, nor is it a required definition in the broader field” (Ox and Keefer, 2005, p.3). Ox and Keefer point out that visual music writer William Moritz would often reference visual music films that were composed using representational images (i.e.,Antheil’s *Ballet Mecanique* (1924), Clair’s *Entr’acte* (1924), several of Bruce Conner's films, and even Busby Berkeley film sequences of choreographed dance as examples of Visual Music films).³¹ These early hybrid visual music pieces fused abstract and representational elements. Similarly, Holger Lund (2018) argues that in visual music, “visuals may be abstract or figurative, but only seldom are they narrative”. This does not mean that narrative structures do not exist in visual music. As

³¹ Mollaghan makes the same reference in her work (Mollaghan, 2015, p.5).

mentioned earlier, musical “narrative” is conveyed through dynamic structures, movement and temporal shifts, and its expressions are emotive.

Other examples of early twentieth century audio-visual art that composed rhythmic images akin to musical forms, include the documentary-style *City Symphony* genre. Notable works include Walter Ruttmann’s *Berlin: Symphony of a Metropolis* (1927), Paul Strand’s *Manhatta* (1922) and Dziga Vertov’s *Man with a Movie Camera* (1929), among others. Asher Arnon’s thesis *Visual Music Strategies and the Sense of Place* (2020) discusses some of these at length. The *City Symphony* genre includes a number of silent films made in the 1920s and 1930s. These films came before sound cinema and were often supported by an orchestral accompaniment. These experimental documentary-style films typically present an artistic or poetic depiction of urban life without a conventional narrative structure and are composed of photographed real-world imagery. Here, the city takes centre stage as the protagonist, depicting the unpredictability present in the multiplicities (people, objects and relationships in motion) that inhabit it. The *City Symphony* films, as the name suggests, were often edited to evoke musical structures, with shots arranged like musical notes and sequences resembling chords and melodies, unfolding into movements or acts. Editing techniques addressed rhythm, tempo, and polyphony within the cinematic narrative (Arnon, 2020, p. 3-4). Discussing *Berlin: Symphony of a Metropolis* (1927) Arnon claims that “the film presents the possibility of handling documentary footage in an abstract, poetic, metaphoric and rhythmic manner (Jacobs et. al, 2019)” (Arnon, 2020, p.25) Vertov’s *Man with a Movie Camera* (1929) is a montage composed, “through geometrical abstraction of movements of objects in space, organised into a rhythmic and artistic whole, while maintaining harmony with the properties and internal rhythm of each object” (Arnon, 2020, p.29). Arnon suggests that Vertov’s

approach (despite differences) resembles that of Kandinsky, in that both “convey a wish to create an art object that is distilled from the reality of its production and by the artist’s awareness of place, time, medium and methods, into an affective actuality in its own right” (Arnon, 2020, p.35).

In 1958 Le Corbusier, Iannis Xenakis and Edgard Varèse created an immersive, architectural multimedia installation for the *Philips World’s Fair in Brussels*. Architecturally, the building was intentionally organised around a series of sonic concepts and strategies that enhanced its acoustical capacities. Its final form was visually fascinating as was its acoustical capacity to sculpt sound. The architecture of the pavilion was designed predominantly by architect and composer Iannis Xenakis. Le Corbusier and Xenakis “conceived the Pavilion as an electronic-spatial environment capable of combining architecture, vocal and concrete music, sounds, coloured light, abstract images and film in a virtual experience of an astonishing synesthetic audiovisual work” (Rebecchi, 2018, p. 96). Rebecchi states that it was a “total” immersive experience that unfolded in time and space (Rebecchi, 2018, p. 96). Partly, this artwork would not have been possible without the advances in the sciences of applied electronics since some of the work that was showcased owed much to the research carried out by the Philips Laboratories (electro-acoustics, lighting, and electronic control technology).

The pavilion's exterior architecture was designed to represent and embody music visually. Xenakis explored the spatiality of sound by using his composition *Metastasis* (1954) as the starting point for constructing the principles of the curved outward surfaces of the Philips Pavilion (the hyperbolic paraboloids). He transferred the glissando movements from the beginning and end of his composition to the mathematical-geometric principles applied to the calculation of the hyperbolic parabolic forms. He, therefore, transferred the continuous

moment of the sound sequences in *Metastasis* to the continuous cladding of the pavilion. John Wheatley highlights the mutual influence that Xenakis's architectural and music composition work had on each other.³² Xenakis was able to adapt musical themes and structure to the three-dimensional architecture of the pavilion.

The Pavilion's structure consisted of nine hyperbolic paraboloids. The interior took the form of a stomach, featuring a narrow entrance and exit on either side of a spacious central area. The walls contributed to a cavernous acoustic environment. At interludes, audiences experienced Iannis Xenakis's musique concrète composition *Concret PH* which resonated throughout. *Concret PH* was a stereophonic composition with sounds of burning coal, played in clusters. Xenakis referred to the relationship between the pavilion and *Concrete PH* as a "homologous antithesis" since the granular structure of the composition acted antithetically to the concept of geometric continuity of the pavilion³³. This exploration of the spatiality of sound was particularly important in the second half of the twentieth century, and I will be returning to this later.

In the latter half of the twentieth century, sound practices in visual music changed from being musical and rhythmical, incorporating other sonic elements, such as electronic sounds and noise.³⁴ Furthermore, filmmakers introduced another innovation in visual music practice. They expanded their work outside the restricted area of the cinema screen and painting,

³² Wheatley states, "The hyperbolic parabola of his Philips Pavilion then encouraged him to crystallise an innovative musical inspiration, based largely on the sliding glissando, enabling his music to be expressed radically, "without breaking its continuity". Smooth architectural stability – and three-dimensional drama – had unexpectedly been converted into the world of music!" (Wheatley, 2009, p. 58–59).

³³ The interior walls of the pavilion were made of asbestos, giving the impression of a "granular texture" that complemented the sound composition created by Xenakis, but were also antithetical to the exterior of the Pavilion. The concepts raised here are consistent with what Evans describes in his "tension/release model" (see later).

³⁴ This will be discussed in more detail in the Sound section of this chapter.

creating more immersive visual music works (Mollaghan, 2015, p.72). In 1957 Jordan Belson and electronic music composer Henry Jacobs incorporated sound, image, and architecture for their performances in the Vortex Concerts.³⁵ They used light projectors to display their works on the dome of the Morrison Planetarium in San Francisco and placed the speakers in an arrangement that surrounded the audience. This visual music work allowed the audience to be part of a collective immersive experience (ibid).

In part, these changes in visual music practices were enabled by technological progression. The invention of camera and film projection enabled Eggeling, Richter, and Ruttmann to put motion into painting and create time-based visual music. Then, the development of colour processing allowed visual music composers to enrich their visuals and also produce synesthetic works by matching hues, intensities, and variations of colours with various musical qualities. Technology enabled artists to gain more control in the making of visuals and sound, but also in the ways of bringing them together and synchronising them. That is, by introducing techniques where the two modes could be produced side by side (Mollaghan, 2015, p.97). Controlled synchronisation expanded the visual music framework by creating visual translations of sound to image and 1:1 coupling, while surround sound systems and light projectors introduced the first immersive performances in visual music practice. Technology made a significant impact on the visuals, sound, image-sound relationships, and spatial immersion in visual music.

As observed until this point, a broader interpretation of visual music's scope that extends beyond its linkage with abstract animation enables considerations of audio-visual

³⁵ This can be seen as a natural successor to the *Gesamtkunstwerk experiments*.

compositions that share the same lineage as visual music. This may offer a new lens through which to interpret the history of visual music and its association with abstraction.

2.3 Contemporary Tendencies in Visual Music

In *On the Aesthetics of Contemporary Visual Music* (2008), Cornelia and Holger Lund discuss a number of contemporary visual music aesthetics and practices, with a particular focus on VJing. They note that contemporary visual music projects can be produced in a studio and later presented on a screen-based platform, or they can be made and presented simultaneously, in a real-time live performance setting. As for the presentation, projectors are commonly used to display the image element of contemporary visual music works. The parameters and specifications of the projector such as brightness, image scale, resolution, movement, position in space, among others, can significantly influence the aesthetic outcome. The writers address two contemporary tendencies in visual music: the *New Elasticity of Images* and *Film Beat* (ibid).

Vjing and Live Performance

Cornelia and Holger Lund identify the “new elasticity of images” as a key tendency in contemporary visual music. They describe images set in dance in relation to music, which can be achieved ‘on-screen’ and ‘off-screen’. ‘Dance On-screen’ describes the medium of on-screen dance comprising depicted visuals (moving characters, objects or lights) that have been edited in such a way that they correspond to the music. ‘Dance off-screen’ describes the

situation where a lack of on-screen dance is supplemented by a dance of the camera (or projector and projector beam) itself; the camera and projector/projector light beams are set up and controlled in real-time by various control interfaces. In situations where the projected image is controlled and determined by people's movements (people dancing), the dance is also considered to be off-screen. This current tendency in visual music explores the relationship between dance and film. It repurposes filming images by turning them into raw material used for the production of new and dynamic visual music compositions. This trend has become possible in the post-rendering era, where various digital technologies, such as software and mixing hardware, allow this type of performance in real-time (ibid). In contemporary visual music practice, VJs become performers. For their live performances, they often operate technologies such as live cameras, mixers, software, effects, projectors, and monitors. Moreover, the VJ can perform with their movements in accordance to the music, very much like a dancer. The spectators of a live performance can experience the dance movement of both on-screen visuals and VJ's off-screen performance.

Film Beat

Another contemporary visual music tendency identified by Lund and Lund is "film beat". Here, image and sound are processed simultaneously, creating a rhythmical audio-visual result. New software has enabled VJs to control both image and sound, something that was difficult to achieve in the past, since most software focused on either sound or video compositing (Lund and Lund, 2008, p.9). Software³⁶ allows for visual music improvisation such

³⁶ Like DVJ-X1

as DVD scratching, which simulates an experience similar to the scratching of vinyl records. One distinctive characteristic of *film beat* aesthetics is the audio-visual mash-up, where composed visuals along with sound or music give rhythmical results. The movements of the filmed characters or objects are edited, sped up, and looped in such a way that they look as if they are following a choreography that corresponds to the music (even though their movement within the original film context was completely different). The rhythmic repetition of movements and gestures to music are the basic patterns of dance. In a number of video mash-ups, the original footage sounds (often diegetic) become rhythmical³⁷ through the video editing process. This rhythmical audio-visual outcome that has been produced by the editing of both image and sound is called “video-music” (Lund and Lund, 2008, p.11). The audio-visual remixes discussed in Lund and Lund’s paper are informed by different aesthetic approaches, drawn from experimental film, live cinema, and visual music produced in a studio. Musically, the examples cited are all inclined towards electronic club music, from which they borrow beats alongside sampling and remixing techniques.

The contemporary visual music discussed by Lund and Lund can be considered to fall within a spectrum that varies from representational to hybrid aesthetics. Even though the form of the visuals and the nature of the sounds are recognisable or referential, they have been remixed to create a new context that is different from the original one. Often, the audio-visual remix does not have continuity, or a narrative, and does not try to simulate a natural experience. Thus, although the visuals and sounds can be representational (live footage), the sequence and overall audio-visual outcome are closer to abstraction. In what follows, I will be

³⁷ Similar to the beat that one might experience in music.

examining the perspectives of different writers and the connections they establish between the two main components of visual music: seeing and listening.

2.4 Sound, Image and Audio-Visual Synthesis

In the various art movements that arrived with Modernism in the early twentieth century there is, undoubtedly, a preference for abstraction over representation. In 1877, Walter Pater famously noted that "all art constantly aspires towards the condition of music" (Pater, 2010, p. 210) This idea stems from the notion that in absolute music, form and content (sense), are seamlessly integrated and perceived as a unified whole. Pater's aphorism forecasted Modernism's aims in abstract art, inspiring painters to seek a visual counterpart to musical themes within the realm of visual arts. Abstract painting, abstract cinema, abstract animation, abstract photography, visual music, and then postmodern audio-visual installations, new media, the VJing scene, motion graphics, and digital media, all challenge the notion of representation in art. At the same time, technological advances (of the twentieth century) enabled the interaction between the visual and aural arts, which allowed for their synthesis and different interpretations of these art forms.

In *Music Alone: Philosophical Reflections on the Purely Musical Experience* (1996), Peter Kivy juxtaposes the sense of vision with that of auditory perception and suggests that hearing is fundamentally different from seeing; precisely because with "hearing" (music), one is less inclined to create meaning and interpretation. "Seeing" on the other hand, prompts a natural propensity to generate visual representation, which triggers the process of meaning-making

in the form of linguistic translation (interpretation). Kivy argues that while music is expressive, it is predominantly an emotional or affective expression that defies figuration (non-narrative).³⁸ Kivy states that: “It is because of our strong tendency to hear music as ‘animate,’ as (at times) emotive utterance, that we perceive emotive properties in music; hear music expressively. Nevertheless, there is not in hearing, as there is in sight, that almost overpowering propensity to put a pictorial interpretation on even the most abstract or ‘formless’ congeries of lines and patterns” (Kivy, 1996, p.6). This is a common-held belief about music that has been expressed by numerous composers, as much as philosophers and theoreticians.³⁹ I will return to the notion of emotive expression through the notion of affect later. However, beyond this framing, the perception of music differs from the perception of images in their individual relationships to space and time. It has long been understood that music is perceived temporally and images spatially. This will be addressed in the following section.

³⁸ This is related to the notion of affect. Affect theories derive from the philosophical theories of Spinoza among others. The theory of affect is a relational theory and in Spinoza describes the modification or variation produced in the body when it interacts with another body, which in turn increases or diminishes the body’s power of activity. The “affective turn” in the second half of the twentieth century is often understood as a reaction to the “linguistic turn” (associated with the work of linguist Ferdinand de Saussure and Jacques Derrida in philosophy). Affect in Deleuze is understood as pre-verbal or non-verbal indicators (are perceived as abstract) which are perceived unconsciously and provide words with their expressive attributes (create feeling and communicate/create meaning). See later.

³⁹ In *The World as Will and Representation* (1818), Schopenhauer distinguishes between *representation* and *will*. While the notion of representation belongs to the world of appearances, ideas and objects, *will* in Schopenhauer falls on the other end of the spectrum, being viewed as a mindless, aimless, and non-rational impulse, which is the foundation of our instinctual drives and is essential to our being. All art forms, (namely architecture, sculpture, painting, and poetry) apart from music belong to the category of representation. Music is in a category of its own, belonging to what he classes as the will. Schopenhauer’s distinction made such an impact on his contemporaries that it altered W.R Wagner’s interpretation of his own work (Swanepoel, 2005, p.2). Similarly, Nietzsche in *The Birth of Tragedy* (1872) borrows from Schopenhauer’s metaphysics and finds an analogy in Ancient Greek Tragedy through the *Apollonian* and the *Dionysian* aesthetic. Music has: “a character and an origin quite different from all the other arts, because, unlike them, it is not a copy of the phenomenon but an immediate copy of the will itself, and therefore complements *everything physical* in the world and every phenomenon by representing what is *metaphysical*, the thing in itself” (Nietzsche, 2012, p.16).

Visual Music Equivalences: Image and Music

As we have seen, attempts to define visual music often highlight the issue of referencing and narrative. Related to this is the effectiveness of visuals and music in reference to one another in visual music composition. Adrian Klein suggests that “somehow or other, we have got to treat light, form and movement, as sound has already been treated. A satisfactory unity will never be found between these expressive media until they are reduced to the same terms” (Klein, 1930, p.37). Addressing this point, Maura McDonnell in *Visual Music* (2007) asks what visual characteristics are available to the visual music artist that are akin to the musical characteristics available to the music composer and how these are used in visual music composition. She argues that,

There are the broad strokes and consideration of, [...] music tradition, style, time, structure, form, space, rhythm, duration, relations, harmony and gestalt. [...] the more specific strokes of, for example, orchestration, phrasing, line, colour, contrast, shape, pattern, repetition, consonance, dissonance, tone and dynamics. Added to this are the artistic style and intentions of the composer, where there is a consideration for the expression of concepts, ideas and emotions.

(McDonnell, 2007, p.2).

According to McDonnell, “The result is a temporal visual artwork that exists in time and whose constituent elements evolve over time just as music elements evolve and exist over time” (McDonnell, 2007, p. 2). This is similar to Brian Evans’s definition of visual music (seen

earlier), as time-based visual imagery that resembles the temporal architecture of absolute music. Evans reviews essential elements (i.e., proportion, temporal design, colour, montage and the musical phrase) and examines how each operates in relation to a tension/release model. His approach builds on the premise that “the resolution of tension moves us through time” musically (Evans, 2005, p.11). Tension here, is understood as conflict or the opposition of forces (dissonance/consonance or tension/release) that motivate and shape action, which are equivalent to the temporal dynamics experienced in music.

To establish the idea of “visual consonance” Evans reviews the notion of proportion. He develops the idea that resolving visual dissonance (tension) leads to consonance (release) thereby creating a dynamic construct that moves the viewer through time in a similar manner to tonal harmony. He states, “Using the tension/release construction, we can move dynamically—some might say musically— through time with visual materials. We can establish visual cadence points. With cadences, we can articulate units of time and so develop larger temporal units such as motifs, periods, and phrases (Evans, 2005, p. 13). Discussing “temporal design”, he provides examples in film where the viewer is moved from visual dissonances to cadences, to moments of visual consonance, illustrating that in these movements time passes musically through various patterns of tension/release (Evans, 2005, p. 15).⁴⁰ In Evans’s model, colour is considered the most ambiguous. He argues that certain aspects of vision, like depth perception and the differentiation between figure and ground,

⁴⁰ Examples include Chris Marker’s *La Jetée* (1962) a historical documentary that uses camera motion over still images, montage and visual composition to tell stories. Contrasts created through variations in movement, repetition and colour are discussed as a syntax from which to construct larger forms and compose visual music. Evans writes: “Each example can be considered as a phrase. We can eventually combine phrases, seeking points of commonality and difference in the visual dimensions of motion (direction and speed), composition, and colour” (Evans, 2005, p. 15).

are colourblind. He suggests that people get visual cues from value, whilst perception of colour, and particularly hue, depend on genetics and experience. He concludes that colour-space is a three-dimensional construct and can move us through time, either by resolving an “emphasis of a single hue to a colouring that balances or equalizes RGB summation values”. He suggests a more practical method, a general application of the perceptual hierarchies of brightness/darkness and/or high saturation that resolve to low saturation or grey (Evans, 2005, p. 18).

Finally, Evans discusses how montage relates to the tension/release construct. He expands on Sergei Eisenstein’s “montage is conflict” and discusses metric, rhythmic, tonal, overtonal, and intellectual montage. He derives a “usable grammar” for the structure of time-based visual art from it, which he applies to the integration of sound and image. Evans’s discussion of montage draws on examples of artworks that consist of real-world (mimetic) images. “Tonal montage” particularly, is correlated to “expression” and the emotional feel of the shots. He argues that we can sidestep the content of the images and focus instead on the graphic or plastic aspects of the moving image (particularly, colour and shape and what these represent). Evans illustrates that the camera movement alone (the medium) can create expectations and fulfilment in a similar manner to musical expression.⁴¹ Evans argues that his aim is to build a simple syntax from a basic design idea and omit issues of content that go beyond formal concerns. In this paper, visual music content (in both images and music/sound) can be abstract or representational, narrative or non-narrative. What matters is that the relationships forged are dynamic and facilitate the passage of time in a manner akin to music.

⁴¹ As already discussed in relation to the *City Symphony* films.

Visual Music: Image-Music Relationship

In visual music, the relationship between music and image is described by Friedmann Dahn as “an equal and meaningful synthesis of the visible and the audible and is therefore ultimately its own form” (Lund and Lund, 2009, p. 149). Battey and Fischman in *Convergence of Time and Space: The Practice of Visual Music from an Electroacoustic Music Perspective* (2016) argue that visual music’s organisational logic depends on the intrinsic attributes of each of its terms (i.e., colour in images, and spectral and morphological content in sound) and the articulation of these materials in time and space (Battey and Fischman, 2016). They suggest that what differentiates visual music from other audiovisual art forms are the relationships formed between sound and image. For instance, film has a specific media hierarchy where speech and images are more prominent, whereas music and sound effects acquire a supporting role. Moreover, they argue that “the organisation and structure of materials in film/animation, generally follow an external narrative” (ibid, p. 62). In contrast, visual music does not follow an external narrative (even when there is an implied narrative) in the same way. In visual music, a storyline may be applied and will contribute to the integration of its materials, however, the story will not be told in the usual sense but rather, as an “unfolding [of] structures and relationships in time” (ibid, 2016, p. 62). They argue that visual music “aims to achieve a delicate balance in which all media interact tightly on an egalitarian basis” (ibid.). Hence, the auditory and visual components in a visual music composition operate in synergy. By tracing the historical lineage of visual music, they point out that whereas in the first half of the twentieth century the spatial (plastic) arts turned toward abstraction (exploring temporality), in the latter half, music/sound shifted towards

mimesis, exploring the spatialisation of sound.⁴² They suggest that “Together these historical shifts serve as a preamble to the development of audiovisual art, revealing underlying theoretical commonalities regarding the articulation of time and space” (Battey and Fischman, 2016, p.1) I now turn to Michel Chion to look at audio-visual synthesis in film in more detail.

Audio-Visual Synthesis

We are capable of speaking two languages at the same time. One is addressed to the eyes, the other to the ears. The content of the communication is different but sometimes there's a link between the two. This is necessary because we're used to the fact that there's a connection between what we see and what we hear.

(Xenakis cited in; Varga, 1996, p.114).

Michel Chion argues that the immersive effect of audio-visual artworks is due to their trans-sensorial nature. He develops the notion of the “audio-visual contract”, arguing that sound and image are “participating in one and the same entity or world” (Chion, 1994, p.222). Despite exhibiting different natures, audio and visual synthesis is defined by transformation. This is not due to a natural harmony between the two senses, but rather because “the two perceptions [vision and hearing] mutually influence each other, lending each other their

⁴² See the Electroacoustic Music section later.

respective properties by contamination and projection” (Chion, 1994, p.9). Chion argues that when image and sound are synthesised, they create an effect which is more powerful and expressive than either could express individually. Sound serves as both a counterpoint and companion to the projected image. The use of diegetic sound in film, for instance, can act as a signpost to the audience and reveal the linear order of the scene (particularly, when using language). Sound also plays a significant role in the temporality of the scenes themselves; sound has the power to give a sense of linearity or succession to what might otherwise be perceived as a series of abstract images.

Chion’s “added value” notion is key to the exchange between audio and visual perception. Radio, silent film and music are less sensorially complete than audio-visual productions, and this enables the audience to engage their imaginations and fill the sensory gaps. Although the use of acousmatic sound⁴³ does not necessarily break audience immersion, a viewer has the expectation to see the causes of sound in the images on screen. Chion’s “synchresis” combines the words synchronism and synthesis to refer to a natural cognitive process which describes the forging between what one sees and hears – a process which fuses sound with image simultaneously. Synchresis is defined as: “the spontaneous and irresistible weld produced between a particular auditory phenomenon and visual phenomenon when they occur at the same time. This joint results independently of any rational logic” (Chion, 1994, p. 63). In synchresis, not every element of the sound heard and the images seen needs to align perfectly. The audience is capable of bridging the gap between sound and image. This is how images gain “added value” (added emotion and/or added

⁴³ Here, acousmatic refers to sounds where the causes and sources of the sound remain unseen.

information) that derives from sound. This enables vision and auditory perception to move independently. However, synchresis is not entirely automatic and is a function of meaning. It is organised according to psychological and contextual determinations.

The majority of the works discussed in this section, thus far, underscores the correlation between sound and image, or the relationship between hearing and seeing. However, as we shall see, by the mid-twentieth century philosophical concepts concerning perception started to shift towards a more holistic "embodied" perspective. These ideas and concepts have significantly influenced the comprehension, creation, and reception of contemporary visual music.⁴⁴ This illustrates that visual music is not only informed by prominent aesthetic tendencies and/or technological progression but also, by influential philosophical and theoretical discourses as well as ideas deriving from social and cultural narratives. Before moving on to sound, I will briefly discuss the philosophical notion of affect and its relation to music and art more generally.

Affect and Music

As already mentioned, music is often understood as more immediate and immersive (by creating a feeling of presence) than any other art form and its impacts are felt more directly within the body. The experience of music and its ability to express affectively or emotively is often discussed as an "embodied" experience which is multi-modal in nature. In its philosophical sense, the notion of affect emphasises embodied experience. Deleuze and Guattari develop the notion of affect, borrowing ideas from Spinoza. Brian Massumi explains

⁴⁴ See Contemporary Practice Review Chapter.

that “Affect (Spinoza’s affectus) is an ability to affect and to be affected. It is pre-personal intensity corresponding to the passage from one experiential state of the body to another and implying an augmentation or diminution in that body’s capacity to act” (Massumi, 1987, p.xvii). Affect is a relational concept that refers to the capacity of bodies to affect and be affected in their movements and interactions within the world. Affects differ from emotions and feelings. Affects are pre-personal and pre-verbal (preceding conscious thought) and its effects are encountered as intensities, directly impacting the body (Tomkins and Demos, 1995, p.19).⁴⁵ In contrast, emotions are “complex constructed experiences that are revealed as socially displayed feelings, and feelings are personal since each individual has a distinct set of memories of sensations to tap into when interpreting and labelling their emotions (Eerola, T., et al., 2017, p3). According to Shouse, “The power of affect lies in the fact that it is unformed and unstructured (abstract). It is affect’s “abstractivity” that makes it transmittable in ways that feelings and emotions are not, and it is because affect is transmittable that it is potentially such a powerful social force” (Shouse, 2005, p.8). Musical meaning, according to Cox (2005) is tacitly understood in an affective and embodied manner, where a listener often unconsciously subvocalises the melody and can even visualize the muscle tension of the performer (Cox cited in; Watkins, 2018, p.376).

As Cox points out, music is understood as possessing a distinctly affective (as opposed to linguistic) expression, however, affect also operates in visual perception or images (indicated through gesture and movement). As Julie Watkins notes, human sounds including breath, tone of voice and vocalisation, as well as images depicting signs of facial expression

⁴⁵ Tomkins and Demos state that the body responds with an analogue of the intensity of the affect, “in the facial muscles, the viscera, the respiratory system, the skeleton, autonomic blood flow changes and vocalisations” (Tomkins and Demos, 1995, p. 19).

and posture, can transmit affects that can resonate with others more powerfully than the conscious message delivered by the artwork. Watkins argues that “both visual music and music can connote human emotional expression on many levels, some of which are affective, embodying or recreating the expressive quality of human vocalisation, embodying the emotion in human motion, and in moving image a sense of animacy or, within music a ‘virtual person’ (Watkins, 2018, p.376). Abstract affect, therefore, is an inherent property of gesture and movement. There is no one-to-one correspondence between bodily movements (or gestures) and emotional states. This is the reason why affective gestures in art can create emotional impacts that differ from person to person and also explains how the same individual can respond differently to the same art on different occasions. Affect relates to the inherent elements within sound/music and images that provide them with their expressive qualities and trigger meaning-making processes. Sensory perception here, is understood as having a multi-modal nature, and perception is conceived as “embodied”.

In the following section, I will be taking a closer look at how sound theories have impacted and contributed to changes in visual music composition.

2.5 Electroacoustic Music

During the mid-twentieth century, sound came to be seen as a music material in its own right and theories of sound challenged notions about what constitutes music (Landy, 2007). For Landy, there is an inherent musicality in our day-to-day sonic environments. His approach relies on investigating what a “music of sounds”, as opposed to a “music of notes”, can reveal

about how we relate to music (as listeners). Landy distinguishes between sound-based music and note-based music, and he defines the former term as: “the art form in which the sound, that is, not the musical note, is its basic unit” (Landy, 2007, p. 17). Landy argues that the twentieth century can be characterised by artistic innovation and in music specifically,

[...] an extremely radical innovation was undoubtedly the introduction of any sound as potential material. This broadening of material accompanied the equally radical developments in music technology allowing, for example, individual sounds to be generated ex nihilo or recorded and then manipulated and subsequently placed into an audio or audiovisual musical context

(Landy, 2007, p. vii).

Advancements in technology expanded the possibilities for sound manipulation, and the exploration of sound-based music and art forms developed rapidly. This in turn created different categories of sound engineering, where sound operates differently depending on context.⁴⁶ The developments in the latter half of the previous century, with the rise of experimental music, electroacoustic and electronic music, disturb the ontological distinction between music and sound. Musicology and music analysis tend to rely on what Wishart has described as the “lattice orientation” in Western art music, which divides time and space into

⁴⁶ For instance: *Sound art* is an experimental category that involves a wide range of creative practices that utilise sound as the primary medium. Sound art need not adhere to traditional musical structures and conventions. It is often more abstract, conceptual, or a site-specific approach to sound. Sound art gives precedence to artistic concepts and sensory experiences. *Sound design* is often used to enhance and support particular mediums and creates sonic environments that complement and enhance the experience of the medium it is supporting (Landy, 2007, p. 6, 17, 56). The sound designer works closely with visual and narrative elements to ensure that the sound effectively communicates and enhances a storyline and/or message. The sonic experience created by the sound designer is one that has as its goal to achieve a seamless integration of sound with visual elements, as opposed to exploring sound as an autonomous artistic medium.

quantifiable units (the traditional grid of rhythmic meter and a scale of seven notes). With sound-based music, one can reduce emphasis on the lattice and instead, consider time and space, “acoustic space, virtual space, or other, in terms of open continua that can be shaped and articulated” (Battey and Fischman, 2013, p. 70). Here, the composer is not only working with notes and beats but is also crafting relationships between shapes (sonic objects) and textures (ibid.).⁴⁷ These shifts also had significant implications for the production, comprehension, and reception of visual music (see later). In what follows, I look at two interrelated ideas that became more prominent in the latter half of the twentieth century: the spatialization of sound/music and the incorporation of referential/mimetic elements (of sound) within the musical framework.

Sound Space

Pierre Schaeffer developed an analytical vocabulary, analysing the sonic experience of space through the notion of the acousmatic. Sound, in acousmatic art, emanates from concealed sources, often behind a “veil” of loudspeakers.⁴⁸ Schaeffer defines “acousmatic” as the experience of hearing a sound without discerning its origin (Schaeffer, 1966, p91). By reducing sound to the realm of hearing alone, hearing is isolated from the other senses, particularly sight, and can be examined independently. This division, termed “anti-natural” by

⁴⁷ See Denis Smalley later.

⁴⁸ Pierre Schaeffer first introduced the term “acousmatic” to refer to sound that is experienced without a visible source, so as to describe the listening experience of *musique concrète*. The term originates from Pythagoras’ practice of lecturing behind a screen. *Music concrète* is a genre of musical composition that employs recorded sounds in their raw form (recordings of musical instruments, human vocals, natural surroundings, as also sounds created through sound synthesis and computer-based digital signal processing). These sounds may undergo manipulation through various audio signal processing and tape music techniques, often resulting in a collage-like assembly.

Schaeffer, involves a deliberate separation of the senses despite their natural tendency for interaction in providing information about the environment. The acousmatic scenario alters our auditory perception by removing the sound from its original "audiovisual complex". As Feld explains, "Schaeffer's group began recording, observing, and acoustically analysing the sonic experience of space and place [...] and developed an analytical vocabulary, a notation system, and a comparative framework for the study of acoustic space and its human interpretation and feedback" (Feld, 1996, p. 95-96). While acknowledging the importance of Schaeffer's work, Feld criticises its tendency to reinforce "a visual-auditory great divide" (ibid.).

Electroacoustic composer, Trevor Wishart, poses the notion of "aural landscape" in opposition to Schaeffer's acousmatic music. Wishart distinguishes between various "acoustic spaces": the illusion of two-dimensional space, the motion of sound-objects through virtual space and "convolution".⁴⁹ With the concept of "aural landscape", Wishart highlights the aesthetic significance of modes of sonic experience that are tied to our ability to recognize the source of the sound. He points out that "changes in aural perspective on an object" obtained by certain recording techniques "produce quite different acoustic results and when they are juxtaposed in the aural landscape, our sense of aural perspective is transformed" (Wishart cited in; Born, 2015, p.8). Denis Smalley who claims that "acousmatic music is the only sonic medium that concentrates on space and spatial experience as aesthetically central" provides an alternative perspective on spatialization (Smalley 2007, p. 35). Smalley's writings include various approaches, from spectro-morphology (discussed later) to concerns of

⁴⁹ Convolution refers to "the imposition of the acoustic characteristics of any pre-analysed sound environment upon a given sound object" (Wishart, 1986, p.45).

“space-form and the acousmatic image” (Smalley, 2007). The latter develops on the phenomenology of the potential spatial forms presented in acousmatic music. Smalley's "space-form", whilst recognizing the simultaneous evolution of space and time in music, is “an approach to musical form, and its analysis, which privileges space as the primary articulator. Time acts in the service of space” (Smalley, 2007, p.56). Smalley however, arrives at a more “holistic view of space” (space and time in sound image) while attending to the sounds of a particular location from which he derives “a remarkable taxonomy of analytical terms for the perception of spatial sound: zoned, proximate, behavioural, perspectival, distal, utterance, agential, vectorial, panoramic, ouverture/enclosure, approach/recession, diagonal forces and so on” (Born, 2015, p.9). Smalley develops a detailed investigation on the relational nature of spatialised sounds, as well as the tendency of sounds to create a sense of spatial boundaries through shifting and nested sonic horizons (Smalley, 2007, p. 37).

Instead of creating a dichotomy between vision and hearing, interdisciplinary research on sound and hearing analysis tends to emphasize the interconnectedness of the senses and focuses on the study of "sensory ratios" (Feld, 1996, p.96). Steven Feld argues that the coined term acoustemology, “invokes the way that space indexes the distribution of sounds, and time indexes the motion of sounds. Yet an acoustic time is always spatialized [...] and acoustic space is likewise temporalized” (Feld, 1996, p.97–8). Georgina Born argues that “perhaps the most important distinguishing feature of auditory experience [is] its capacity to reconfigure space” (Born, 2015, p.2). Space here is understood as inherently mobile (in motion, and as a co-product of all of those things that encompass it, as they encounter each other and transform one other. Space is not only understood as continually being under construction (in process) but also “space is seen as a co-product of those proceedings” (Thrift cited in; Born,

2015, p.14). Space is understood as relational, multiple and indivisible from time, and is the outcome of social and material practice: “indeed, space and time should be understood as ‘combined in becoming’” (ibid.). Studies of sound demonstrate a conceptual shift towards phenomenology, drawing on the ideas of Merleau-Ponty and subsequent scholars (i.e. Deleuze and Guattari), who highlight the embodied and spatialised nature of the moving body and the affective entailments of sound perception.

Sonic knowledge is considered experiential knowledge based on the exchange between sound, space and place (the body). The experience of sound and music (their spatiality and temporality) are immanently affective and formulate subjective impression and expression as well as transformation; multiplicities transform space and are transformed by space. The auditory self is understood as an embodied self that mediates and is mediated by sounds; responds and re-sounds. These ideas are harnessed to aesthetic ends and will be discussed further in the following chapter. The spatialisation of sound is associated with multichannel techniques of studio recordings and loudspeaker projection as it develops in music from the 1950s onwards. Theories of sound space and time inform the design and execution of visual music across different mediums, enabling artists to explore new dimensions of sensory expression and immersion. I will now turn to the concept of mimesis.

Sound: Mimesis

Leigh Landy

The starting point for Landy in *Understanding the Art of Sound Organisation* (2007) are sonic constructions that use perceptible real-world references (mimetic sounds) and allow a

diverse range of associations for the listener *to latch on to*; either by identifying the references directly, or by experiencing them within the environment and context that the composer has created.⁵⁰ Landy argues that certain sound-based compositions enable a connection between art and life because “the specific content creates experiential associations linked with meaning by listeners” (Landy, 2007, p.4). With the use of real-world recordings, the composer can create sonic spaces which immerse the listener into virtual realities, based on the listener’s ability to identify the sources of sounds (Battey and Fischman, 2016). Battey and Fischman, argue that “the effects of mimesis extend into new types of semiotic communication” (Battey and Fischman, 2013, p.68). The mimetic composer becomes a storyteller; someone who documents the real world and can also provide a personal interpretation of reality. Although, this is more of an “unfolding” of structures and relationships. Landy’s exploration of Simon Emmerson’s “language grid” and particularly the differentiation between the abstract and the abstracted, sheds light on the interaction between abstract and mimetic aspects of sound.

Simon Emmerson: “The Language Grid”

Simon Emmerson claims that “the use of natural sounds in the composition of electroacoustic music on tape allows us to claim that this is the first musical genre ever to place under the composer’s control an acoustic palette as wide as that of the environment itself. Hence the vastly increased possibility that sounds may appear imitative” (Emmerson,

⁵⁰ Borrowing from phenomenology and Lockheed specifically, Landy argues that meaning can be created by an experienced listener (noema which is the content or object of consciousness) based on past experiences. Or otherwise, an inexperienced listener who cannot rely on previous experience, relies on what is called experienced listening (noesis which is the process of consciousness).

1986, p. 18). An entire continuum exists and is available to acousmatic composers. Emmerson's "language grid" divides musical discourse into classes and syntaxes. The identity of a sound can range from abstract to mimetic, and its syntax from abstract to abstracted (Emmerson, 1986).⁵¹ Mimetic identities retain their original referential qualities, while abstract identities do not. While abstracted syntaxes are organised in reference to ecological and/or other referential models related to the sound source, abstract syntaxes are organised according to formal principles. Emmerson highlights that these aural and mimetic aspects of a composition are hardly ever manifested as belonging purely to one axis or the other, rather most artworks tend to move around and traverse the grid as sound evolves. Emmerson illustrates how sound operates on a spectrum and shows the interaction between the referential (or concrete) and the abstract.

An important facet of Emmerson's "language grid" is his distinction between the abstract and the abstracted. Essentially, the convergence of aural and mimetic discourse (situated on the spectrum ranging from abstract to abstracted syntax) establishes a domain where possible amalgamation between concrete and abstract-oriented elements in sound exist within the same framework. The composer is free to explore and create within this space, a unique compositional language. He distinguishes between two types of mimesis, a "timbral" mimesis which, refers to a direct imitation of the timbre (colour) of a natural sound and a "syntactic" mimesis, which may imitate the relationship between natural events, i.e.,

⁵¹ Emmerson's "language grid" places "syntax" on one end of the axis, (which runs from "abstract" to "abstracted") and "discourse" on the other end of the axis (which runs from "aural" to "mimetic") with midpoints illustrating the combinations that can take place. (Landy, 2007, p.34). Within the "syntax" axis, "abstract syntax" signifies a formalist approach to organising the work, while "abstracted" syntax suggests that the source material serves as the foundational (building block) element for the composition. On the other side, the "discourse" axis runs between what he calls the dominance of "aural" discourse to "mimetic" discourse. The more abstract the sound quality the more likely it is to fall under "aural" discourse, whereas the more identifiable a sound, the more likely it will fall under "mimetic" discourse.

the rhythms of speech can be orchestrated in a number of ways (Emmerson, 1986, p. 17-18).⁵² He argues that “abstracted sound” (sound that has been deliberately removed from its original context) enhances the evocation of images “by deliberately removing the visual clues as to the cause of sounds, indeed by removing or reducing visual stimulation of any kind, the composer is almost challenging the listener to re-create, if not an apparent cause, then at least an associated image to ‘accompany’ the music” (Emmerson, 1986, p.18). Landy considers Emmerson’s “language grid” an important tool because it explains the tendency for listeners to invent their own imagery in response to abstract sounds (often contradictory to the intentions of the narrative of the work (Landy, 2006). Emmerson claims that, “the term ‘image’ may be interpreted as lying somewhere between true synaesthesia with visual image and a more ambiguous complex of auditory, visual and emotional stimuli. We are concerned here not with how specific sources may evoke particular images but with how the imagery evoked interacts with more abstract aspects of musical composition” (Emmerson, 1986, p.17). Hence even for “abstract” acousmatic music, there exists a tendency and capacity for imagistic qualities to emerge, even though these sounds do not directly reference real-world images. This is acknowledged in Smalley, “the invisible world of acousmatic imagery also conjures up scenes in the imagination” (Smalley, 2000). Emmerson’s approach views environmental sound as inherently contextual and meaning emerges from both its inherent properties and its relation to the surrounding environment. Electroacoustic techniques often extract sounds from their original context and reproduce them in a different setting, resulting

⁵² In his discussion of music, Emmerson utilises the term “mimesis”, “to denote the imitation not only of nature but also of aspects of human culture not usually associated directly with musical material. Some aspects of mimesis are unconsciously passed on by a culture while others are consciously appropriated and used by the artist. Conscious and unconscious aspects are not sealed off from one another, of course, and a two-way exchange is evident over a period of time” (Emmerson, 1986: 18).

in abstracting mimetic sounds. The significance of environmental sounds is that they significantly differ from traditional musical material, in that they are more complex in spectral and temporal shape (see Smalley later). Environmental sounds are challenging to parametrise since their meaning is context-dependent.

Emmerson's framework clarifies the process of sound's transition from tangible to intangible and from the representational to the abstracted. It highlights the interrelation and interaction between these dualities, emphasising that sound typically exists within a spectrum that changes as it develops and evolves. Moreover, Emmerson's work illustrates that the abstract is not inherently devoid of meaning since a listener can establish connections through various means. I will now turn to discuss Smalley's theory of spectromorphology, which operates in reverse, progressing from abstract to representational.

Denis Smalley: "Spectromorphology"

In "Spectromorphology: explaining sound shapes" (1997) Denis Smalley defines spectromorphology as "an approach to sound materials and musical structures which concentrates on the spectrum of available pitches and their shaping in time" (Smalley 1986, p.61). Spectro-morphology highlights "the *interaction* between sound spectra (spectro-) and the way they change and are shaped through time (-morphology)" (Smalley, 1997, p. 107; my emphasis). The theory of spectromorphology is concerned with how sound operates; how it is apprehended by the ear and the changes in spectromorphological energies as heard by a listener (a perceiving subject).

Smalley's spectral content refers to the frequency content of a sound. This involves analysing the distribution of energy across different frequency components and may refer to available pitches, specific frequencies and amplitudes present in a sound space. The morphological aspect refers to how the structure or shape of a sound evolves. In simple terms, this aspect determines how a sound begins, develops, changes, and ends - it refers to a sound's narrative or the unfolding of its relationships. It also refers to textural corporeal/touch characteristics, including alterations in density, shape and movement (EARS, n.d.). Smalley constructs an extensive framework for categorising various spectromorphological appearances. This framework commences with a detailed examination of textural levels encompassing sonic micro-events that may exist within gestural contours, how they interact or serve to impart a textural orientation to a piece. It then progresses to higher-order levels, addressing the evolution of discrete sounds, i.e., basic sonic gestures from start to end. The dynamic states of changing densities that unfold in these processes arise from alterations of spectral and morphological forms, their spatial distribution, and the varied directions of their trajectories, all of which, serve as the foundation for establishing compositional decoding patterns, prediction and expectation in musical developments. These patterns are crucial for creating an impact and providing cues for orientation (Smalley, 1997, p. 112-118).

Spectromorphology seeks to establish the descriptive language and tools that allow both listeners and practitioners to engage in discussions about the fundamental characteristics that are inherent to sound; the sound-shapes, sensations and the associations they are capable of evoking. Smalley begins by exploring abstract sound and argues that the concept of spectromorphology "is intended to account for types of electroacoustic music

which are more concerned with spectral qualities than actual notes, more concerned with varieties of motion and flexible fluctuations in time rather than metrical time, more concerned to account for sounds whose sources are relatively mysterious or ambiguous rather than blatantly obvious” (Smalley, 1997, p.109). Smalley acknowledges that the motion and growth processes are central to spectromorphology, and the energy inherent to spectral motion extends beyond sonic phenomena. Smalley suggests that sonic motion itself may imply real or imagined motions of shapes in free space (Smalley, 1997, p.110). For Smalley, a listener instinctively responds to the physicality of sound (its space, the energy and motion involved in its apprehension).

Smalley explains spectromorphology through the notion of *gesture*. The concept of gesture is relational and an articulation of the continuum. Smalley’s notion of gesture informs the relationship between the visual and the aural, as he argues that the visual absence of a sound triggers a natural human inclination to associate sounds with an assumed source and cause. This tendency is defined as source bonding – a connection that establishes a link between the intrinsic spectromorphological qualities of the sound and extrinsic, real, imagined, or imaginative connections (Smalley, 1997, p.110). The listener, Smalley suggests, will often associate specific visual or spatial qualities with various sonic attributes. He examines how human agency is involved in the production of sound in instrumental music, specifically focusing on the sound-making gesture; gesture utilizes motion and sense of touch to generate sound from a “sounding body”. Smalley considers how source bonding establishes a connection between source and cause that leads to an eventual sonic event. The sound-making gesture is understood as an “energy-motion trajectory” with spectromorphological significance for both the agent, through sensorimotor experience, and

the observing listener (perceiver) who correlates the movement (and energy) of the physical body to the nature of the produced sound. Hence, for Smalley, the spectromorphological expression of a gesture encompasses tactile, visual, and aural elements (Smalley, 1997, p.111). In cases where visible human presence is absent, as would be the case in acousmatic music, the links of source bonding are maintained through what Smalley calls *gestural surrogacy*. Gestural surrogacy is activated by memories of actual sounding gestures (these can vary in their levels of clarity). Clarity depends on whether the sound is mimetic (referential), abstracted (discussed in Emerson above) or purely abstract and can span from states of clear identification of recorded or electronically simulated sounds based on their spectromorphological attributes (i.e., mimetic,) to states of increasing ambiguity (regarding their source and cause). This is achieved by the decrease or alteration of identifiable gestural clues (i.e., abstracted), to the state of what Smalley calls remote surrogacy (abstract).⁵³ In remote surrogacy, gestural residues persist (as traces) while the source and cause become unidentifiable. It is in this latter state, gesture functions as a trajectory of moving energies devoid of extrinsic associations.

Similarly, Wishart argues that “gesture is essentially an articulation of the continuum... [and] is evidenced in the internal morphology of sound-objects and also in the overall shaping of groups, phrases etc.” (Wishart, 1996, p.17). Wishart notes that sound can encompass physical attributes (contour, dynamics, and articulation) and expressive qualities (movement, shape and emotional impact). These gestural qualities of sound are expressive and/or evoke

⁵³ The range of gestural surrogacies from recognized sound sources to unknown (abstract) are: first-order surrogacy, second-order gesture, third-order surrogacy and remote surrogacy (Smalley, 1997, p.112).

meaning.⁵⁴ For Smalley, there are several factors that collectively contribute and work in tandem, to create and reveal spatiality as music progresses through time. Sound perception is bound up with the totality of our motor-sensory experience and our imagination. What a listener hears (and by extension the meaningful associations one makes) is coloured and shaped by that particular subject's previous knowledge, both subjective and culturally acquired, as well as the space and vantage point of that listener.

Trevor Wishart

In *On Sonic Art* (1996), Wishart considers some of the new developments in music-making and musical aesthetics since the advent of the home computer. Although his work focuses solely on sound, numerous ideas and concepts that Wishart introduces can be useful to composers and visual artists who experiment with visual music. Among these, *On Sonic Art* discusses lattice-free parameters of sound in order to advance a notion of sonic discourse and practice that is beyond what might otherwise have been possible using a musical score. Although intended as a brief introduction, the following subheadings provide a sense of Wishart's main terms and concepts, as applicable to the content of this particular thesis; later in the thesis, some of these parameters are reviewed in the context of visual music, particularly in terms of how these might apply in the creation of immersive visual music works.

⁵⁴ Wishart claims, "For the individual speaker, however, meaning is a synthetic activity. She or he means. Not merely the combination of words but a choice from an infinitude of possible *inflections, tones of voice and accents for their delivery, together with possibilities of movement, gesture and even song*, enter into the synthesis of the speech-act which attempts to convey what he or she means" (Wishart, 1996, p.13; my emphasis)

Sound Image

In a similar way to Smalley, Wishart notes that when listening to a sound (where the source is absent or out of sight) a potential source may be imagined. This is quite common when a listener experiences recorded music played through loudspeakers; an aural image can arise in the listener's imagination when they hear the specific sounds (perhaps, in relation to other sounds or in a specific environment), and we might refer to this as a sound-image. The sound-image is not always in alignment with the actual source of the recorded sound, since heavily edited or transformed sound can become unrecognisable, but that does not necessarily prevent listeners from imagining a potential source for what they hear. One may apply Wishart's concept to a visual music scenario, where the visuals are made to represent a given sound. In such cases, the visual-image would correspond to the sound-image, rather than the exact source of the recorded sound (which, oftentimes can be unknown), with the corresponding imagery that can range from representational to abstract depending on the sound-image.

Spatial location of sound

The term 'spatial location', in Wishart's writing, refers to the position of a sound object within the virtual acoustic space (Wishart 1996, p194). This illusion of spatial distance between the listener and the sound object can be created with the use of high/low amplitude, echo or reverberation, among others. Stereo sound can be enhanced with the use of a surround sound system, where the sound is delivered from different speakers arranged

around the listener to further enhance the notion of a virtual space. For example, a signal with low amplitude and low frequency that is delivered from the front speakers can create the illusion that the sound source is in front of the listener at some considerable distance. Along similar lines, surround sound systems can improve the virtual acoustic space possibilities and support the production of immersive visual music. The visuals that correspond to the spatial sound in a visual music scenario, can appear nearer or further from the viewer/listener, depending on the combination of sonic and visual cues. Additionally, they can appear front-back-left-right of the observer with the use of multiple screens/projections or VR. The matching location of the visuals and sounds can be part of the arsenal of visual music artists for applying additional levels of image-sound correspondences.

Spatial Motion

Spatial motion is the illusion of a sound object altering its position within the virtual acoustic space. Spatial motions can be achieved with time-based alterations of amplitude, frequency, and reverberation but also with cross-fading from one set of loudspeakers to another. Again, this illusion can be more dynamic with fewer limitations when a surround sound system is utilised, and, thus, this is often the preferred method in spatial sound design.

Figure: 1 below, shows a simple instance of spatial motion inspired by 'On Sonic Art'. Illustrations 'a', 'b' and 'c' show the top view of a listener placed in the middle of a virtual acoustic space. The sound object cross-fades from the front-left speaker to the left speaker behind the listener, while all other parameters of the sound remain the same. This creates the illusion of a back-left side edge-hugging movement. In *Figure: 2* (illustrations 'a', 'b' and

'c') the sound starts again from the front-left speaker, but this time crossfades to the front-right speaker, so as to make an aural edge-hugging motion from front-left to front-right.

Figure: 1

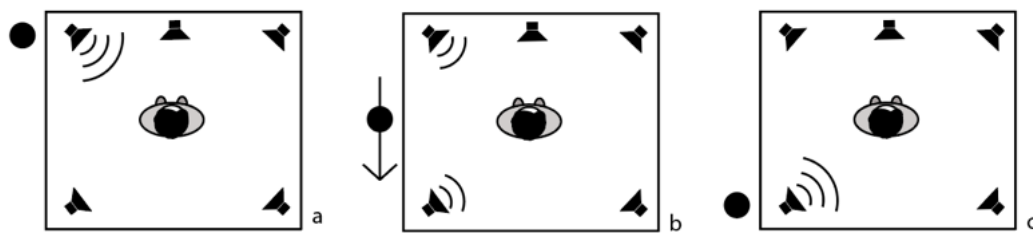
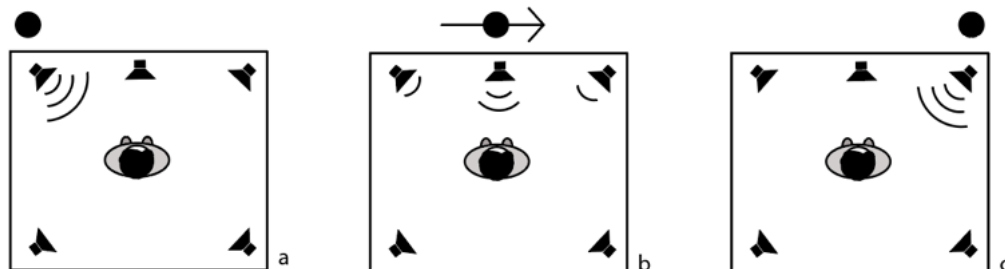


Figure: 2



In visual music instance, when the sound crossfades from front-left to front-right, the visual object (or perhaps a group of objects) can be displayed on a screen in front of the observer and have its position changed and keyframed from left to right in a duration

analogous to the sound motion. This will create an audiovisual outcome that resembles our natural perception when the visuals' motion aligns with the sound's motion.⁵⁵

Amplitude /pitch

Amplitude refers to the loudness or volume of the sound. Pitch is an auditory property that can be placed on a scale from low to high and is related to frequency, e.g. a sound that has high frequency is high pitched (Gupta, 2010; Ladefoged, 1997). These two parameters (amplitude and pitch) can provide information about the sound-image, such as the distance of the sound source and/or the size of the sound source. From our experience, a sound source that is closer to us is perceived as being louder than an analogous sound source that is far away. Similarly, a sound that becomes increasingly loud *may* give the impression that the sound image is getting closer to the listener. Therefore, loudness can express both location and motion. Furthermore, from our experience larger and heavier objects produce louder sounds, and conversely, smaller objects produce quieter sounds; this is not necessarily a rule, but it is a common association (Wishart, 1996, p.191). Therefore, loudness and pitch can give us information about the virtual scale (along with location and motion) of the sound-images and suggest the corresponding parameters of the visuals in visual music.

⁵⁵ It is significant to note that there are many examples in visual music, where there is no clear and distinct visual object. As also, artistic reasons why a composer might not want to recreate a natural experience.

Wishart's work illustrates how technology has transformed our control over sound; a discussion which is useful in understanding the sound component in contemporary visual music.⁵⁶ In what follows, I discuss the impact of technology on visual music.

2.6 Technology and Media Theory: Immersion

In Cornelia and Holger Lund's paper *On the Aesthetics of Contemporary Visual Music* (2008) they claim that: "Mostly the aesthetics [of visual music] are informed by the features and possibilities of digital software and hardware, but also by analogue devices [...]" (Lund and Lund: 2008, p.2). Arguably, this has always been the case for visual music in the digital era. As Julie Watkins points out: "leading pioneers in visual music were, of necessity, innovators of technology as well as visual musicians and artists as well" (Watkins, 2018, p.1). The development and exploration of new technology enable visual music artists to consistently re-imagine how music can be made visible in novel ways. As we shall see, visual music and audio-visual art forms have developed in tandem with the progression in digital software and hardware. Digital technology has had a great impact on both the production and presentation of visual music. Digital software and hardware can offer many features and a wide range of possibilities in the creation of visual music. For instance, fast processors and powerful graphic cards allowed the coupling of visuals with music live in real-time, and have helped to increase audio-visual productions in general (Lund and Lund, 2008). In some of the

⁵⁶ Much of Trevor Wishart's work and terminology discussed here, is used to discuss the sound component of visual music works in later chapters.

artworks discussed in the Contemporary Review Chapter, visual music artists incorporate new elements enabled by technological developments or have developed their own new technology to create visual music (see Henke later). In other cases, there is a remediation of old elements, re-imagined in new ways. Here, it is useful to turn to Bolter and Grusin's (1999) notion of remediation to investigate how new technologies and re-fashioned ideas might operate in the context of visual music.

Bolter and Grusin: Remediation

In *Remediation: Understanding New Media* (1999) Bolter and Grusin view *remediation* as a defining characteristic of digital and new media. Remediation describes the appropriation of the content of one medium into another or, differently, remediation refers to the assimilation or blending of old and new media (in either direction). Bolter and Grusin argue that digital and new media are consistently remediating their predecessors.⁵⁷ To be sure, old media can remediate new media as well; this occurs when old media attempts to reassert itself in the digital world. Bolter and Grusin conceive the notion of remediation, not simply within the limits of re-fashioned technology. They also extend this concept to include the ideas and theories behind the creation of these technologies.

Bolter and Grusin claim that new visual media achieves cultural significance by paying homage to (often rivalling, or refashioning) earlier media, such as painting, photography, film, and television. They identify similarities between old and new media, specifically in their tendencies and attempts to create convincing representations of reality (aiming to simulate

⁵⁷ This includes television, radio, print journalism and other forms now considered old media.

reality as closely as possible) i.e., Virtual Reality, which is immersive and interactive. These are attempts to create what they name “immediacy”. This desire for immediacy is not new. Since the Renaissance, at least, such a desire has been one of the defining features of Western visual representation. That is, “to create a presence [that] should come as closely as possible to our daily visual experience” (Bolter and Grusin, 1999, p.22). In order to achieve this, virtual reality’s graphic space should be “continuous and full of objects” and “should fill the viewer’s field of vision without rupture” (Bolter and Grusin, 1999, p.22). They maintain that in order to understand the notion of immediacy in computer graphics in contemporary practice, it is important to consider the ways in which earlier mediums, like painting, television, film, and photography, have sought to satisfy this same desire. They state, “these earlier mediums sought immediacy through the interplay of the aesthetic value of transparency with techniques of linear perspective, erasure, and automaticity, all of which are strategies also at work in digital technology” (Bolter and Grusin, 1999, p.24). In other words, virtual reality not only shares the same concerns as earlier mediums (concerned with creating accurate representations of visual reality); rather than being entirely new and self-sufficient, newer technologies have built upon these.

Bolter and Grusin differentiate between two types of immediacy. They introduce the terms “transparent immediacy” and “hyper-immediacy”, which are two different logics of remediation. Transparent immediacy is the creation of representational images that try to hide their representational qualities, often creating realistic illusions that are difficult to detect. In order to create these realistic representations, artists erase features which enable

the viewer to identify that it is a mediated environment (that there is a medium apparent).⁵⁸

In transparent immediacy, techniques which are representational and immersive are employed; real life-size figures (i.e., sculptures) with detailed anatomy, the illusion of the third dimension and perspective in painting, lights and shadows, screen dimensions that can capture all our peripheral vision, surround sound, and Virtual Reality. Contrastingly, hyper-immediacy is a “style of visual representation whose goal is to remind the viewer of the medium” (Bolter and Grusin, 1999, p.272). Hyper-immediacy employs representational images or three-dimensional graphics, but in contrast to transparent immediacy aims to draw attention to the medium itself. Hyper-immediacy reminds the viewer that what they are viewing is a representation, dispelling any possibility of illusion. Several examples that illustrate hyper-immediacy at work are Dada collages, newspapers, websites, graphic design, and film. Hyper-immediacy plays on the desire for both immediacy and transparent immediacy. Consequently, making the viewer hyper-conscious of the act of seeing. Hyper-immediacy is therefore self-referential (of both the visual composition and the medium in use).

Oliver Grau: Immersion and Interactivity

Oliver Grau, in *Virtual Art: From Illusion to Immersion* (2003) elaborates on the concept of immediacy and realism in art, taking a special interest in Virtual Reality and virtual spaces; since they are the most contemporary media to combine art, science and technology. He maintains that virtual images and spaces are not something new. Rather, they belong to the

⁵⁸ This includes pixels, frame of the medium, glitches, evident brush strokes, text, graphics that do not follow the physics of the scene, overlapping images, stylisation, non-diegetic sounds etc.

discontinuous attempts (in various art movements), seeking illusory images and spaces that Grau traces back in history (e.g., the frescoes in Villa dei Misteri in Pompeii). He claims that on one hand, there is the recurring desire in Western art to create illusions that mimic reality, but on the other hand, it is not possible to create an artwork that is an objective representation of reality since it will always carry an element of subjectivity.

Grau claims that, "Virtual space is an automatic illusion of hard – and software elements, a virtual image machine that is based on the principle of real time" (Grau, 2003, p.152). He discusses the strategies of immediacy through the use of digital technology, as the production of "as if" worlds. Grau agrees with Bolter and Grusin's assessment that immersion can be achieved through scale or specific devices in two main ways. Firstly, it can be achieved by creating large-scale spaces (this follows the Western art tradition of paintings, painting rooms, wallpapers etc.) which physically surround the observer, such as the CAVE, IMAX cinemas, planetariums, surround sound systems etc. Secondly, through the use of devices that cover the eyes and ears of the observers, such as Virtual Reality, stereoscopes, and headphones with stereo or, 3D sound.

The relationship between sound and image in virtual art can effectively enhance the experience of immersion. Grau evaluates the immersive experience people felt in *Osmose* (1995) by Char Davies, where each visually experienced zone has its own localised sound. He argues that the mimesis, or re-creation, of a *natural* experience between sound and image (for instance, when moving towards an image, the sound it generates becomes louder and clearer) was a decisive factor in generating a *feeling of presence* for the audience (he understands this as being inside the image). He asserts that the audience accepted this form of art with great enthusiasm because of this very feeling of immersion. As we shall see in the

following chapter, these strategies are regularly being used in contemporary visual music practices, and specifically in visual music works that are considered immersive.

According to Grau, another strategy that achieves the feeling of presence is *interaction*. He argues that in virtual reality, a panoramic view combined with “sensorimotor exploration of an image space [...] gives the impression of a “living” environment. Interactive media have changed our idea of the image into one of a multisensory interactive space of experience with a time frame” (Grau, 2003, p.7). Digital technology takes interaction to another level, since it does not merely stimulate simple interactions, such as moving objects, but can also generate CG organisms with artificial intelligence that can act subjectively: reacting to touch, reproducing, imitating, and learning how to behave etc. By combining art, technology and science, humans not only imitate the appearance of the existing world but also give life to the CG world and therefore create intelligent design. We can now create artificial worlds, with artificial life and artificial intelligence. The technologies available are improving and are becoming ever more convincing year by year. This is relevant to examples of contemporary visual music that use interactive forms of presentation, like VJing and installation. In what follows, I discuss a number of contemporary tendencies in visual music practice. This is not meant to be an exhaustive list. Rather, it will be limited to some of the contemporary directions in the visual music discipline that have not been investigated (at length) elsewhere.

2.7 Literature Review Conclusion

The historical and theoretical work on visual music practices suggests that it is an adaptable field, often altering in response to conceptual changes, art trends (and creative

practices) and developments in technology. The theoretical framework established here has provided the groundwork upon which this thesis will discuss the contemporary works analysed in the Contemporary Practice Review Chapter, which also aims to produce a dialogue between theory and practice. The discourse addressed in this chapter demonstrates that practice and theory are never entirely separate entities. Rather, the one informs the other, and the exchange between them enriches our understanding of how each operates, both separately and together. The various debates and concerns that the theorisation of visual music conjures up have been seminal to this thesis and immensely useful to reviewing and analysing contemporary visual music works. In the following Chapter, I review a number of contemporary visual music works and investigate how these operate in practice.

Chapter 3: Contemporary Practice Review

This chapter will review a number of contemporary visual music works. It will address particular techniques, audio-visual relationships, practices, and aesthetic decisions that characterise recent works and trends in the visual music field. As part of the ongoing dialogue that this thesis seeks to develop in relation to contemporary visual music, this chapter aims to complement the theoretical work and discussion addressed in the Literature Review by also undertaking a closer analysis of current practices and directions in the area of visual music as these presently unfold.

In recent years, the contemporary visual music field has unquestionably extended its scope and practice to include new technologies, novel aesthetics, and unique elements. These distinguish it from the familiar features that are associated with visual music that emerged at the turn of the previous century. It is no wonder then, that theorists of visual music (and interviewees of this study – see Analysis Chapter later) characterise contemporary visual music by its diversity (in aesthetics, along with methods of presentation) (Lund and Lund, 2008). Contemporary visual music practices can range from configurations that follow the tradition of visual music more strictly, to others that exhibit unique elements and diverge from this tradition. This chapter will focus on current visual music works that play with the concept of immersion (and diverge in both aesthetic directions and forms of presentation).⁵⁹

⁵⁹ Also, a selection of contemporary visual music works displaying abstract aesthetics (mostly following the visual music tradition) and hybrid aesthetics (that introduce mimetic or representational elements) have been included. See: Appendix 3- Contemporary Review: Fixed Media.

This is not meant to be an exhaustive list. Rather, it is a selection of artworks chosen for their distinctiveness.

The aesthetics of contemporary visual music are mostly informed by the exploration and possibilities of new and available technologies (both digital software and hardware). The majority of contemporary works are made for, and presented on, single-screen-based media. These works are made for a TV, computer, phone, or cinema screen; the most common medium of presentation for traditional visual music (see Literature Review). Recent research (Kanellos, 2018) shows that the vast majority of screen-based visual music works presented at the 'Image-Sound Festival' between 2016 and 2017 carry abstract or hybrid aesthetics.⁶⁰ The research determined that 62% of the works continue the visual music tradition using abstract visuals and 28% use hybrid aesthetics.⁶¹ Therefore, abstraction is the most common aesthetic associated with visual music. Following a long tradition and history that traces back to early visual music and abstract painting, abstract visual music has many different ways of producing image-sound expressions, including minimalism, formalism, complexity, musicality and abstract ambient sound, among others. A selection of contemporary works displaying abstract aesthetics can be found in Appendix 3 - Contemporary Review: Fixed Media, including *Synthetic Electro Replicant* (2016) by Dave Payling, *Fractal Evolution* (2015) by Wilfried Jentzsch, and *Dots, Lines and Roughness* (2017) by Elsa Justel. While visual music aesthetics combine abstract and representational (or mimetic) features in various ways, they

⁶⁰ *Image-Sound Festival* is an annual festival organised by and held at the University of Greenwich London that attracts visual music artists and researchers from all over the world.

⁶¹ The term 'abstract' is used to describe self-referential and non-representational aesthetics, while 'hybrid' is used to describe works that blend abstract and representational aesthetics.

fall under the category that this thesis has described as *hybrid*. This allows the artist to introduce experimental elements to visual music by deviating from what might be considered the norm. Alfredo Ardia's *Rami* (2015), and Andrew Hill's *Perpetual Motion* (2012) are examples of hybrid visual music works (see Appendix 3). In what follows, contemporary immersive visual music works will be reviewed and compared to traditional visual music practices and tendencies, identifying aesthetics, relationships, or forms of presentation that can be considered alternative, or original, in the field.

3.1 Immersive Visual Music

In contemporary visual music practice, the term *immersive* has been used to describe a number of different works that seek to create an enhanced audio-visual experience, amongst other things.⁶² These types of works have extended the visual music field, from one that primarily produced fixed media artworks to visual expressions of sound and music that can be created in immersive media. In part, immersion can be achieved and attributed to new digital technological developments. For this thesis, in order for a work to be considered immersive visual music it needs to fulfil two criteria: a) to be visual music and b) to be immersive. For the first criterion, the fundamental components of visual music are examined; these are the visuals, the sound, and their relationship. These need to agree with the definitions and characteristics of visual music that are discussed throughout this thesis. For

⁶² The term 'immersion' in contemporary visual music practice is being used to describe a wide variety of works that might contain immersive properties or elements to them; with little agreement as to how the term should be used. Perhaps, this is due to the fact that it's a relatively new phenomenon for visual music. For the purposes of this PhD, the term immersion will be used (as mentioned previously) to mean spatial immersion and will include practices and artworks that create experiences (virtual/augmented realities) which, give the impression of presence, or create the feeling that you are elsewhere; discussed in the previous chapter.

the second criterion, the works need to create the illusion of presence in a new virtual audio-visual space (or imitate space). In what follows, I discuss Christopher Bauder and composer Robert Henke's '*Deep Web*' (2019), '*Singing Light-1*' and '*Singing Light-2*' (2019) by Julie Watkins and '*Possession Trance*' (2010) by Ryan Jordan as examples of immersive visual music.

3.2 *Deep Web* (2016) by Christopher Bauder and Robert Henke

Introduction

Deep Web (2016) is an immersive kinetic installation created by light artist Christopher Bauder and composer Robert Henke that crosses several different artistic genres and forms of presentation including installation, performance, and kinetic sculpture. It was presented as both an installation and a live performance in the industrial space of the Kraftwerk, Berlin.

Bauder and Henke argue that the compositional process for *Deep Web* was to minimise the active elements of sound, light, and movement to their absolute physical essentials. These included winches moving objects, lights illuminating objects, synchronised sound and light and a musical score with an organic and material approach to samples that were reduced to their barest elements and rearranged. The precision and synchronisation of the lasers with sound and kinetic movement appeared, "as if slicing through space the lines move fluidly to trace sculptural patterns, intersecting with precision at moving nodes – the result is an ethereal dance of three-dimensional light and sound" (Tan et. Al, 2016, p.127). The result is a three-dimensional amorphous sculpture of choreographed light and multi-dimensional

sound. The audience is immersed in a sensory experience of space and time, “exploring the intricacies of digital connections” (Tan et. Al, 2016, p.127). The sculpture’s luminous patterns represent an analogy to the nodes and connections of digital networks. Together, the elements of the artwork explore the mediated immediacy afforded by technology; the interaction between lived experience and the virtual, the material and the digital; light and music create a journey into the depths of (digital and material) space.

In recent decades there has been a resurgence in kinetic art sculpture and installations, emerging as a focal point within the broader exploration of music. This transition reflects a move towards a more inclusive realm of sensory experiences. Interactive installations, responsive to user actions or external stimuli, foster active engagement. Listeners' involvement is intertwined with their creative instincts, enabling them to investigate the cause-and-effect dynamics between their actions and resulting outcomes. Modernism’s emphasis on materiality and its intrinsic qualities has given way to new expressions that are often grouped under the umbrella term “relational art”. Relational art emerges within the space that exists *between*; that is, between groups of people, or individuals and their preconceptions, ideas and thoughts.⁶³ As we shall see, these concepts are also central to *Deep Web*.

A precursor to current practices in kinetic art installations and performance can be traced back to the concept of the “musicalization of space” (Sterken cited in Born, 2015, p.12)

⁶³ Lefebvre’s *The Production of Space* (1991 [1974]) is understood as having inaugurated the theoretical shift away from the Kantian categorical conceptions of space and time, focusing instead on space as a “historical production”. Lefebvre stresses “the multiple, concrete and abstract modalities of socially-produced space, and in particular his conceptual triad of space as perceived, conceived and lived: *l’espace perçu, conçu, vécu*” (Born, 2015, p.16). Here, spatial (art) practices result in “a constellation of physical, conceptual and lived spaces” and “the three elements of the social, spatial and temporal shape and are shaped by each other [...] space is not merely ‘the passive locus [*lieu*] of social relations’” (Born, 2015, p.16).

i.e., the 1958 pavilion discussed earlier and Xenakis's later work in *Polytopes*.⁶⁴ Specifically, in *Polytope de Cluny* (1972-1974), projections and sound were synchronised with multi-coloured lasers that were viewed above the spectators' heads (at times touching the spectators) incorporating the audience into the art. We can see echoes of this tradition in works like *Deep Web*. According to Curtis Roads, "In both the *Polytope de Cluny* and *Deep Web*, visuals were synchronised to sounds, but except for timing, there was no direct relationship between the visual and sonic patterns" (Roads, 2023, p.937). Perhaps this might be true of the *Deep Web* installation, where the relationship between sound and image is metaphorical, however, there is a more direct relationship between the sound/music and the images produced in the *Deep Web* performance event (see later).

Visuals and Sounds

The pitch-black hall sets the scene of the *Deep Web* installation. The material frame of this complex structure was 25m wide and 10m high and was "overlaid with a digital skin" (Tan et. Al, 2016, p.127) that consisted of 12 high-power laser systems that illuminated 175 motorised spheres (that could change their vertical position). In the tradition of Xenakis's *Polytopes*, this enormous installation was made up of fleeting light arrangements that appeared like a floating matrix that continuously transformed and rearranged itself above the

⁶⁴ The *Polytopes* are a collection of expansive multimedia and architectural installations created by Xenakis during the late 1960s and early 1970s. They combined light projections and sound that changed over time and produced multiple, dispersed and overlapping sound spaces. The intention was that listeners could perceive the music in different ways depending on his or her location. Here, acoustical space "is no longer homogeneous, but divides itself into different spatial areas" (Oswalt, (1991) cited in; Born, (2015) p.12). In this way the "abstract and multi-layered *Polytopes* try to open the audience's mind to diversity and simultaneity" (Sterken, (2001) cited in; Born, 2015 p.12).

audience's heads. The light was used as a tangible material to construct the intangible three-dimensional "vector drawings in thin air" (Tan et. Al, 2016, p.127). The movement of the laser lights illuminated the spheres with blasts of colour and cut through the darkness of the Kraftwerk building. Initially, the visuals were reduced to their most essential form: dots and lines.⁶⁵ These units interacted and combined with each other, forming waves and other complex geometrical shapes and animated abstract patterns. The result was an emerging three-dimensional sculpture consisting of lines and dots that created patterns and rhythms that visually aligned with the tradition of visual music.



A frame from *Deep Web* (2019) by Christopher Bauder and Robert Henke

⁶⁵ Animated compositions made of dots and lines are common practice in visual music, notably in: Oskar Fischinger's *Kreise* (1934); Norman McLaren's *Stars and Stripes* (1939); *Dots* (1940); in Jordan Belson's *Allures* (1961); Julian Scordato's *Constellations* (2014)

The sound composition of the *Deep Web* installation neither resembled easily recognisable sounds, nor did it sound like traditional music.⁶⁶ It was mostly an abstract, ambient and atmospheric electroacoustic composition which, over time, encompassed some rhythmical musical notes and sound patterns of modems, glitches, and other electronic, computer sounds. A background beat provided a layer of music to the whole sound composition.

Image-Sound Relationship

The sounds and images in *Deep Web* are also aligned conceptually. *Deep Web* incorporates sounds and visual patterns from early telecommunications and fibre optic communication systems, and evokes visual references to early wireframe computer graphics and futuristic holograms. For the audience, it felt as if the invisible digital connections that surrounded them in the space suddenly materialised before their very eyes” (Tan et. Al, 2016, p. 127). The music consisted of sounds that were mostly veiled (abstracted), yet, discernible components emerged from tones reminiscent of cell phones and fragments of telecommunications ephemera to snippets of airport announcements woven into an encoded symphony. In the live performance of *Deep Web*, Henke created a musical score in real-time where the lights responded automatically to improvised music, making every performance different. In the live performance, the relationship between light and music ceases to be a

⁶⁶ In melody, musicality etc.

mere metaphor and becomes more direct; the visuals are created by the music and point back more directly to the music.

The abstracted sounds and the abstract visuals give rise to a number of metaphors that illustrate the notion of relationality at play within the work. The title itself, *Deep Web*, suggests this idea of interconnectedness. Our modern experience of technology connects us via virtual worlds, which in fact informs our material existence and experiences. *Deep Web* draws on the relational aspects of technology and its capability to connect us to each other in a way that is both immediate and mediated. This finds parallels in the live performance of electronic music, where the performer's utilisation of technology links audiences through the shared experience of a musical event. We experience this type of performance event, both through our individual bodies and perceptions but also collectively, connecting via mutual appreciation of an effective experience of music.

Immersion

The *Deep Web* installation transforms the space of the Kraftwerk venue, reshaping its boundaries and re-creating its spatial dynamics anew. The large space of the Kraftwerk is kept dark, thereby removing its framework from sight, creating a sense of deep space that extends beyond its walls. Scale functions to enable a more immersive experience. The frame of the kinetic sculpture and the reach of the lasers create new boundaries within the space, making its audience feel like they are inside the work. The space itself is crucial to the overall effect of how the sound will be perceived. The installation's multidirectional sound serves the same purpose, "to surround" and immerse the spectator (creating a more intimate feeling of being

up close or within). The perception of visuals and music will ultimately be different depending on the physical location of the spectator within the space. Rather than merely occupying the space, the spectators become integrated with the art, actively contributing to its constant transformation. Bauder claims, “A lot of people have said that they felt detached from being in Berlin, being at this time, or being who they are” (CTM Festival, 2016). This detachment from a specific time and space forms the experience of “presence” seen earlier in definitions of immersion. The interplay between distance (creating depth) and proximity (creating intimacy) is significant in establishing a feeling of immersion (and this is similar to Watkins’s work discussed later).

A crucial aspect of kinetic art is movement and its relationship with time and space. In essence, the defining feature of kinetic art lies in its emphasis on movement, serving both as a formal element and as a means of immersing the viewer in a profound and experiential encounter. Whether employing mechanical contraptions or interactive technologies, kinetic artists aim to craft pieces that exude vitality and dynamism, continuously evolving and offering fresh opportunities for interaction and discovery. In *Deep Web*, light and sound are linked through their mutual rhythm. Unlike static art forms that can be appreciated from a fixed viewpoint or moment, kinetic art is in a state of perpetual change and evolution. In the case of installation and performance, movement is also created by the viewer in his or her interaction with the work and (within) the space. The viewer is encouraged to explore the artwork from various perspectives, engaging with its diverse facets and subtleties. This movement both generates the space of the artwork and transforms it simultaneously.

3.3 *Singing Light-1* and *Singing Light-2* (2019) by Julie Watkins

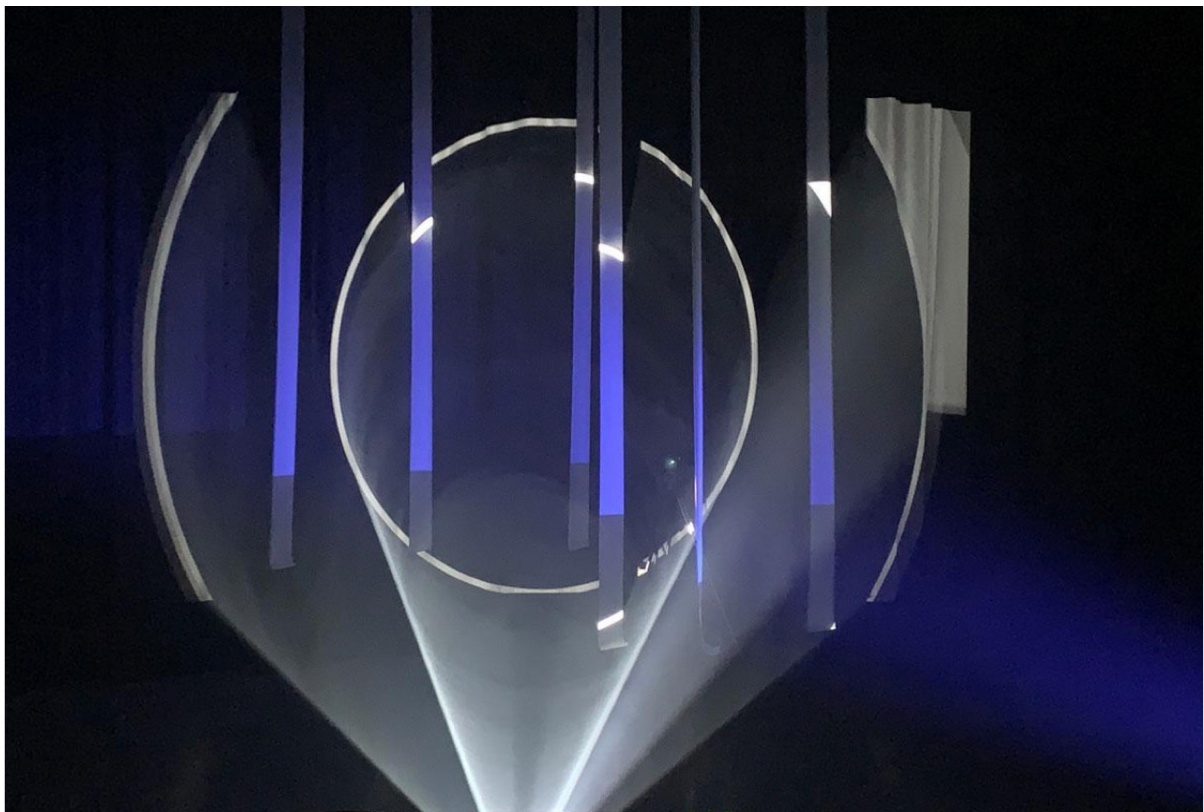
Introduction

Julie Watkins' *Singing Light-1* and *Singing Light-2* were presented at the Stephen Lawrence Gallery (University of Greenwich, London) as the final piece of Julie Watkins' PhD practice in November 2019.

The methodology underpinning Watkins' work derives from recordings of real-world (mimetic) footage. This often includes field recordings of both audio and video as well as stills and textures of natural imagery and sounds, which she utilises to layer, enhance and then reanimate (abstract) in her compositions. Watkins isolates and extracts from filmed images its inherently abstract elements (form, colour, light) and in doing so, changes their details and focus. (Watkins, 2017, p. 10). While the images are abstracted in Watkins work, sound/music often retains its mimetic qualities (the sound of waves in *Horizon* (2014); fragments of speech, bells, birdsong, chant, breath and steps in *Reservoir*; in *Shadow Sounds* (2015) and *Ambience* (2016) non-verbal vocalisations. These sounds are acousmatic (unseen), cut off from their source and cause, yet they retain a level of familiarity (identification and mimesis) and an ability to express affect. This echoes Landy's assertion regarding sound (seen earlier), that listeners require something tangible to connect with for meaningful engagement with the work.

Singing Light 1 and *2* are immersive and interactive visual music installations that explore concepts that align with the overarching themes present in Watkins's body of work. The first concerns the idea that visual music can enable a meditative state in the viewer. She

states that her work, “aspire[s] to making vision and music more than the sum of the two parts through very closely integrating them. Experientially I find this enables a meditative state in me as a viewer. This may relate to the actual cross-modal integration of the senses” which is referred to as metaphorical synaesthesia (Watkins, 2017, p. 4). As we shall see, in *Singing Light 1 and 2* the ideas of meditation, immersion and affective “embodied” experience are central.⁶⁷ The second relates to her ongoing phenomenological exploration in the notions of distance and proximity (see later).



Singing Light (2019) by Julie Watkins (Photo copyright Julie Watkins)

⁶⁷ Watkins links meditation to both immersion and metaphorical synaesthesia. The term meditation refers to a practice, where an individual uses techniques to train attention and awareness in order to achieve mental clarity and an emotionally calm and stable state. For Watkins, being immersed in nature, or the metaphorical synaesthesia experienced in a visual music artwork produce similar effects; these are affective and embodied experiences where there is a dissolution of boundaries and of self, time and space (Affect has been discussed in the Literature Review Chapter).

Sound and Image

One of the visual elements in *Singing Light 1 and 2* were the abstract animations that consisted of white, linear, two-dimensional graphics such as straight and wavy lines, circles, and particles. The morphing animated shapes were used to illustrate movement, fluidity and change. Their arrangement and appearance can be said to correspond to Klee's dividual-individual visual structure theory (Aichele, 1994) which is used to create more depth in the space. Dividual, refers to the occasion where straight or wavy lines are arranged in a horizontal or vertical order and by intersecting with each other, they create new patterns. Individual refers to the situation where single geometric shapes expand without interacting with other graphics (shapes or lines), creating their own disconnected motifs resembling ripples. When dividual and individual visual structures are combined, visual rhythms are created. These morphing animated shapes correspond to what Watkins describes as composing figures of motion (energy); a notion she takes from visual music artist Len Lye.

The sound/music in the *Singing Light 1and2* installations are wordless (phonemes), sung acapella that she describes as "meditative sound". Watkins claims that it is in our very nature to feel emotions when listening to the sound of the human voice. She states: "the special qualities of the human voice as an instrument have been recognised ever since Darwin brought attention to the primal nature of voice both conveying and affecting emotions" (Watkins, 2018, p.69). Watkins explains that vocal expression is key in these installations, "human traces in the vocal expression create resonances that support the use of light itself as a medium, becoming a celebration of light as a fundamental affective, embodied experience" (Watkins, 2019, p.4). While the human voice has a presence (is proximal), its source and cause remain unseen (acousmatic); by removing the visual reference, hearing

becomes more dominant. The use of the human voice (as an instrument) aligns with Chion's acousmetre; "The voice wells up, it has presence, it is unseen, an acousmetre" (Chion, 1994, p.71). The acousmetre provides vocal expression with power and omniscience.

Nonverbal vocalisations are a form of vocal gestures. They are actions performed to convey feelings, in the sense that Smalley discusses sound-making gestures (seen earlier). In this concept, the gesture is concerned with human physical activity and is viewed as: "an energy motion trajectory" which has spectromorphological consequences (Smalley, 1997, p.111). Smalley's structural hierarchies in tonal music are useful here. He argues that "the note is regarded as the lowest structural level, and all tonal music is made up of note-groupings of increasing dimensions as one moves outwards through the form – from note to motive to phrase, and so on. In addition, the metrical structure gives the lowest-level note, a pulse, which defines the minimum possible density of movement" (Smalley, 1997, p.114). Sustained notes in non-verbal vocalisation depict a graduated continuant. Sustained sung notes are prolonged by breath, which results in elongating the gesture, making the listener aware of every underlying nuanced modification.

Image-Sound Relationship

The sound matches the slow changes in the animations. In fact, she argues that the contrast between slow and rapid sections only highlighted the slowness of the piece. Watkins' aim was to evoke a feeling parallel to being in nature and experiencing "soft fascination".

The sound and animated images in *Singing Light 1 and 2* were synchronised. In a similar manner to her work *Shadow Sounds* (2015), Watkins created "animated-image-audio units"

(2018) and built a composition from these units by using musical phrasing. This was accomplished by consistently associating certain sounds with particular animations. The vocals both highlight and create the impetus for change. For example, changes of sound amplitude were associated with the intensity of shake motions of lines, while sound motions such as acceleration or deceleration were associated with specific shape morphs (Watkins, 2019, p.3). The repetition resulting from the fusion and mapping of image-audio-units created a consistent association of sound and image as a single entity and reinforced synchronisation. As a result, the abstract animated shapes appear to mimic the mouth's (abstract) movements as they change to correspond with the sounds heard in the animations, resembling the emotion in the singer's voice. In this work, the sonic element appears to be of equal weight to the visuals. Though the visuals are continuous and there are minutes of silence; the audio remains intentionally incomplete to give the spectator-participant's imagination space to respond.

The other visual element in this work was the coloured light, which was animated by the haze that has its own textural density. Watkins states that "The light forms animations in the air, given volume by the ever-changing haze created by a haze machine" (Watkins, 2019, p. 1). By diminishing the primacy of vision, the other senses become more dominant and seeing extends to touch, while hearing organises seeing.⁶⁸ I will discuss this in more detail next.

⁶⁸ Watkins states, "*Singing Light* is based on my experiences of fog and haze and creating the visceral experience of a 2D animation becoming a 3D tunnel of light in the haze [...] The works aspire to extend seeing into touch and were inspired by my immersive experiences in works by Turrell, Gormley and Eliasson" (Watkins, 2024, p.132). See later.

Immersion

In the *Singing Light 1and2* installations, Watkins intentionally departed from a fixed screen-based presentation, favouring an interactive artwork presented as an installation. Various layered elements that come together in the installation including (coloured) light, animated morphing figures projected on paper thin banners (that looked like they were hanging in the air), fog created by a smoke machine, a fan that provided the fog and light with movement, and sound from an unseen singer. The installation “invites spectator-participants to walk through it, be inside it, to react to it” (Watkins, 2019, p. 1). The smoke machines created an overall hazy atmosphere diminishing the dominance of visual perception. The installation created a deep space by projecting the animations across illuminated hanging strips of fabric that receded into the space. The darkness, double height and scale of the room also helped accentuate the feeling of vastness. One purpose of the banners was to function as screens for the projected animations. The singing came from loudspeakers, which were placed at each side of the room emphasising the space. The fan moved the haze around the room giving the projected light the appearance of turbulence.

The haze limited visual perception to make the experience of the artwork more immersive. That is a more affective and embodied experience where navigating the space meant using all of the senses. At the same time, the haze also served the purpose of enhancing and highlighting what was visible within the haze. The haze interacting with the light created an animated volumetric light effect, looking like a three-dimensional tunnel of light. Her source of influence is Thomas Wilfred’s *Lumia* (1919) and his polymorphous three-dimensional light shapes that influenced sound-shapes through rhythmic motion and colour. The three-dimensional light tunnel in *Singing Light 1* and *2* created an effect resembling

turbulence, with both colour and the motion of the haze. Although the image component in these works may appear abstract, they consist of implicit references to the physical world. The “turbulence” created by the tunnel of light is analogous to natural imagery and resembles the turbulence of the ocean or the wind (voice/sound). This basing of abstract images into ecological patterns and shapes is a key feature of this installation. In *Singing Light 1* and *2*, an analogy can be made between the “textural play” created by the animated banners and the temporal effects of the “currents” or “turbulence” produced by the integration of coloured light and haze in rhythmic motion, moving the piece forward.

The installation aimed to create an unanchored scene, to heighten elements of immersion. Watkins likens this to a painting without a horizon line or being in an atmosphere like fog which encourages us to put the body into the mind and be absorbed by the present moment. By doing so, “this embodied, phenomenological approach counters the seduction of seeing” (Watkins, 2023, p.24). She argues that when we dissolve the horizon, (in this case through fog) we remove the binary distinction between up and down and “we literally and metaphorically find our balance differently, navigate space differently. Such experiences bring us into an embodied present, a mode that appears to be diametrically opposite to the quick consumption and judgement of images” (Watkins, 2023, p.24). Not only could the spectator-participants experience the installation from different angles and perspectives, but they could also interact with the material aspects of the artwork. The element of visceral surprise creates a sense of “presence” or an immersive experience. In this work, this occurred when the light became three-dimensional in the fog, and the spectator-participants felt drawn to touch the light. Watkins suggests that animating light in space was key to creating abstract animation that had the potential to be affective. Recalling the event, Watkins claims

that “the participants started to interact [...] which, in the ever-changing haze looked soft and inviting, touchable. They drew shadow shapes with their fingers, sat in the light, posed in the light, examined the flags and looked all around the space” (Watkins, 2019, p.24). As the mechanics of the display were not hidden from the spectator-participants, they were available to be examined. This experience of immersion as “a sense of presence” also possesses the characteristic of being in a constant state of perpetual flux that depends on the interaction between sensory and environmental stimulations as well as individual inclinations (discussed earlier in the thesis).

3.4 *Possession Trance* (2010) by Ryan Jordan

Possession Trance was a live audio-visual performance by Ryan Jordan, performed at various festivals including *Behind Bars* (2010), *Audio Art Festival* (2014), and *Image-Sound* (2016). This work can be included in visual music practice since it incorporated musical elements and established a clear connection between the visual and the sonic aspects. *Possession Trance* shared similarities with *Deep Web* and *Singing Light 1 and 2*, in terms of using projected light for visuals within a dark enclosed space, minimalist sound, synchronisation between sound and image, and providing an immersive visual music experience.

The set-up was similar to electronic music performance, the artist was standing behind his sets facing the audience. The sets included strobe lights, smoke machine, audio amplifiers

and loud speakers. In *Possession Trance* the audience is standing in the same level with the performer, they can interact, participate by moving to the rhythmical noise and become part of the performance. This type of immersive experience through interaction and participation aligned with Grammatikopolou's (2016) "ritual of art experience" concept discussed in the Research Questions chapter.

Sound and Image

If in *Singing Light 1* and *Singing Light 2*, the visuals were reduced to lines and shapes, and in *Deep Web* to just lines and dots; in *Possession Trance*, they were reduced solely to flashing lights. Strong strobe light projectors were used to repeatedly light up the entire space, creating an uneasy, contrasting sensation of continuous visual change from pitch-black to ultra-bright light. These lights did not project any graphics, and they produced no shapes or defined rays. The surfaces that bounced the light (audience, surroundings and walls), along with the dark gaps between the flashes, composed the performance's visuals. The flickering light made even the slightest movement of the participants appear like an overexposed stop-motion animation. This illusion is quite common in nightclubs and rave parties. The fact that the participants became part of the visuals and the performance made *Possession Trance* a powerful, immersive experience.

Jordan's *Possession Trance* was performed live, and the outcome of this performance featured elements of the underground DJing and VJing scene. The sound itself belongs to the electronic noise music genre. The sound was performed on a multichannel platform and was projected loudly from a surround sound system. The energy-motion trajectories were

spreading fast from the speakers to the whole interior like bursts of noise. The sound shapes of these noise bursts could be imagined as aggressive, jagged shapes made by sharp attacks and decays. Their pacing was changing over time. The percussive noise was fast and dense at the beginning and end of the performance, but slow and sparse during the middle. At the same time, additional distorted and delayed feedback loops produced swirling motions. In *Possession Trance*, the music and human voices of the audience became part of the composition, creating a trancelike sensation. The visuals, the sounds and the performances of the artist and audience resembled a fusion of an underground rave and a transcendental, ritualistic experience.⁶⁹



A frame from *Possession Trance* (2010) by Ryan Jordan

⁶⁹ Similar to what Mollaghan calls the “spiritual absolute” (Mollaghan, 2015).

Image-Sound Relationship

In *Possession Trance*, the image and sound were closely connected. Loud noise bursts, and intense strobe flashing lights spread rapidly in all directions, with analogous energy motion and pace, creating a 1:1 mapping relationship between the two modes.

The dynamic sonic gestures corresponded to the physical gestures the performer made when operating the sound-producing bodies (synthesiser and self-built crystal amplifiers). For instance, when Jordan turned up one of the amplifier controllers more aggressively, the noise increased in energy and intensity. The brightness of the flashes also seemed to correspond to the loudness of the noise (i.e., the brighter the light, the louder the sound), adding another layer of audio-visual correspondence.

This image-sound relationship was also coherent with experienced reality, as flickering bulbs, power surges, high voltage, and glitches are often associated with disrupted electrical noise.

The overstimulation of senses aimed to affect the audience's perception by inducing disorientation and altered states of consciousness.

Immersion

In *Possession Trance* the type of immersion is similar to the nightclubs and raves where the loud music, lights and collective sense of belongingness make the audience to feel fully absorbed in the experience. As discussed in the Research Questions and Literature Review

chapters, immersion is often associated with transcendent, trance-like, and spiritual experiences, ranging from tribal and religious rituals to music festivals

In *Possession Trance*, the loud sound and bright lights occupied the whole space and surrounded the audience, creating an immersive sensation. The audience was not merely a spectator but a part of the performance. The dynamic audio-visual experience and the closed environment did not allow participants to become distracted by other stimuli; instead, they were fully immersed in the performance. The participants were not expected to dance as is expected in a nightclub or a music event. Instead, they could do as they wished freely within that space. Sometimes, participants seemed to move to the rhythm, interact with each other, while others stayed still or sat on the floor, forming a concentric arch around the performer, similar to a tribal, ritualistic performance. Simultaneously, the continuous light flashes and smoke produced dizziness in the audience (as in an ecstatic, trancelike experience).

Furthermore, the crescendo of noise mixed with the human voices of the audience and the delayed feedback loops produced an immersive abstract trancelike sensation resembling a spiritual ritual. The performance was a communal group experience in a chaotic and immersive landscape. This simultaneous shared experience of the performance gradually developed a sense of participation, engagement and group unity among the audience. All these aspects of trance, immersion, unity, and irrationality echoed Nietzsche's Dionysian aesthetic (mentioned in the Research Questions and Literature Review chapters)

3.5 Contemporary Practice Review Conclusion

Recent developments in visual music illustrate that it remains an experimental field that allows for the combination of different media and audio-visual productions. What can be observed in recent examples of visual music practice is that aesthetically, it remains primarily informed by the parameters set out by traditional visual music. Although only a small sample of works, those examined here illustrate that abstract and minimalist aesthetics persist as the predominant aesthetic; the use of circles, dots and lines mirror early visual music works. The sound compositions discussed in this chapter were mostly abstract or ambient electroacoustic music; the sounds used were mainly noise, minimalist, rhythmical, and sometimes referential (to a lesser extent). This chapter sought to draw attention to instances of current visual music where there is some deviation from purely abstract aesthetics—the abstract graphics of some of the works investigated in this chapter attempt to convey three-dimensionality. Hybrid approaches in some of the visual music works discussed involve a combination of abstract and representational images or referential and non-referential sounds. Although the audio-visual outcome of these works does not try to imitate a natural world experience, it can be regarded as a small step towards representation and a departure from traditional (absolute) visual music.

As we have seen, immersion can be achieved via installation and performances. The installations and live performances examined created spatially immersive experiences through visuals, sounds and space. These environments are often a blend of physical and virtual spaces. However, the physical space (as seen) is usually closed and dark, which allows the virtual space to prevail. In the examples of immersive visual music mentioned, the visuals

occupy the entirety or most of the physical space surrounding the participants. This technique enhances the element of immersion in the work. The projection of light appeared to be an effective technique to produce visuals in all three case studies discussed in the Contemporary Practice Review. When light is combined with smoke or physical surfaces (used as screens) arranged in space, the visuals become three-dimensional. Basic and minimalist visuals, like light beams and vector graphics, appear particularly effective. Spatial sound is achieved when it is heard from different loudspeakers arranged in physical space. Typically, the sound is loud to make the participants feel part of the composition. In the examined installations and performances, spatial immersion is a shared experience.

The observations discussed in this chapter were considered when establishing a framework for the practice portion of this thesis. As mentioned, a collection of experimental visual music works has been created and submitted for this thesis. My practice introduces experimental aesthetics that utilise representational and/or (real-world) referential elements (in varying forms and presentations), seeking further to explore the practice of representational aesthetics in visual music. In what follows, the Analysis chapter will discuss the qualitative research part of this thesis. Several visual music experts have been interviewed, and their responses have been analysed to provide insight into classifications, image, sound, media and technology aspects of visual music. Finally, my own practice will be discussed in the Practice chapter.

Chapter 4: Analysis

This chapter presents an analysis of the research findings from the conducted interviews. The primary data compiled from the interview process has undergone systematic review and has been coded into themes and categories, which are presented here. Where applicable, the transcript findings have also been discussed in relation to the material assessed in the Literature Review Chapter. This chapter is primarily concerned with identifying new practices within the visual music field, thereby determining a framework that addresses and includes both new and established practices in this area.

Significantly, the data extracted from the transcripts and their analysis provided a framework for my own practice work that was submitted for this thesis. The result was the creation of a series of experimental projects that sought to test the findings of this research. This culminated in a final project that was informed by the data analysis and supported the research by testing the data. The data included research into immersive technologies and contemporary visual music characteristics that were discussed by the participants of this study. In the next section, I discuss the coding and data analysis process.

The interviews conducted for this research provided a good amount of data about the current state of visual music. The selection of an appropriate participant population played a critical role in this research.⁷⁰ The information extracted from the interviews that was deemed most significant to the research was highlighted and filtered, and then arranged into quotes (See Appendix:5). Each of the quotes extracted from the interviews was tagged with various codes. The codes were single words or small sentences that describe the topic of the quote.

⁷⁰ See Methodology Chapter (section: Sampling)

Many related codes formed a *theme*. Quotes tagged with more than one code were included in different themes since they contributed to important information in more than one area. Hence, the quotes were coded, and broader themes were created from the codes (See Appendix 4). In the analysis' themes below, if a sentence is accompanied by an in-text citation *e.g. (AA:1)*, it indicates that the information has been paraphrased or summarised from a corresponding participant's quote. Equally, when there is no in-text citation, it means that the sentence is my interpretation, evaluation or elaboration. At the end of each theme, there is a discussion section where the new findings are compared with the findings of Literature Review and Contemporary Practice Review.

After reviewing the data, the following **codes** were identified: a) Classifications of Contemporary Visual Music; b) Image–Sound relationships; c) Visuals; d) Sound; e) Contemporary technology; f) Media; g) Immersion; h) Innovation. The following **themes** were formed from the research analysis: 1) Characteristics of Contemporary Visual Music; 2) Image and Sound; 3) Media and Technology

The final arrangement was organised as follows:

Theme 1: Characteristics of Contemporary Visual Music

Codes: Classifications of Contemporary Visual Music

This theme includes codes that make reference to contemporary visual music characteristics and the interviewees' attempts to define and categorise contemporary visual music. One of

the main aims of this research is to identify characteristics of contemporary visual music in order to establish an up-to-date framework. Thus, some of the interview questions explicitly asked the participants to characterise and classify contemporary visual music.

Theme 2: Image and Sound

Codes: Image-Sound Relationships; Visuals; Sound

The codes included in the 'Image and Sound' theme are ideas and opinions about the two main components of visual music: sound and image. These have been examined as two different modes but also, in a relationship.

Theme 3: Media and Technology

Codes: Contemporary Technology; Media; Immersion; Innovation

The codes in the Media and Technology theme discuss current technologies and media used for the production of contemporary visual music. Additionally, during the coding process, it was found that participants frequently discussed the concept of (spatial) immersion in relation to contemporary technologies and media. Thus, a code section for immersion has been added and analysed. Finally, this section also includes a code on innovative practices in the field of visual music; from tools, quality of work, and future directions; and a section that reflects on how technology can potentially impact the visual music field.

In what follows, the findings and analysis of the themes and their related codes will be examined in more detail.

4.1. Theme 1: Characteristics of Contemporary Visual Music

Codes: “Classifications of Contemporary Visual Music”

All interviewees shared their opinions on what can be classified as contemporary visual music. When asked to characterise contemporary visual music, participants provided different classifications according to various common characteristics that visual music presents. References were made to classic examples of visual music; some classifications were arranged according to the type of artwork; the way the artwork is presented or performed; according to the image - sound relations; and in some cases, according to film or music genres (see later).

Although the interview questions concentrated predominantly on contemporary visual music, some responses were broad and described visual music in general. For instance, a participant (AB) referred specifically to Ox and Keefer’s classification of visual music (2006; updated in 2008). While participants AA, AC and BB, may not have referred to this specific classification by name, also mentioned relevant characteristics discussed by Ox and Keefer.. It was observed that the characteristics ascribed to visual music by Ox and Keefer were generally accepted as canon by the majority of participants.⁷¹ However, it was also

⁷¹ This was in agreement with many other seminal visual music writers, where the Ox and Keefer classification was reviewed as one of the most popular; including Joseph Hyde (2012), Max Hattler (2014), Lund and Lund (2008), Julie Watkins (2018), and many others.

acknowledged that this classification could be viewed as outdated since the visual music field has grown a lot since then (AB:2).⁷²

In order to establish an up-to-date framework of contemporary visual music, the Ox and Keefer classification has been used as a springboard and analysed in relation to participants' answers accumulated in this study, exploring to what extent it continues to be relevant in current practices. After a thorough examination the classifications were updated accordingly, and new categories were created. While, categories 1-3 discuss Ox and Keefer specifically, new categories have been introduced (Categories 4 and 5) that derive from the transcript's responses, the Literature Review and prominent writers in this field. In this subchapters of Theme 1, I will discuss the logic behind how these categories have been developed in more detail. To make a clear classification of the new categories, I have included some visual music examples for each one of them below.

Category 1

"A visualisation of music, which is the translation of a specific musical composition (or sound) into a visual language"⁷³ (Ox and Keefer, 2008).

This first classification deals with the distinct characteristic of visual music which translates sound to image. One interviewee made reference to this classification, but instead

⁷² Indeed, most of the examples provided by Ox and Keefer refer to early visual music practice; the works of Klee, Fischinger, McLaren, Spinello, Damonte etc.

⁷³ Ox and Keefer's category: 1

of the word “translation”, which refers to the practice of making visuals equivalent to music, used the word “transcoding” that refers to a file conversion from one format (audio) to another (video) with the use of coding (AC:2).. In principle, both words may describe the same thing, however ‘transcoding’ requires technology. Therefore, the word ‘transcoding’ could be added to the first characteristic as an additional way of rendering music into image.

The same participant suggested that the use of the word ‘sound’ should be highlighted in reference to the acoustic part rather than just ‘music’ (AC:1&2). This is in alignment with the contemporary idea, which expanded the music framework by considering sound as a music material too (Landy, 2007). Hence, as a first step, if the word ‘transcoding’ is included and the word ‘sound’ is made more explicit, then this first category could be extended as follows:

A visualisation of music, which is the translation or the transcoding of a specific musical or sound composition into visual language.

Moreover, the same subject added that transcoding can be done vice versa too, from image to sound (AC:2). ‘Image to sound’ conversion is included in the first part of the third category in Ox and Keefer’s classification (see Appendix 1): “A direct translation from image to sound or music” (Category 3). The concept of transcoding sound to image and vice versa has been discussed by Andrew Hill as well (see Appendix 1 for Hill’s classification). Hill writes: “The synthesis of visual materials from sound (and vice versa) and the representation of sound visually. This includes visualisation software such as those within media players,

oscilloscopes and computer algorithms that render visually spectral and waveform images of sonic material” (Hill, 2013, p 6). Although Ox and Keefer incorporate this element (image to sound) in their third category, Hill goes one step further, stating that this can be achieved with software that uses algorithms to transcode sound into visuals. The translation or transcoding may result in 1:1 mapping between image and sound; however, this is not always the case. For instance, in *Rami* (2015) by Alfredo Ardia (see Appendix 3) the movements and shape of a video-recorded tree have been transcoded into animated sequences of parallel lines and corresponding sets of sound frequencies, instead of one-to-one image-sound mapping.

By integrating this feature into this first category, we can draw a more accurate picture of where contemporary visual music has been heading in recent years, which enables us to revise the Ox and Keefer classification accordingly. Thus, the complete proposed category for this first classification has been revised.

The new proposed category 1:

The translation of a musical or sound composition into a visual language (music visualisation) and vice versa. This includes the use of visualisation software, such as those within media players, oscilloscopes, and computer algorithms that transcode sound to image and image to sound, such as *Duel Tones* (2016) by Maura and Bedhinn McDonnell and *Rami* (2015) by Alfredo Ardia. The translation or transcoding need not necessarily result in a 1:1 mapping between image and sound.

Category 2

“A time-based narrative visual structure that is similar to the structure of a kind or style of music”.⁷⁴

“A visual composition that is not done in a linear, time-based manner, but rather something more static like a 7' x 8' canvas”.⁷⁵

(Ox and Keefer, 2008).

After assessing the data, it was deemed that two of the Ox and Keefer categories (Categories 2 and 4) could be combined and arranged as a single category. The interview responses indicated that the characteristic of visual music (category 2 – reproduced above) is one of the most widespread; most of the interviewees regarded the visual composition to be analogous to musical structure, or principles (AA:12, AB:2, AC:2, BB:1).

Audio-Visual or Purely Visual.

The structural reference to music can be achieved, either a) audio-visually; by combining both sound and image with reference to musical structure for the production of ‘audio-visual music’ (AA:24, AC:2) or b) visually; the visual aspects are treated as independent elements that can be organised and composed, akin to how a music composer organises sounds (AA:14, BB:1).

⁷⁴ Ox and Keefer’s category: 2

⁷⁵ Ox and Keefer’s category: 4

Where the audio-visual composition has a structural reference to music, it is in agreement with Andrew Hill's third category. Hill states:

"Audio-visual music, the composition of both sound and image informed by traditions of music. This form is here defined as audio-visual music, because the works contain both sonic and image elements, which are regarded as equal components, joined in the context of a work, and structured according to musical principles." (Hill, 2013, p.6)

When the visuals, or visual composition, are being treated independently from the sound (or are entirely without sound) but do have qualities or structure similar to music, they are in alignment with Ox and Keefer's second category (first quote above), but also with Hill's first category: "A purely visual approach - visual music"—for example, Thomas Wilfred's *Lumia*, or some of the works of Kandinsky or Klee. Works that aim to emulate music, or contain structures and forms inspired by those within music but contain no sonic content themselves." (ibid) Aimee Mollaghan in *Visual Music Film* (2015) also highlights this characteristic; she explains the concept by comparing 'Symphonie Diaganale' (1924), a silent visual music work by Eggeling— with the musical symphony form and finds similarities in the arrangement of movements (similar to sonatas) including, the introduction of motifs and figures, rhythm, temporal structure, counterpoints and so on (Mollaghan, 2015, p28).

Time-based (or, Static) Compositions

For Ox and Keefer, static visual composition is a category of its own (second quote above); this is unsurprising since their discussion draws on examples of classic visual music works, where purely visual and static compositions are common. However, while writers like

Hill and Mollaghan make references to purely visual and static compositions, they are not treated as a separate category; as it's no longer a prominent practice in contemporary visual music works. Hill for instance, merges silent visual music films and static visual music imagery into one category. In this research, none of the subjects made any particular or explicit reference to static compositions either. As a result, Hill's categorisation appears to be more in line with the findings of this study. Hence, this category updates the Ox and Keefer classification by combining purely visual and static compositions, with audio-visual and time-based compositions into a single category.

The new proposed category 2:

Analogous to musical structure. An audio-visual or purely visual composition that is organised similarly to the structure of a kind or style of music. This includes time-based (or static) works that aim to emulate music or contain structures and forms inspired by those within music and can be presented with or without sound. An example of this category is the *Synthetic Electro Replicant* (2016) by Dave Payling.

Category 3

"A direct translation of image to sound or music, as images photographed, drawn or scratched onto a film's soundtrack are directly converted to sound when the film is projected. Often these images are simultaneously shown visually. Literally, what you see is also what you hear. (An early example is filmmaker's Oskar Fischinger's Ornament Sound experiments c. 1932).

There are many examples in Visual Music film of this process, e.g., McLaren".⁷⁶ (Ox and Keefer, 2008)

The third category discussed by Ox and Keefer partly refers to the translation of image into sound (AB:2), which refers to the reverse practice described in their first category. As already seen, this practice was merged and included within the first classification, since the first category was extended to include both, the translation of image to sound, *and* sound to image (AB:2).

Therefore, the analysis of Ox and Keefer's third category will concentrate on the other features that they mention here. First visual music where the sound is produced by scratched film or film projector (e.g., 16mm) - or other analogue media. In these examples, the media of presentation (and their mechanisms) are the sources that produce the visuals and sounds. Even though this practice is viewed as retro, it is important to note that some interviewees see a renewed interest in this area including instruments, post-digital presentation techniques and post-digital performances that focuses on the body.

Digital media can also produce visuals and sounds simultaneously during the visual music presentation or performance. The participants mentioned examples such as glitch art, interactive installations, among others. Therefore, this category can be updated and include visuals and sounds generated by (analogue, digital and post-digital) media such as glitches, noise caused by electromagnetic interference, and other post-digital aesthetics etc. Second, this visual music category can include visuals and sounds produced simultaneously by an event or a source which is being video-recorded or performed in real-time. The audio-visual

⁷⁶ Ox and Keefer's category: 3

material may derive from natural landscapes, real-world events, movements, performances or the sound-producing gestures of a musician, etc. Cornelia and Holger Lund (2008) mention that the visuals and sounds derived from audio-visual recordings are being edited and organised for the composition of visual music. (see Literature Review Chapter). Often, the recorded sounds are diegetic and presented along with the video-recorded visuals in a 1:1 mapping fashion (AB:2, AA:20 & 26, BA:3). 1:1 mapping is discussed at length in Theme: 2, code: image-sound relationship.

Hence, this category has been updated to embody these practices too.

The new proposed category 3:

Music and image are produced simultaneously by the same source or event. In this category, visuals and music are generated together by the media used during the visual music presentation, interactive installation or performance (i.e. post-digital aesthetics, glitches, noise caused by electromagnetic interference, etc.) like in *End Transmission* (2009) by Joseph Hyde. This category also includes visual music compositions that convey sounds and visuals captured during a video recording of an event, e.g. *Timber* (1997) by Coldcut and Hexstatic.

Category 4

This section introduces a new category derived from the research analysis. Due to the frequency of its occurrence, a visual music practice that could be considered a category of its

own is 'image-sound improvisation', analogous to musical improvisation (AC:2 & 8, AA:5, AD:11).

This practice may seem similar to the second category, but a distinction between the two was clearly drawn by the interviews. While the second category describes compositions that have a planned musical structure, this type of visual music is spontaneous and happens intuitively – it does not strictly follow a pre-planned structure similar to the musical one (AA:5). This category includes works where there may not be a prearranged timing for sounds and visuals; or a predetermined melody or visual narrative; or set individual image-sound analogies such as hue-pitch or intensity-loudness and so on.

This does not mean that there are no 'image-sound' relationships in this category; image and sound follow the same set of rules (or logic) that allow improvisation in both elements at the same time. Some examples that can demonstrate improvisation are live visual music performances, VJing and interactive installations. For instance, with interactive installations, improvisation can happen when the sound and/or visuals of an installation react to the spontaneous and unique actions of the audience or the performer (AD:2&11). Visual music improvisation has been added as a category of its own; this is due to its prevalence in contemporary visual music practices, as also the high rate of its occurrence in the transcript responses.

The new proposed category 4:

Visual Music Improvisation. Visual music compositions that are produced by performing music and image, according to the rules of musical improvisation. These works operate

through a combination of music and image that are composed freely and spontaneously, e.g. *Cadres* (2023) by Gabriel Geneau.

Category 5

“Visual composition to pre-existing musics, such as in some of the early works of Oskar Fischinger, the artistic interpretations of Walt Disney’s animators in the 1940 film *Fantasia* or music videos of the type found on MTV”⁷⁷ (Hill, 2013, p 6).

In order to complete these categories, it was deemed that a fifth category that was not included in Ox and Keefer but rather extracted from Andrew Hill’s classification should be included. This category draws on but differs from Ox and Keefer’s first category (see above). This category describes visual music works that do not follow a formal method of translating music into images such as prearranged or programmed image-sound couplings, but rather become visual *interpretations* of pre-existing music.

The difference between translation and interpretation is significant; it is not merely a linguistic difference. Translation invokes a formal relationship in the interaction between image and sound, (see Analysis Chapter, Theme: 2) which is one of the oldest in the visual music tradition. In contrast, interpretation describes visual music works, where the artists can freely create images they imagine when listening to a specific music or sound score. Andrew Hill uses examples like *Fantasia* (1940) and music video to represent this category; however,

⁷⁷ Hill’s category 5

for the purposes of this study, this category provides new or contemporary visual music examples that fit this category.

The new *proposed category 5*:

Visual composition founded on the interpretation of pre-existing music and vice versa.

This approach differs from a formalised method of translation. Examples of this include *Eye of the Storm* (2017) by composer Matthew Grouse and visual artist Andy Sowerby, and music videos such as Chemical Brothers' *Star Guitar* (2002) directed by Michel Gondry.

Theme 1 Discussion

The newly proposed categories constitute an updated framework for contemporary visual music and are an original contribution to the field. They have been constructed as follows:

1. *Translation or transcoding of a musical or sound composition into a visual language (music visualisation) and vice versa.* This includes the use of visualisation software, such as those within media players, oscilloscopes, and computer algorithms that transcode sound to image and image to sound. Examples of this type of work include *Duel Tones* (2016) by Maura and Bedhinn McDonnell and *Rami* (2015) by Alfredo Ardia. The

translation or transcoding need not necessarily result in a 1:1 mapping between image and sound.

2. *Analogous to musical structure.* An audio-visual or purely visual composition that is organised similarly to the structure of a kind or style of music. This includes time-based (or static) works that aim to emulate music or contain structures and forms inspired by those within music and can be presented with or without sound. An example of this category is the *Synthetic Electro Replicant* (2016) by Dave Payling.
3. *Music and image are produced simultaneously by the same source or event.* In this category, visuals and music are generated together by the media used during the visual music presentation, interactive installation or performance (i.e. post-digital aesthetics, glitches, noise caused by electromagnetic interference, etc.) like in *End Transmission* (2009) by Joseph Hyde. This category also includes visual music compositions that convey sounds and visuals captured during a video recording of an event, e.g. *Timber* (1997) by Coldcut and Hexstatic.
4. *Visual Music Improvisation.* Visual music compositions are produced by performing music and image, according to the rules of musical improvisation. These works operate through a combination of music and image composed freely and spontaneously, e.g. *Cadres* (2023) by Gabriel Geneau.

5. *Visual composition founded on the interpretation of pre-existing music and vice versa.*

This approach differs from a formalised method of translation. Examples of this include *Eye of the Storm* (2017) by composer Matthew Grouse and visual artist Andy Sowerby, and music videos such as Chemical Brothers' *Star Guitar* (2002) directed by Michel Gondry.

The proposed categories can be used as an updated version of Ox and Keefer's (2008) and Hill's (2013) classifications. This classification arrangement was chosen because it better reflects the opinions of the interviewees. It seems that the interviewees viewed the classifications from the perspective of the visual music artists and curators, and therefore, they emphasised the techniques used in producing visual music works. Therefore, the new classification can be a useful tool for contemporary visual music artists.

A potential problem with these and previous classifications is that it might be difficult for the audience to identify the category a work belongs to by solely experiencing it. However, some audio-visual cues, such as the timing of image and sound, visual and musical structure, image-sound correspondence, performer's gestures, etc., may make apparent the method used for the visual music work production to the audience. For instance, in a live performance, if the spontaneous gestures of a performer are followed by real-time changes in the visual and sound behaviour and patterns, this may suggest the visual music production method becomes apparent to the audience. Nevertheless, visual music can be sorted by other characteristics more prominent to the audience. The following code, Image–Sound

Relationships, focuses more on how a visual music work is perceived while expanding on the visual music characteristics.

4.2. Theme 2: Image and Sound

Codes: Image–Sound Relationships; Visuals; Sound.

This section will discuss the transcript responses to questions that relate to contemporary image and sound relationships, as well as examining these two components independently.

Code: Image – Sound Relationships

The majority of the participants of this study described the relationship between image and sound as an important element in visual music (AC:2, AA:1and36, AD:13, BB:3 and 4, BC:1). In some of the aforementioned visual music classifications and some of the answers given by the subjects, the visuals appear and move in coherence with the sound (AA:15 and 18, BA:6). Some participants mentioned that the time of appearance of the visuals can be rhythmical, harmonic, dynamic, etc., creating visual narratives similar to musical or sound structure (AA:19 and 29) or they may have other musical qualities assigned to them in terms of their vibrancy, motion (AA:12, AD:13).

Comparing the data from the primary research with the data from the literature and contemporary practice review, it occurs that these image-sound parallels most frequently appear and are heard simultaneously in the form of a metaphoric relationship, loose synchronisation, or 1:1 mapping. However, there are cases where the visuals are neither synched with sound nor produced as a visual representation, interpretation, or translation of music but rather composed as individual elements. These time-based image-sound relationships will be analysed below.

Time-based relationships

According to the participants, a common characteristic in image-sound relationships is audio-visual synchronisation, which can be precise, loose or absent (AA:20-29, AB:2, B:3). The use of a specific type of synchronisation is a part of the arsenal of expressive techniques a visual music artist can use to relate image and sound (AA:28).

Participants discussed a number of different sound-image relationships; these have been organised as a sub-section below and according to how synchronous (or not) image and sound are in a particular work.

- *Precise Event Synchronisation and 1:1 Mapping:* Some behaviours or events in the image and sound occur simultaneously, resulting in a precise event synchronisation (AA:20). A participant mentioned that the accurate synching between image and sound has become easier than ever before; one can precisely match an event in the visual part with an event in the musical part, with the assistance of a time-coded timeline (AA:26).

It was also added that 1:1 mapping could produce very satisfying and dramatic results (AA:27). Two subjects argued that one should not rely solely on this relationship otherwise, the work may lack depth (AA:27, BA:3)

- *Sequential Event Synchronisation* – Some behaviours or events in the image and sound occur in sequence and suggest a relationship in time (AA:21). In this type of synchronisation, the image and sound are composed simultaneously, and their relations are dealt with as constructs that rise into metaphor (BA:3). Some key moments are synched to create a dialogue between the two (AA:21).
- *Independent Relationship and Dramatic Journey* – Two worlds – image and sound that are combined and seem to match in terms of mood and treatment, but not necessarily synchronised (AA:22). In this relationship, the participant is referring to the type of visual music where the visuals are composed and organised independently to sound; though they correspond to the way music/sound is composed. The same participant continued that image and sound can have independent dramatic development and degrees of tension and resolution (AA:23).

Additional image-sound relationships

Apart from the types of synchronisation, the participants mentioned additional image-sound relationships, such as:

- *Formal Relationship and Synaesthesia* – “A colour linked to a pitch; a shape linked to an instrument. So many possibilities in forging relationships between the formal elements and components of visual, image, sound and music” (AA:24). According to some participants, certain qualities of music are translated visually into assigned forms and colours, producing an effect that imitates synaesthesia (BA:2, AA:16 and 17).⁷⁸ One participant emphasised that the synaesthetic experience has always been a key characteristic of visual music, from early artists such as Wassily Kandinsky and Oskar Fischinger to contemporary artists such as Lisa Park (AD:14).
- *Motion*. Motion can enhance the relationship between sound and image; both as a holistic approach to the audio-visual composition but also as movement of each of the various elements (AA:12 and 29). Furthermore, motion can create textures, forms, sounds, pitches, rhythms, and trajectories in both the image and the sound (AA:29).
- *Matching Image-Sound Combinations*. This relationship demonstrates that the image was produced with the sound in mind and/or the other way around (BC:9). According to some of the examples given by the participants a matching combination could be achieved by performing sound and image according to the same set of rules (audio-visual composition or improvisation); structural reference to musical composition; or different types of transcoding (AC:2 and 8).

⁷⁸ See Literature Review for a discussion on synaesthesia.

- *Contrasting Image-Sound Combination.* It was argued that image and sound can produce different meanings by pulling against each other (BC:8).

Code: Visuals

According to the transcript, this section examines how the visuals have changed in contemporary visual music practices. The data derived from the answers of the participants agrees with the Literature Review that one of the most common visual music practices (both past and present) is the association of colour with sound. Two participants said that visual music artists experiment with various colour qualities and often link them with various musical qualities (AA:11, BA:3). In contemporary visual music, the correspondence of colour and sound can be programmed. For instance, one subject referred to an installation that analyses the colour harmonies between paintings and translates the data into a visual soundscape (AD:5).⁷⁹

Another participant described contemporary visuals as: “eclectic, inspirational, dynamic, often psychedelic, mesmerising, often multi-dimensional, vibrant and elevating” (AD:12). The participants also stated that collaborations between visual artists/animators with musicians/composers, and very often with computer programmers as well (AA:6, BA:7) are common practice in the field. Visual music has become a rich field of interdisciplinary,

⁷⁹ See David Payling’s *Visual Music Composition with Electronic Sound and Video* (2014). Payling analyses traditional and contemporary methods of matching different visual qualities with musical ones.

inter-media and inter-art creative activity, generating multisensory experiences that are both creative and compelling (AA:2).

The data shows that although contemporary visual music has expanded and progressed in many ways, certain aspects of classic visual music works remain central to current practices.

- ‘Synaesthesia’ - is a concept that continues to be present in the practice of contemporary visual music (AD:14).
- Visual references relating to the visual music tradition, such as abstract shapes, moving colours etc., (AC:6, BC:5) are equally significant to contemporary practices.
- Though most subjects agreed that in contemporary visual music, visuals come in all different shapes and forms (AA:11, AC:4, AD:12), more than half mentioned or implied that abstraction continues to be one of the main aesthetics in visual music (AA:10, AC:6, BC:5 and 6, AD:4 and 12).⁸⁰

Numerous preeminent practices in contemporary visual music can also be identified in the data. There are several contemporary works that engage with cinematography and filmmaking practices (BC:13, BB:2). In these cases, there might be video footage of recognisable objects, but their form and movements are edited in such a way that the final visual outcome is still partially abstract (BC:5). These visuals engage more with the materiality and textures of the objects, rather than their conventional representational qualities (BC:1).

⁸⁰ See Literature Review for a discussion on abstraction in relation to visual music.

Noise has also been integrated into the contemporary visual music aesthetic, in both image and sound (AD:4).

Code: Sound

Interestingly, far fewer subjects attempted to characterise music or at least discuss it to a great extent. This does not mean that the sound in visual music works is gradually being disregarded or that it is considered as secondary in contemporary works. On the contrary, the subjects who did discuss music mentioned that it was an important contributor to the visual music work and viewed no distinction between sonic and visual aspects in terms of importance (AA:15). A subject stated that in many visual music works, sound is the leading mode, and the visuals follow (AA:16). Similar to the visual component, which can vary greatly from work to work (AC:4), the music in contemporary works can encompass a wide range of musical genres, including experimental, jazz, and (European) classical music, (AC:5) and incorporates or experiments with club music, noise and immersive en(AD:4 and 5).

Additionally, participants stated that the most frequently addressed music genre in contemporary visual music is electroacoustic music (AA:19, BC:6). One participant stated that electroacoustic music engages mostly with the evolving experience of sound rather than the instrumentation and orchestration of the music (AA:19).

Theme 2 Discussion

Comparing the answers of the participants with the information in the Literature Review chapter it can be noted that most of the aforementioned contemporary visual music image-sound qualities could describe a range of traditional visual music works too.⁸¹ However, the three-dimensionality⁸² of the visuals is a practice most commonly found in contemporary visual music.⁸³ The participants also provided examples of edited videos and images of once recognisable objects, used in the making of abstract and abstracted compositions that this thesis has characterised *as hybrid*.⁸⁴ To sum up, Literature Review, Contemporary Practice Review and Analysis chapters show that the visuals continue to range from abstract to hybrid, which allows space for innovation and experimentation with more representational imagery in visual music.

Other findings show that the use of electroacoustic music and immersive sound are practices more common in contemporary visual music. This aligns with the findings from the Contemporary Practice Review and Literature Review chapters too. In conclusion, the overall audio-visual outcome in some contemporary visual music works remain faithful to the abstract traditions, however, the incorporation of figurative elements, referential sounds, 3D graphics and sounds could be considered a small but significant step towards representational and immersive visual music. Therefore, while abstraction continues to be central to visual

⁸¹ See Literature Review for Aimee Mollaghan's (2015) discussion; she describes Whitney's *Lapis* (1966) and Belson's *Samadhi* (1967) in a similar manner.

⁸² Either rendered as 3D graphics or displayed in three-dimensional space.

⁸³ See Contemporary Practice Review.

⁸⁴ See also, Appendix: 3 Contemporary Practice Review: Fixed Media. Here, a number of hybrid contemporary visual music works have been reviewed.

music practices, contemporary visual music works - including the practice part of this research - are challenging this view.

4.3. Theme 3: Media and Technology

Codes: Contemporary technology; Media; Immersion; Innovation

This section includes information related to up-to-date media and technologies and how they affect the production and immersive experience in contemporary visual music. It also provides information about the areas where the participants see innovation in visual music due to the usage of media technologies.

Code: Contemporary Technology

In the interviews, it was highlighted that over the last 20 years, digital technology has facilitated the growth of visual music practice (AD:6). Three interviewees mentioned innovation in software, hardware and digital platforms (AD:1-4, BA:4, BC:12) stating that the improvement in sound and image-making tools has helped them with their own practice. Participants referred to the ease and creative possibilities that machines, tools and technologies offer visual music practices (BA:4). They also discussed how contemporary technologies have benefitted from access to high-resolution cameras. This has enabled the creation of new types of images and sounds; visual artists can use detailed textures in their

work, when in the past they would engage solely with forms (AA:35, BC:12). This, along with the increased availability of audio-visual programmes, software and hardware solutions such as Resolume and Isadora, as also real-time generative software, like Touchdesigner, Unity, etc., has helped a new scene of audio-visual artists to emerge globally, and in all genres, whether it is pop, fine art, or concert support for bands (AD:4, AA:39, BA:4, BC:12).⁸⁵

From the responses, it is evident that apart from the revolutionary image and sound-making tools, technology has also brought about changes in the means of presentation and form. For instance, one subject categorised contemporary visual music by referring mainly to the technologies used to create it: video (e.g., the video music works of Jean Piché), abstract animation, generative real-time audio-visual and visual music instruments (real-time performance) (AA:10). Some contemporary visual music works were even described as ‘post-digital’ (AC:9), referring to works that combine analogue and digital technologies.⁸⁶ The following are participant observations, regarding how technology has impacted their field:

- Networking and technology have opened the field of real-time performances, which can now take place at different venues around the world at the same time (AD:17).
- Technology has contributed to the immediacy of real-time performances but also increased their transfer to online video-sharing platforms (AD:15).

⁸⁵ This includes: sound control, DJing, VJing, pre-made stage visualisations, etc.

⁸⁶ See Contemporary Practice Review Chapter.

- Visual music events and online forums (such as VJ London) have become a place for visual music discussions, live gigs, presentations and the exchange of technical knowledge between pioneering artists (AD:8).

Some of the participants gave examples of technologies in relation to contemporary visual music practice which include programming, coding, deep learning, interactivity, kinetic installations and 360 sound etc. (BB:4, AD:1,4,5 & 10)

Code: Media

The communication outlets and tools used to deliver and present visual music works have been divided into three main categories; identified and derived from the participants of this study who drew on their own experiences as curators, artists or as audience members at visual music events: a) *Fixed media screening*, b) *Live performances* and c) *Installations*

a) Fixed Media Screening

(Visual Music Cinema, Visual Music Film/Video, Video music)

This category appears to be the most common way of displaying contemporary visual music. One participant estimated that approximately 70% of the visual music they have

experienced was through fixed media screening (AA:30). Fixed media includes visual music cinema and visual music film or video and is typically displayed or projected in film theatres (AB:3). Occasionally, contemporary visual music works are presented in exhibition-based settings (e.g., galleries,) on monitors of all sizes (from small laptops or iPad screens to big screens in galleries, or on exterior monitors) (AB:3). According to some examples given by the participants, these can take the form of single, or multi-screen films/videos, with stereo or multichannel sound (AA:37, BA:8, BC:2 and 10). Visual music works can be projected on various interior or exterior surfaces of all sizes (AB:3). Two participants mentioned that the works are most often submitted in digital media (QuickTime etc.,) and less frequently on 35mm, 16mm and videotape (AB:3, BB:5).

b) Live Performance

(VJ performances, Audio-visual performance, Visual music performance, Visual music instrument, Transcendental, Transformative performances, Visual sound art installations and performances, Post-digital)

A smaller but increasing number of contemporary visual music works are presented as live performances - one participant roughly estimated 20% (AA:30). A participant mentioned that live performances are a field of experimentation with possibilities of controlling sound and image in real-time (AC:11). These works utilise real-time media and technologies that support live audio-visual and visual music performances (AA:7and9, AD:11). Another

participant noted that most live performances use video projection and/or multi-screens from Standard to Ultra-High Definition to display the image (BA:8).

A number of subjects gave examples of live visual music performances that incorporate post-digital forms (AB:3, BB:5, AC:9) such as dance, performance focused on the human body (AC:10) or various analogue elements such as gallery paintings, interactive physical sculptures and musical instruments. (AD:15, BB:4, AC:9).

Other contemporary live visual music performance examples mentioned include the works of New Opera Hero and Holotronica, which often combine live music and live visual triggers. The transcendental, transformative performances found in the practices of Kimatica and the visual sound art installations and performances, found in the works of the Analema Group were also mentioned (AD:11).

Lastly, It was mentioned that an increased number of visual music performances are using online platforms such as YouTube, which may increase the accessibility of the live performance but can also decrease its immediacy (AD:15).

c) Installation

(Visual music installation, Audio-visual installation, Generative real-time audio-visual, Visual sound art installations)

One interviewee stated that roughly 10% of contemporary visual music that they have experienced was presented in this form (AA:30). It was noted by several interviewees that contemporary visual music installations combine different types of media to stimulate vision

and hearing and/or other senses (AD:1,5 and 11 BC:2, AC:12). A participant noted that installations set up in a gallery are the most easily accessible (BC:10).

Some of the examples of installations given by the participants incorporate standard projectors and screens (BC:1); projections on flat surfaces, smoke or gauze (BC:3); 360 projections (AD:1), 360 multi-screens, (AD:4, BC:4)⁸⁷ and 360 sound, (AD:5). Various subjects gave examples of interactive visual music installations, where actions from the audience or performers (in the form of sound, movement, gaze, other visual cues or brain wave activity)⁸⁸ would trigger a programmed sonic or visually corresponding reaction in the installation (AD:1,2,5 and 11, AD:1 BB:4). Additionally, some artists that make contemporary visual music AV installations were mentioned: Brian Eno, Chris Levine, AntiVJ, United Visual Artists, TeamLab, Tony Nicholls, Claudia Robles Angel; as well as, VR installations, such as those of Dominique Gonzales-Foerster (AD:16).

Code: Immersion

The participants' answers focus on two methods by which media and technologies are employed to achieve immersion: a) Virtual audio-visual environments presented in physical spaces and b) Virtual Reality.

The first method includes the audience experience of 360-degree virtual installations and live performances (AD:1 and 11). For the production of virtual audio-visual spaces, artists

⁸⁷ Contemporary visual music works that use 360 visuals and sound enhance the immersive quality of the art work; this will be discussed further in the Code: Immersion below.

⁸⁸ Like in the work of Claudia Robles-Angel.

use various media (multiple screens and projections on surfaces) arranged in such a way to encircle the viewers in a 360 environment (BC:4, AD:1and5). Interview responses mentioned installations that produce 3D sound and interactive spatial soundscapes and when combined with 360 projections, the outcome is a 360-visual soundscape (AD:5).

The second technical method mentioned by more than half of the interviewees is that immersive experiences can be created through Virtual Reality (AC:14, AD:16and20, BA:5, BC:4). It was acknowledged that this medium has many other applications and has great potential with visual music (BA:5). Increasingly, immersive environments are opening up to Virtual Reality in other arts and practices as well (BC:4).⁸⁹ It was mentioned that the main challenge of VR is the immersive expression of possible realities (BA:10). However, the examples of VR in visual music in this study were a few (AC:14). From the answers provided, it seems that the subjects acknowledged the potential of VR, but it was considered as something more likely to develop in the future (BA:5, AD:20). Augmented reality and holograms were discussed in a similar manner (AC:14, AD:20).

Code: Innovation

This code provides a synopsis of the participants' answers related to innovative practices and technologies in contemporary visual music practice. Some of the content in this passage may overlap with previous codes/sections; however, due to their significance certain answers are reiterated here. Additional or new elements are included.

⁸⁹ The exact word used was *everywhere*.

In the interviews, it was stated that contemporary visual music has seen an increased use of installations and real-time performances; the introduction of coding into live performances and installations - a practice that has initiated new ways of transcoding visuals to sound and vice versa (AD:2,5 and 10). It was also mentioned that increasing numbers of artists engage with cinematography and filmmaking practices (BA:4, BC:13, BB:7). One subject suggested that visual music is gradually moving away from imitating existing aesthetics and is opening up to a rather filmic experience - not in a storytelling sense but rather, from a more conceptual approach (BA:9). Contemporary visual compositions often incorporate videos with recognisable objects and textures (BC:5). Future technologies could connect and interact even more with the human body, for instance, there could be more approaches where technology could translate the bio-data into audio-visual outputs (AC:12). Kinaesthetic and haptic technologies could add a corporeal element to visual music practice (BB:7). It was also argued that there is room for experimentation with alternative modes of image - sound works and control, especially in real-time (AC:11).

Some of the interviewees proposed the following future innovations in visual music such:

- Architecture exclusively designed and equipped with hemispherical spaces (i.e., domes) to facilitate contemporary visual music projects and immersive audio-visual presentations (AA:38).
- Telepresence (VR) is also likely to develop in visual music practice; potentially changing the field substantially (AC:14, AD:20, BA:5 and 10, BC:4).

- Other immersive technologies that open up new possibilities for future visual music are augmented reality and other mixed reality media and holographic technology (Hololens and Pepper's Ghost) (AC:14, AD:20).

Although in the interview answers, innovation was often correlated with technology, one subject claimed that many contemporary visual music works fail because they rely too much on tech gimmicks (AB:4). Another subject agreed, arguing that although technology has allowed visual music creators to produce new types of sounds and visuals, it is talent that matters in the end. However, proficiency and the skills of the artist often produce the innovative work rather than the technology that is being used (AA:31 and 36).

Theme 3 Discussion

The importance of technology in the production of contemporary visual music has been recognised by all participants. The findings of this research suggest that new technologies have opened up new possibilities for artists: in the production, experience, and presentation of contemporary visual music. This is consistent with the Literature Review findings. Additionally, contemporary visual music aesthetics have become more diverse than traditional visual music because of the diversity of technologies.

During the interviews, it was also mentioned that technology has made significant contributions to video-sharing, online events and networking, which were not addressed in this study before.

Findings in both the 'Technology' and 'Media' codes show a renewed interest in analogue technologies. Holger Lund, one of the visual music authors mentioned in the Literature Review, notes that "a huge amount of works in the arts, in design, music, film, etc. tends to 're-introduce humanity' by way of re-analogization, since the analogue is — like humans — non-perfect, dirty, and material." (Lund, 2017, p.1).

Contemporary visual music has evolved to include *interactivity* in addition to the audio-visual presentations that utilise screens, projectors and loudspeakers. Technologies that use coding are frequently incorporated into contemporary visual music installations and performances. Although installation makes up a small portion of visual music, it is something relatively new and distinct from the majority of traditional visual music works. Live visual music performances, along with VJing, seem to gain more prominence and recognition within the contemporary visual music scene.

There is also a new movement in contemporary visual music practice which expands outside fixed media screens and produces increasingly immersive visual music artwork. This was also discussed in the Literature Review and Contemporary Practice Review chapters. This tendency appears to occur in the production of virtual audio-visual environments set in physical spaces. The Contemporary Practice Review chapter in particular, discusses the use of image or light projections on multiple surfaces arranged in space, along with the use of surround sound systems. In the interview transcripts, fewer references were found about

installations or live performances that use laser or strobe lights for the creation of immersive spaces.

The majority of the interviewees suggested that there are a number of contemporary visual music practices that simulate space, such as 3D graphics, screens arranged in space, 3D sound, 360 installations, 360 projections, and have enabled artists to develop and deliver immersive visual music works. Finally, the contemporary practices reviewed in previous chapters and the interview data analysis concede that visual music works that use VR are currently not widespread.

4.4. Analysis Conclusion

From the interviews conducted for this research, it is apparent that contemporary visual music has developed beyond the remit of the traditional visual music works of the past. It is an art that can be done intuitively and draws inspiration from various other art forms. As a result, contemporary visual music has taken many different forms.

The participants noted that the number of visual music events has increased in recent years. Contemporary visual music and music artists, as well as researchers, participate and present their work at international festivals such as ArtFutura, Splice Festival, Crux Events, and VJ London Forum. These events provide the attendees with the opportunity to experience first-hand, inventive visual music works and exchange technical knowledge. They can also

expand their network for future work or research project collaborations. Visual music has increasingly become a focus of academic research, and research has become a stage of visual music practice.

The most discussed and recognised technological innovation in visual music practice by the interviewees, was methods of producing immersive experiences. Nearly all subjects predicted this in their interviews, and some even expressed their anticipation of spatial immersion to develop further in the field. As mentioned, participants expected that more visual music artists would move away from fixed media screens (cinema and monitor) and explore the potentials of 360 projections, immersive multi-screens and expanded cinema. Immersive projections and displays could potentially be designed to be part of the physical space or architecture. Immersive virtual spaces and telepresence (VR) have great potential in this field. These technologies have increasingly gained traction amongst visual music artists. As discussed in the Literature Review, recent research such as Arnon's (2020) *Visual Music Strategies and the Sense of Place* engages with visual music and immersive spaces.

This research has shown that the incorporation and VR technology can enhance visual music practice and make an original and anticipated contribution to the field. Therefore, this developing area of immersive visual music provides an opportunity for further investigation and experimentation, which this research has engaged with as part of the submitted practice for this thesis.

Chapter 5: Practice

This chapter will present the practice portion of this research, which was informed by the primary data and findings discussed in the Analysis Chapter as well as the research documented in the Literature and Contemporary Practice Review chapters. The practice section aims to explore the use of new technologies in the production of visual music. A series of exploratory visual music works were created for this study, investigating how immersive technologies that simultaneously challenge traditional visual music aesthetics can be utilised effectively in visual music practices.

Notably, the experiments (*Abyss, Mascenery, Sea Storm, Hades and Ripples*) provided the groundwork for a final visual music work (*Vorstellung*), which demonstrates the findings from the experiments and will be presented at the end of this chapter. The selection of used technologies includes a) Movie Theatre Setting (big-screen presentation), b) Virtual Reality and c) Spatial Augmented Reality (projection mapping). Primarily, the tested elements were immersive visual music components, corresponding aesthetics and sound-visual relationships. More specifically:

a. *Immersion*: experimentation with the aforementioned immersive media technologies, along with immersive practices such as: illusion of perspective, three-dimensionality, image scale, sound localisation, and stereo or surround sound.

b. *Visuals and sounds*: experimentation with mainly alternative (alongside traditional) visual music aesthetics and techniques, including representational or stylised visuals, 3D animation, sound organisation, mimetic and abstracted sounds, among others.

c. *Image-sound relationships*: experimentation with the timing of image and sound, such as precise event synchronisation, loose synchronisation, or independent relationships. There is also experimentation with bringing these two modes together in a matching relationship suggesting that the visuals are created in accordance with given sounds and vice versa.

The practice presented in this chapter is split into two parts: a) experiments (primary practice research) and b) final piece (a reflection of the research conducted for this thesis as a whole).

The initial experiments include the following:

- *Abyss*: an immersive visual music work presented in a movie theatre setting, which is a commonplace for contemporary visual music practice.
- *Mascenery*, *Sea Storm* and *Hades* that experimented with VR technology and aesthetics. These will be presented here as a trilogy of works, which explore different visual-sound relationships (including the use of various sound materials such as human voices, natural soundscapes and musical characteristics) that display diverse relationships in combination with the visuals, while also possessing diverse acoustics (sounds from indoor, outdoor and in-between spaces). All of these elements test the level of immersion that the visual-sound relationship can produce in various contexts.

- *Ripples*, a project that was presented as an installation, and experiments with natural sounds and hybrid aesthetics.

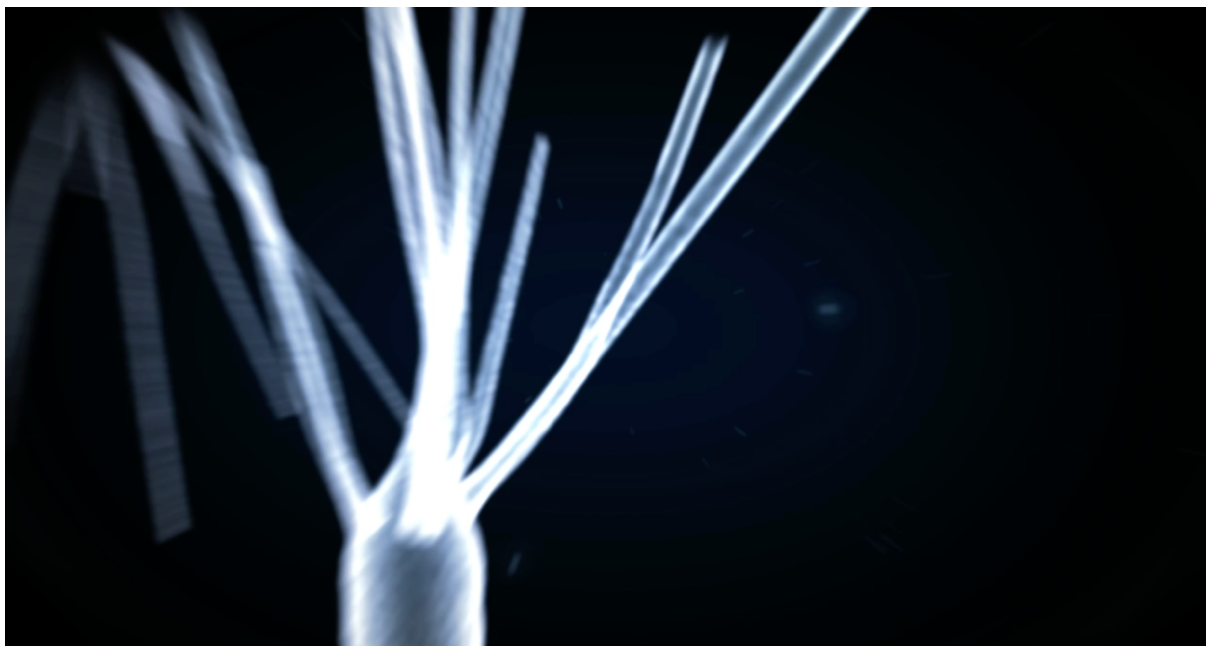
All the aforementioned immersive visual music experiments were analysed; observations regarding limitations and the problems encountered in each project (as well as how these were resolved) are discussed in this chapter. The final work, *Vorstellung*, aims to demonstrate how these findings can be used to create effective immersive experiences in visual music. In what follows, I discuss each experiment separately and analyse the outcomes; identifying the strengths and weaknesses of the elements above-mentioned, as applicable to each experiment.

5.1. Movie Theatre Setting Experiment

Abyss (2018)

For the *Abyss* project, visual and sound objects represent a dark subaquatic environment; the point of view (POV) displays a forward wandering into an unknown space, where various living organisms are floating around the spectators. Sound and visual objects are moving ceaselessly in every direction. This project can be classified in the proposed category 1; the sound composition was produced first, and the visuals were made as a translation of the sounds. There is no obvious rhythm in the sound composition, and therefore, the spectators are not expected to predict the approximate succession of sounds

or visuals. Listening to the referential sounds, the audience may identify what is being presented in an underwater or liquid environment. However, some sounds, such as heartbeats or abstract ambient sounds, are introduced to create a sensation of abstruseness or surrealism. Visually, certain objects are recognisable, while others are random in size and abstract in form.



Abyss video link: <https://youtu.be/1YbAOTzuDrc> (Accessed: 30 June 2024)

Immersion

Abyss was rendered in video format and belongs to the fixed media category, since it can be uploaded online or stored on a hard drive and played back from almost any media player. However, for the purposes of this research, *Abyss* was presented in a movie theatre

setting in front of a live audience.⁹⁰ In order to achieve an immersive experience, big-screen projection and 3D were tested as the key technologies and media. To remove visual stimulations and distractions, the lights of the theatre were switched off. This allowed the live audience to fully immerse in the visual music work.

The screen of the presentation was big enough to capture the entire vision of the audience, when facing forward.

The sound was produced in a digital audio workstation (DAW) and exported as 5.1 surround sound. However, if played from a conventional computer (with two speakers) or a media player, the sound would come out as stereo. During the presentation the sound of the project was loud, not allowing other environmental sounds to distract the audience. The loud bass vibrated across the physical space, so as to make the spectators feel present in the simulated world.

The camera's POV that captures this journey is central and aligned with the POV of the audience; the camera's angle travels forward while underwater organisms, bubbles, and particles appear to move toward the viewers. There is no horizon and/or landscape to help the spectator's orientation; therefore, the animated objects themselves become the sole visual reference that simulates perspective and demonstrates three-dimensionality. For this reason, all animated objects were made to be three-dimensional – in a 3D software – to convey a feeling of space. The minimal light of the scene casts shadows on some of the moving objects, enhancing the three-dimensionality of the textures, the objects and the scene. Moreover, the objects appearing to move closer to the camera (or alternatively, the camera

⁹⁰ This took place in one of the lecture theatres at the University of Greenwich.

is moving towards them) become enlarged until they pass by; other times, blurry objects become focused as the camera moves towards them. Simultaneously, the corresponding sounds of the animated objects become increasingly louder as the camera approaches the object. The editing of the images and sounds was made to look like a continuous shot with no editing cuts or different scenes aiming to simulate an immersive experience. However, there was a mismatch between the surround sound and the image that was projected only on the front side of the audience, which weakened the element of immersion. For instance, a sound might have represented a movement from front all the way to the back side of the spectators, but the corresponding visual would disappear as soon as it reached the edge of the screen.

Visuals and Sounds

The music of *Abyss* is primarily composed of field recording sounds. Although all sounds and visuals clearly demonstrate characteristics of an underwater environment, they also carry other features that can cause a feeling of uncertainty for the spectator, including the location, shape, and motions of the sound sources. The timing of these motions occurs in an unpredictable (and unclear) manner - the sound composition does not follow or illustrate traditional musical patterns and tempo.

Similarly, this sensation of ambiguity is also reflected in the visuals since the visuals correspond to the sound. The visual environment was intentionally made to be dark and blurry. In a dark environment, there is not enough light to allow for the distinction of one's surroundings and the blurriness conceals the main characteristics of the objects, thereby intensifying the obscurity. This imitates a physical world experience, where light in a deep-

sea environment is limited, and things appear blurry because of the liquid material. The lack of light in the visuals also allows the audience to concentrate on the sounds.

The visuals explore a hybrid aesthetic - a mixture of recognisable and non-recognisable objects. The spectator might identify viruses, bioluminescent microorganisms, deep-sea fish, and early aquatic species, but also a number of indistinguishable objects, such as 3D lines moving in a flock, glowing, floating particles, and forms of x-ray abstract shapes, resembling veins or nerves seen through a microscope. The animation of all the objects (abstract and representational) was created to resemble the experience of swimming in a liquid environment.

The sounds in this composition are field recordings that exhibit qualities which fit into the mimetic discourse in Emmerson's grid or the first-order surrogacy in Smalley's taxonomy.⁹¹ However, a small number of atmospheric sounds are abstracted, and they could be classified as third-order surrogacy. In spectromorphological terms, the sounds are shaped with low frequencies and extended sustain, manifesting that they exist, move and evolve in an underwater environment.

The overall shape of the compositions could be described as rounded and organic. The recurring change of frequency of some of the sounds and the added swell shape of the increased and decreased amplitude gives the impression that something is approaching in an oscillating movement and then receding.

The sound composition starts with minimalist sounds representing diverse movements around the spectators from left to right, front to back and so on, following Wishart's theory

⁹¹ See Literature Review

of sound localisation and motion as discussed in the Literature Review chapter. In the middle of the composition, a background low-frequency sound with added bass ascends and evolves into a sustained shape by maintaining the continuant phase. Occasionally, some percussive bubble sounds of higher frequency are introduced to add some granular shape and create a little contrast with the rest soothing low-pitch sounds of the composition.

To conclude, in *Abyss*, both sound and image lean towards representation, but the composition exhibits several abstract and abstracted elements, creating a complex interplay between mimetic and abstract discourse.

Image and Sound Relationship

‘Abyss’ is analogous to musical structure,⁹² and therefore, falls under the second proposed visual music category, as discussed in the previous chapter. The visual structures, shapes and movements are inspired by the corresponding sounds.

The visuals and sounds of *Abyss* match. They both represent shapes and movements that are predominantly round and organic. For example, the wavy movement of a flock of abstract lines that crosses the screen a couple of times is analogous and synchronous to the wave-like gesture of a sound that oscillates in volume and frequencies. Another example is the quick stretch and slow release movement of medusa-like objects that correspond to sounds which also have attack-decay shapes.⁹³

⁹² Sound composition structure in this case

⁹³ The sound begins with a quick attack and then gradually decays.

Furthermore, both acoustics and visuals represent a subaquatic scene. The environmental and long-distance sounds are of low-frequency while some of the sound sources that are closer have higher amplitude and sometimes high frequencies. This is reflected in the visuals as well, with the long-distance objects being blurry, darker, and barely visible while the closer ones appear brighter and more defined.

The dramaturgy of the visuals is analogous to the music, too. In the beginning, minimalist sounds are accompanied by corresponding minimalist visuals. Later, as the texture of sounds add more layers, the visual counterpart becomes busier with graphics.

To that point, the sound-image relationship is quite precise down to 1:1 mapping. In the end, the continuant phase of the sound matches visually with the continuous movement of a number of virus-looking visuals. In that part, the synchronisation changes from 1:1 mapping to event synchronisation since both visuals and sounds correspond to one event (approaching movement) that lasts until the end of the composition.

5.2 Virtual Reality Experiments

Mascenery (2018), Hades (2019), Sea Storm (2019)

The experiments I discuss here are three visual music works that have been presented in a Virtual Reality form: *Mascenery* (2018), *Hades* (2019) and *Sea Storm* (2019). All three works vary in duration, image-sound relationships and treatments. The sound compositions of the three videos experiment with different types of music or sound. *Mascenery*

experiments with industrial, rhythmical sound, *Hades* with (human) vocals and *Sea Storm* with a natural soundscape. Since the immersive technology being tested for all three visual music works is VR, these three experiments have been grouped together. However, each will also be discussed separately in regard to the visual-sound relationship.

Mascenery



Mascenery video link: <https://www.youtube.com/watch?v=bFKiQ6cOGg4> (Accessed: 30 June 2024)

The title of the *Mascenery* project is a portmanteau, coined from machinery and scenery. In this project, visuals and sounds simulate machines, which are in a fixed position but have parts that are moving rhythmically. The synchronised images and sounds were produced in such a way as to create the illusion that the machines are working to make a rhythmical noise, though in reality, the opposite happens. The movement of the visuals is

follows a pre-made sound composition, similar to a visual music experience where the visuals are a representation of the music. The sound composition, therefore, was produced similarly to a traditional musical structure. Repetitive movements of animated visuals and sounds resemble a factory environment.

Hades



Hades video link: <https://youtu.be/2xO6qlqymXA> (Accessed: 30 June 2024)

Hades is the second experimental visual music project that explores Virtual Reality. The position of the 360 camera makes the spectators feel like they are hovering above the ground in a still position or that they are placed at a higher-than-ground-level altitude. The whole atmosphere is dark, foggy and gloomy. The mist and the light of the scene make it difficult for the viewers to distinguish where the ground level is; at times, rocky cliffs reaching the sky can be distinguished in the slow-moving fog. Throughout this visual music work, the spectators

can distinguish human-like figures, which can be interpreted or give the sense that they are desperate souls travelling in a virtual space.

A narrative is more apparent here than in the previously mentioned works. Although interpretations may vary, the spoken words of the souls may suggest that they are newcomers to the underworld. The loose tempo of travelling voices blends with the bass of the windy ambient sound. The voices coming from the wanderers' souls speak a number of different languages including Russian, Polish, Spanish, English, Turkish, German, French, Arabic and Greek, which could imply that these were the languages that they were speaking before they passed. The concept of the spoken words invokes a similar feeling to that of the visuals: despair and depression. Some of the souls are just making eerie sounds to create a feeling of uneasiness at their newly arrived destination.

Sea Storm



Sea Storm video link: https://www.youtube.com/watch?v=uemPbh7_7pc (Accessed: 30 June 2024)

In *Sea Storm*, the spectator is placed in a virtual stormy sea, travelling in the night through a complex of tall rocky islands. The sounds are referential and represent nature: waves, rain, wind and thunder. The night storms, sharp rocks and the sound of a raging ocean echo the Kantian sublime aesthetic: the fear and terror a human being feels at the sight of cliffs, hurricanes and storms, reminds them of how small they are in relation to the greatness of nature. The beauty of the sublime aesthetic can be appreciated when the spectator observes these phenomena from a safe place outside them (Kant, 2009). In *Sea Storm*, the sublime aesthetic is indeed experienced in a safe place, through the VR goggles. The experience is made to be immersive, the smooth and slow camera movements (or spectator's POV) work in contrast to the experience of big waves, rain and wind, producing an unreal, dream-like sensation.

Immersion (all three projects)

In all three of these visual music projects, the immersive technology that was put to test was virtual reality. Virtual reality is often associated with the stimulation of three senses: vision, sight and touch. In this series of projects, touch is overlooked since it is not one of the main components of visual music. Undoubtedly, tangible interaction could provide a whole new area of visual music research, however, it is not something that this research has focused on and has therefore been omitted here.

The displayed image through a VR set was only a few centimetres away from the spectators' eyes, which captured their central and peripheral vision, and prevented any other visual distractions that might have been present in the physical (immediate) environment.

The VR head-tracking technology enabled real-time interaction between visuals and the audience' head movements. These allowed the spectator to fully immerse into the virtual environment.

In order to create an immersive experience for these three projects, both sight and hearing were stimulated simultaneously. The spatial sound created the illusion that it was coming from the places where the virtual objects are situated. In the *Abyss* project, the spatial sound was created with the use of a 5.1 surround sound system, where each channel corresponds to a different location, front centre, front-left, front-right, back-left, back-right. The bass can also enhance spatial immersion. For instance, in *Mascenery*, bass was used to stimulate the vibration of the sledgehammer and other heavy machine sounds, while in *Sea Storm*, it simulates the thunder sounds coming from a distance as well as the underwater acoustics. Sound effects and edited sound parameters were added to improve the immersive experience. In *Mascenery*, the reverberation effect that was added to almost all sounds, along with the high amplitude, simulated a convincing experience of being present inside a large-scale, indoor space, surrounded by heavy working machines.

A number of issues were encountered during the composition of sound for these works. Transferring 5.1 channel output to applications that support VR, such as *Youtube 360* and *GoPro VR player*, was problematic since these applications do not automatically localise the sound. The use of headsets and/or headphones when the surround sound becomes stereo worked better for projects where the sounds were more ambient, like those in *Sea Storm* or *Hades*. However, it feels odd in projects like *Mascenery*, where the localisation of sound is meant to be precise; when the spectators turn their heads left, the visuals will move from left to right, but the sounds remain unaffected. The solution to this problem could have been to

use ambisonic audio in video editing software like *Premiere Pro* and work in VR mode. Alternatively, visuals might have been exported for use in a VR headset, the sounds composed for 5.1 speakers, with playback happening simultaneously, in a room setting that includes VR headsets and speakers.

In all three projects, the visuals were created with 3D computer graphics, made in 3D software with the intention of replicating the third dimension visually. The virtual distances and the objects' scale were made proportionally to a natural world experience. In order to capture the whole surrounding environment visually, a 360-degree camera was placed in the 3D working virtual space, where we want the spectator to be standing.⁹⁴ In *Hades*, the camera is 180° since most of the action is happening in front of the spectator. However, the 360 degree videos of *Mascenery* and *Sea Storm* produced more immersive results. The rendered output is an equirectangular video (size: y=2x) that can be uploaded to different VR players and platforms. In all three of these VR projects, the images are not stereoscopic. However, this has been attempted in the final piece of work (see later). Stereoscopy can really enhance the three-dimensionality of the visuals, and therefore, the spatial immersion of the work.

Moreover, with VR, the resolution must be quite high because the viewers watch the video from a close distance (only a few centimetres). If the video is too long, it may take time to be uploaded to a VR platform. A solution to this problem is the compression of the video file, however, this reduces the image resolution – as was the case for the *Sea Storm* and *Hades*

⁹⁴ In *Mascenery* and *Hades* the cameras are still, but in *Sea Storm* the camera travels through the virtual landscape.

projects, consequently affecting the immersion of these projects. The better the video quality, the more immersive and realistic the work will appear.

During the development of these projects, the *Mascenery* project was rendered and tested in both a big-screen / cinema setting (like *Abyss*) and using a VR headset. The big-screen-based video required camera movement and edits (cuts and transitions) between the scenes in order to navigate through all the different visuals and corresponding sounds. The single-screen presentation and film edits made the presentation less immersive in comparison to the Virtual Reality one. One-shot videos (especially in VR) imitate a real-life POV perception and allow the audience to immerse into the scene without having to readapt their focal point every time the scene changes.

I will now turn to discuss the visual-sound relationship in each project individually.

Visuals and Sounds: *Mascenery*

In *Mascenery*, I used a mimetic discourse of real-world sources to create a realistic and literal outcome. Virtually all sounds can be categorised in the first-order surrogacy in Smalley's classification. Concrete and mimetic sounds, along with corresponding representational visuals, imitate a real-world setting. The sonic elements are pre-recorded sounds of metallic objects banging together, chains that are being dragged, rotating cogs and working drills. These sounds were edited and composed together, to give the impression of a factory. However, the edited sounds do not always represent the original sound source. For instance, the sound of a sledgehammer (original sonic source) had its pitch, amplitude and reverberation altered, so as to sound more like a steam hammer (new sonic source). All

sounds were recorded at different times and in different locations, after being edited and composed together however, they appear to co-exist in the same environment and work in unison. In contrast to the *Abyss* round and organic sound shapes, the *Mascenery* sound goes through various sharp and dynamic gestures, from the sharp attacks of starting steam hammers (impulse shape) to the sustained roar of the engines (sustain shape) and their gradual decrescendo towards the end of the composition. The texture of the sound builds up as more sounds are gradually introduced. The composition opens with the clanking sound of metallic chains; it follows the heavy rhythmical banging sound of the steam hammers, and then the drilling sound of a drill machine. After that, mechanical noises of different frequencies make the sound shape more granular, while periodic steam release sounds enhance the beat of the composition. There is a peak point of the composition where the different sound pitches, directions and movements overlap and produce a dense texture. It follows a de-escalation moment where every sound gradually terminates.

Although the visuals represent the real-world behaviour of machines and the environment of a factory setting, they were entirely computer-generated and not real-world video recordings. This is because a) technically, computer-generated images are easier to control, synchronise, and compose - as opposed to editing and putting together various video footage in different virtual locations; b) it allows contemporary visual music artists to design and animate imagery with any number of possibilities. The technology of the machines in *Mascenery* does not reference a specific historical period. Rather, in this project, a symbiosis of steam and electronic technology is apparent, some objects look old and rusty, while others look brand new and polished.

The overall image and sound aesthetic of *Mascenery* was inspired by steam-punk, industrial aesthetics, and realism, a re-fashioning of the futurist ideal, where machine sounds are viewed as a form of higher beauty than classical aesthetics (Marinetti, 1909). Realism was visually attempted by using realistic-looking objects with textures from real pictures, or materials that have physical world behaviour such as glossiness, roughness, reflection etc., 360 HDRI (High Dynamic Range Imagery) backgrounds, as well as lights and shadows that create a believable illusion of a realistic environment. Realism was enhanced with photo-realistic renderings, along with additional camera lens effects such as depth of field and motion blur. Furthermore, 3D graphics have a great advantage in accurately representing the perspective and dimensions of the physical world and can be viewed as a key element in creating more immersive settings/environments. Here, the 3D software is programmed to calculate these two factors with algorithms and display an instant representative outcome.

Visuals and Sounds: *Hades*

In *Hades*, the visuals are representational but stylised with dark fantasy aesthetics to evoke a feeling of melancholy and fear. The sounds of the composition represent wandering human voices that sound unhappy, lonely and uncanny. In this work, the figures/souls do not appear to interact with one another. The human voices are real-world recordings edited to sound eerie and otherworldly.

The raw sound material is mostly whispering sounds that provide little to no information about gender. In an attempt to convey these aural sensations visually, the sound sources are represented as blurry and shady humanlike figures. The sounds that refer to children's voices

have been edited to sound more high-pitched. As it was mentioned in the Literature Review, in nature, bigger creatures have bigger sound-producing organs, and therefore, the sounds they create usually sound deeper (lower pitch), whereas smaller creatures have smaller sound-producing organs, producing higher pitched sounds (Wishart, 1996, p.191).

The wind sound has the shape of continuous granular noise that cyclically changes density and intensity, creating a centric spatial motion around the listener. This movement is enhanced with the surround or stereo sound. The travelling sound sources of the voices form swell shapes. The approaching sounds gradually increase in volume and peak, and then decrease while they recede. The unidirectional motions of the voice sounds create an interesting outcome of diverse motions while they blend with the rotational motion of the wind.

The reverberation of the sounds in the *Hades* environment might make the spectator imagine being in a dark and isolated or enclosed space, like a cave or a dungeon, while the continuous sound of the wind adds a layer of outdoor acoustics to the composition. The corresponding-to-the-sound visuals represent a virtual dark cave with an opening to the outside world. The edited images are intentionally dark and unclear, as are the sounds that enhance this dream-like ambiguity.

Visuals and Sounds: *Sea Storm*

In *Sea Storm*, I use mimetic discourse by incorporating sounds recorded from nature, such as rain, sea waves, thunder and wind. The editing of these sounds was very little so that

they retain their recognisable character. This makes the sound sources, or their causes, easily identifiable (first-order surrogacy).

The spectral profile of *Sea Storm* is quite diverse. Low-frequency sounds derive from the deep rumble of the waves and thunder. Mid-to-high frequencies come from the blowing of the wind. High frequencies come from the splashing of the waves and rain.

The morphological shaping of sounds within the composition is equally varied. The thundering sounds create sharp shapes with quick attacks and gradual decays, accompanied by the sustained textures of the granular noise of the wind and rain (both of which are relatively consistent). There are evolving, oscillating shapes formed by the fluctuations in the pitch of the sound of the waves.

The visuals are dark because the project is set at night. The only sources of light are the moon and occasional lightning. The graphics simulate the experience of being alone in the ocean, travelling through gigantic rocks, during a storm. As mentioned earlier, the aesthetic being experimented with here aligns with the Kantian concept of the Dynamic Sublime (see Literature Review). The calming movement of the camera and the fact that we can safely experience all this through the VR goggles allow us to comprehend and aesthetically appreciate such an awe-inspiring and frightening environment.

Image-Sound Relationship: *Mascenery*

‘Mascenery’, is a visual representation of a sound composition. The music alone is meant to create an illusion to the spectator that they are in the middle of an indoor space, where heavy machines are operating around them. The visuals represent several attributes

of the sound sources, such as position in space, movement, materials and scale, creating a tight sound-image relationship.

In *Mascenery*, the 3D animated graphics are precisely synched to the corresponding sounds. When a sound is heard, a visual movement occurs at exactly the same time and comes from the same virtual location where the sound is heard, creating an association between specific sounds and corresponding visuals (form and movement) and vice versa. At the peak point of the sound composition, when all sounds are overlapping, all visual objects move simultaneously. Finally, as the sounds gradually fade out, the corresponding visual movements of the machines slow down before stopping completely. The sound and image do not simply match because they are forced through a 1:1 synchronisation method. Rather, there is a rational connection between the two modes. The visuals represent the sources and movements to which the sounds are bonded to. For example, the dynamic impulse-shaped gestures of the metallic hammering sounds are translated visually into two metallic steam hammers that make a dynamic, vertical hammering motion. The industrial, granular-shaped noises are translated visually into working machines and the spinning movements of multiple gears and cogs, and so on.

Image-Sound Relationship: *Hades*

In *Hades*, there are two types of sounds that are being represented visually: human voices and the wind of the scene. The voices are represented by ghostly, shady, humanlike silhouettes and the wind sounds by fast-moving fog. The sound objects move aurally in different unidirectional paths, mostly towards the spectator. The corresponding visual objects

imitate the swell shapes of the sounds in a 3D virtual space. For instance, when the sound becomes louder, the corresponding visual object moves closer to the spectator. When the amplitude of the sound decreases then the visual object is moving away and disappearing into the mist. Occasionally, the opposite happens, the sound is edited to match the visual movement. A reverberation effect is added to the human voice sounds to evoke a feeling of transcendence and to represent the acoustics of the visual environment where rocky cliffs surround the spectator. The continuous rotational motion of the clouds around the spectator is in alignment with the centric spatial motion and speed of the wind sound. Additionally, the absence of colour and the stylised (gothic, dark art) visuals are created to correspond with the dark mood of the sound composition.

The synchronisation in *Hades* is a simultaneous event synchronisation; not every single movement is assigned to a corresponding sound and vice versa. In this synchronisation, the focus is mostly on visual and sound events that are occasionally brought together by the use of sync-points (see Literature Review chapter) Meghan Stevens describes sync-points as the following: “In the music-image relationship synchronisation can be achieved using sync-points. In music, sync points can be created using beat or changes in loudness, tone or melody. Image sync-points can be created using added graphics, actions, images and cuts” (Stevens 2009). In *Hades*, a sync-point example would be the moment a figure starts moving and talking at the same time. However, the duration of the speech might be shorter than the duration of the movement. Therefore, after the speech finishes, the spectator may watch the rest of the movement without any accompanying vocal sound. The synchronisation might have been more precise if the figures had not been shady and lip-sync was applied.

Nevertheless, the sync points here still create a convincing and coherent sound-image relationship.

Image-Sound Relationship: *Sea Storm*

In *Sea Storm*, the visuals and sounds were produced parallelly; one mode is the translation of the other (proposed category 1). When the two modes are played together, they produce a rational and coherent relationship. The wavy movement of the 3D graphics that represent the sea visually is translated into a wave-like motion oscillating between the high and low frequencies of the wave sounds. The ambient noise of the rain draws parallels with the grainy graphics that visually represent the rain. Additionally, the dynamic, sharp, attack-decay shapes of the thunders are represented by strong, sudden flashes of lightning bolts.

In this project, precise synchronisation was not necessary. For instance, there was no need to sync each grain of the rain sound with a visual raindrop, as our senses generally perceive these granular shapes and particles as a whole, not as individual units. Moreover, the sounds of the rain and waves remain in a continuant temporal phase throughout the composition, which have been synched with the corresponding visuals in a *Sequential Event Synchronisation* relationship (see Analysis chapter).

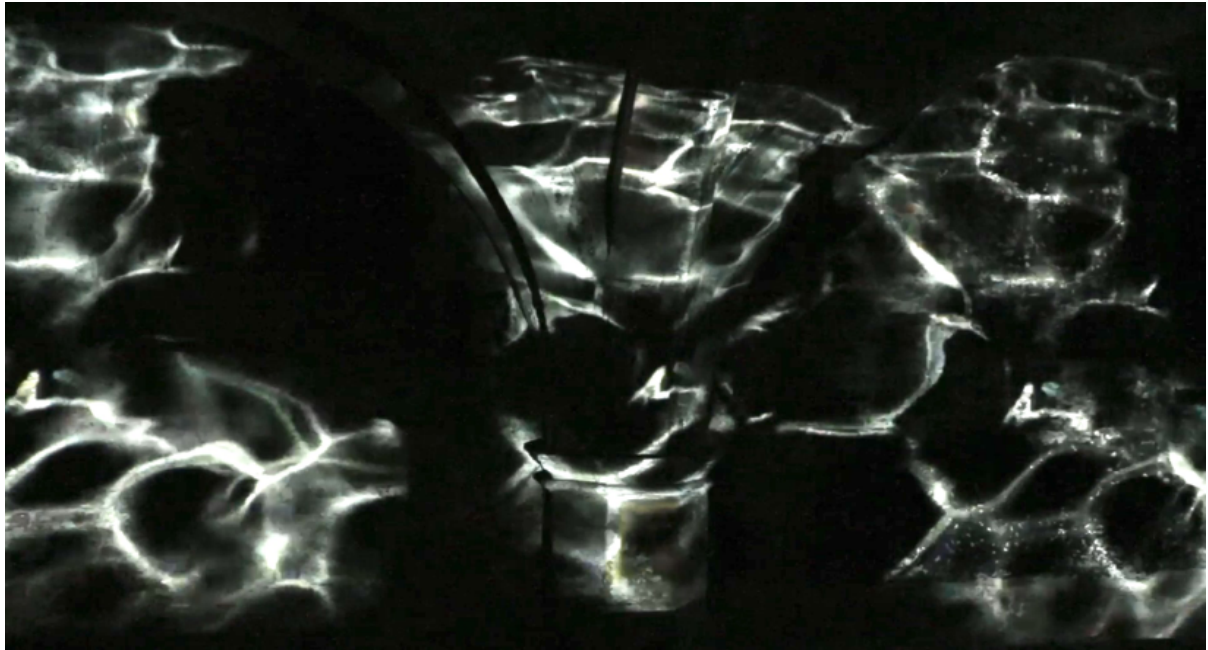
The image-sound relationship in this work was strengthened by one extra coupling of some key moments, the lightning and corresponding thunder sounds. The timing of the occurrence of image and sound was intentionally out of sync to simulate our real-world experience. To add more realism to the scene, when lightning strikes far away from the

spectator, the time gap between image and sound is made longer than when it appears to strike in close proximity. Therefore, in specific visual music works, we can still get convincing simulations of events, even without precise image-sound synchronisation.

5.3 Spatial Augmented Reality (Projection Mapping) Experiments

Ripples (2020)

Ripples, the fifth experiment explores projection mapping within visual music practice. The audio-visual materials are minimalist, and the overall outcome in terms of aesthetics is both realistic and abstract. This visual music work was inspired by the natural world, simulating the experience of when water drops falling into a pool of water within an indoor space. As noted in the Contemporary Practice Review and Analysis chapters, contemporary visual music artists frequently use projections of images and lights in their installations or live performances to create immersive spaces. Projection mapping is a Spatial Augmented Reality technology which allows artists to project animated textures on objects, sculptures, or the architecture of a building and produce various convincing illusions. Projection mapping works engage with spatial immersion and the representation of the third dimension. However, this is something that has been developed and explored infrequently within visual music practice. Therefore, with this project, I explore how to effectively incorporate projection mapping in visual music practice.



Ripples video link: <https://www.youtube.com/watch?v=Ude8lpD5TOs> (Accessed: 30 June 2024)

Immersion

The *Ripples* project was presented as a multi-projection and surround sound installation in an indoor space. In order to create an immersive visual music experience, a number of techniques were used. The main focus here was the Spatial Augmented Reality technology. The exhibition space was large, undercroft room with no dividing walls or windows. Four projectors, linked to four individual media players, projected full scale onto the walls and pillars on one side of the exhibition space.⁹⁵ The projections were mapped to create the illusion that they exist only within the walls and pillars' dimensions. Incorporating the buildings' architecture in *Ripples* imitates the natural experience when lights (or objects) are affected or interact with a specific space. In some projection mapping projects, the spectators

⁹⁵ The experiment took place at the undercroft of the Queen Anne building at the University of Greenwich.

may feel that the walls of a building are collapsing or experience physical sculptures come to life and so forth. By blending the physical space (undercroft room) with the virtual space (animations) in this project, it allowed the spectators to step into the artwork and immerse in the visual music experience. This overlap of the digital and physical, along with the precise alignment of architectural lines and graphics, produced a hybrid environment where the two worlds co-exist.

In order to create such immersive illusions, the artist needs to know beforehand the physical space that they are working with, visit the space physically and use the required software to take measurements and capture the architectural layout of the space. With this method, the artist will have a template of the space on their computer so they can work on the graphics in relation to the space. The last stage of this practice is to project back the graphics onto the physical space from the exact same spot where the measurements and layout were taken; the artist can map any wall they wish within that space, creating different immersive layouts. The four projectors used in the *Ripples* project provided flexibility in the arrangement of the space. For this installation, I chose to project the visuals on consecutive walls and pillars so that the spectators could pass by and feel like they were walking in an underground canal. Projecting only on one side served the purposes of the experiments' spatial immersion, but the visual experience perhaps feels quite flat. The projection on surfaces placed at different angles can improve the three-dimensionality of the experience (3d projection mapping) and therefore, the spatial immersion aspect of the work.

The large-scale projections on large-scale surfaces capture a big part of the spectators' vision and make them feel present in that world. The fact that the large indoor space allows the spectators to walk through while they keep watching consecutive visuals and hear the

sounds coming from the corresponding directions, also increases the sensation of spatial immersion.

The sound for this project was spatial also; four speakers were linked independently from each other, with the same four media players where the projectors were connected. With this method, each sound corresponds to a projection, and it is perceived louder and clearer when a spectator is close to the physical space where the corresponding image is projected. However, the openness of the space cannot stop the noise and the visual distraction of people who are passing through or standing in the exhibition space. On the one hand, these distractions reduce the spectators' focus on the installation, but on the other hand, it feels natural to hear that sort of noise from a crowd of people. In this way, the distractions become part of the immersive experience.

In contrast to Virtual Reality, the immersive experience generated by Spatial Augmented Reality can be collective. However, in order to work, projection mapping requires specific lighting arrangements. An immersive experience cannot be achieved if the lights within the space are stronger or as strong as the light emitting from the projections. The less light in the physical space, the more convincing the virtual space will appear. Therefore, ideal spaces for mapping projection are indoor spaces with low light and/or in an outdoor environment at night, in places where the streetlights do not compete with the projection light.

Visuals and Sounds

This visual music work, as the name suggests, is an audio-visual representation of ripples. Both image and sound materials were real recordings that were edited in order to create the sensation of drops falling periodically and rhythmically in a pool of water within an indoor space.⁹⁶

Similar to previous experiments, in *Ripples*, the sound is mimetic; it refers to the sound a drop makes the moment it meets the surface of the water. The field recording is an actual drop falling in water. However, with the addition of a reverberation effect, noise removal, pitch change, and an increase in amplitude via a DAW, the outcome gives the impression that the sound event takes place in an indoor, isolated place like an underground canal. In particular, the reverberation effect imitates the acoustics of a similar setting in the natural world and increases the spatial immersion of the project. The texture of the sound composition is simple and sparse. The only sound events are the drops into the water. Between these sound events, there are moments of significant silence. Each drop sound of the composition is characterised by a sharp attack and gradual decay. The high amplitude and frequencies of the attack slowly decrease during the decay phase, which is prolonged with the use of reverberations. The shape of the sound could be visualised as a spike with a long tail. The reverberations add multiple reflections and delays to the original, creating a granular effect on the sound's overall morphology. The interplay between the periodic attack-decay shapes and the moments of silence produces the sense of a gentle, predictable motion.

⁹⁶ Sometimes, the frequency appears to be rhythmical and at other times, gives the impression of being arrhythmic.

The visuals in the *Ripples* experiment can be perceived as both abstract and representational. Without the sound, they may look like abstract animations of interference patterns that could have been created as a visual translation of sound waves – a typical practice in visual music. Or, perhaps, it could be viewed as an abstract animation (but with forms or movements inspired by experienced reality). When accompanied by the sound, it becomes clearer that they represent water ripple caustic light reflections. The raw footage is indeed a video of a water pool's surface that reflects caustic light. The video has been edited in video-editing software so as to keep only the caustic light patterns. The ripple effect caused by the drops is entirely computer-generated. When the high-contrast visuals are projected onto the wall, they imitate the reflection of caustic lights. Hence, the image does not really represent the drops and the ripples but instead a reflection of them.⁹⁷

Image and sound relationship

In *Ripples*, the visual events are a translation of sound events and vice versa, tied in a formal premeditated relationship (proposed category 1). Every time a sound event occurs, a visual counterpart behaves in a specific and similar way.

For example, the sharp attacks of the drop sound that splashes into the water are translated visually into distinct spiky ripple shapes that create fractal noise patterns in the reflection of the water. The lengthy decay of the sound shape after the attack is represented visually by the gradual decrease in the height of the ripples and the fractal noise effect. The

⁹⁷ This distorted image of reality may suggest the perception of the depicted world through shadows in Plato's cave allegory.

silent moments between the drop sound events are represented visually by calm, wavy patterns.

In the exhibition space, four projectors and speakers connected to the same number of media players and played simultaneously. In the beginning, all sounds and visuals were played in sync, creating a powerful audio-visual result. However, after a few loops of playing, they became slightly out of sync, creating new patterns of repetition. This was happening because the media players had a few milliseconds difference from one another every time they played a new loop. The initial milliseconds difference would turn into seconds after some time. The drop sounds, along with the ripple reflections occurring slightly out-of-sync in different areas of the exhibition space, gave a spontaneous and natural result. Thus, this technological imperfection worked in favour of the realism of this visual music work.

5.4 Outcomes

After comparing the technologies used in the experiments, several characteristics and methods that effectively enhance the immersive qualities of a visual music work were identified. These outcomes have been compiled into a set of principles that can be used as a guide for producing immersive visual music compositions. The Immersive Visual Music Principles are as follows:

A) Interactivity.

A1) Head-tracking

The image and sound correspond to the audience's head movement in real time. Head-tracking technology in VR, enables the audience to rotate their heads in any direction, change perception, explore different angles while the image and sound perception match their head movements. This way, the audience can control which part of the visual music work they want to engage with more.

A2) Movement interaction

In an immersive space setting, the audience can explore or focus on a specific audio-visual event of the composition by moving physically closer to the locations where this event is taking place. This freedom to navigate and interact with the visual music composition in a more personalised way can increase the audience's engagement with the work.

B) Spatial sound and visuals

Both image and sound exhibit spatial characteristics.

B1) Spatial and Surround Visuals

Virtual Reality places the spectator in the middle of a 360-degree panoramic space, allowing them to fully immerse in the simulated virtual world. Similarly, in immersive installations, visuals are displayed on surfaces surrounding the audience, creating 360-degree environments that blend the physical with the virtual spaces.

With the use of Projection Mapping technologies (SAR), the visual music artists have the opportunity to consider and incorporate details of physical architecture or landscape into their work and create even more powerful immersive experiences. Projected visuals on sculptures, props, or other three-dimensional surfaces, can augment the level of space simulation by making the simulated world appear more tangible and have depth.

Visual music artists, with the use of 3D software, can create a virtual camera that resembles the audience's location in the virtual world. They can then model and animate the visuals around that virtual location. Advanced video compositing software with VR interfaces enables artists to compose and edit 360-degree scenes. Both 3D and video editing software also allow sound editing in order for artists to produce visuals that correspond to these sounds directly and vice versa.

B2) Spatial and surround sound

Multi-channel audio played through stereo and surround sound speakers set around the audience can produce an effective immersive sound experience.

Crossfades of sounds between loudspeakers or headphones and changes in amplitude and pitch levels can create a sense of motion and give the impression that they move around, towards and away from the audience. Spatial motion, in turn, can enhance the gesture of the sound and produce dynamic and immersive results.

Spatial sound technologies enable visual music artists to work with multiple channels and arrange the sounds of the piece anywhere in a virtual sound landscape. Digital Audio Workstation (DAW) software provides visual graphs that make it easier for the composers to place, mix and move the sounds in virtual space while they can simultaneously watch the visual counterparts of the piece on a screen.

C) Image-sound relationship

Immersive visual music works demonstrate coherent relationships between visuals and sounds.

C1) Synchronisation

These two modes can occur in precise event synchronisation, sequential event synchronisation or in an independent relationship, depending on composition. For example, in a visual music work where the visuals are synchronised precisely with the sounds, and vice versa, the relationship may represent an identifiable source, motion or event and thus be perceived as literal. In a sequential event synchronisation, the visuals may be analogous to various sequences of music composition or an ambient environmental sound, possibly using synch points. In an independent relationship, visuals and sounds may holistically convey a specific mood or concept without synchronisation.

C2) Spatial alignment of image and sound

When the 3D visuals and 3D sounds are aligned in the same virtual location, their relationship simulates our real-world experience of audio-visual events. By working across DAW and video compositing software, visual music artists can refine the spatialisation of sounds and images at the same time.

C3) Motion alignment of image and sound

When the virtual location of visuals and sounds changes during a specific time, they create a sense of motion. To produce an immersive result, the trajectory and duration of the sound motion should be consistent with the trajectory and duration of visual motion and vice versa. Visual music artists can produce motions for both visuals and sounds and align them with the use of DAW, video compositing and 3D software.

C4) Visual and acoustic environment

Visual environmental representations consistent with the sound acoustics, and vice versa, convincingly simulate the physical characteristics of the simulated environment. For instance, in an acoustic environment with reverberating sounds, the corresponding visual might represent an enclosed space.

C5) Image - sound evolution over time

Visuals are analogous to the way sounds evolve over time and vice versa. Specific changes in visual properties such as lights, colours, textures, motions, shapes, scales, and quantity can be linked to various sound properties such as frequencies, morphology,

amplitude, timbre, shape, texture, gesture, etc. This way, the visuals and sounds can represent events with matching harmony, energy, intensity, etc.

D) Presence

The immersive audio-visual experience creates a perception for the audience of being physically and/or emotionally present in the virtual environments depicted in the visual music composition.

D1) Physical Presence

The illusion of physical presence can be achieved with believable visual representations and mimetic sounds. Stereoscopy, figuration, textures, lights, shadows, three-dimensionality, POV, depth of field, and motion blur simulate how we perceive physical reality. Equally, field recordings, binaural recordings, concrete sounds, 3D sounds, and clear source-bonding produce realistic sound results. High-resolution images and sounds minimise imperfections such as pixelated images and unwanted noise, enhancing the immersive experience and maintaining the illusion of being present in the simulated environment. Continuity in the direction, narrative or dramaturgy of the visual music work simulates a natural audio-visual experience and allows the audience to fully immerse in the scene.

D2) Emotional Presence

The immersive technologies can create experiences where the audience may feel emotionally present in the visual music work, too. Visual stylisation or abstraction and musical

expression or abstract sounds can enhance the mood of the composition and evoke emotional, psychological, meaningful and metaphorical connotation.⁹⁸

D3) Exclusive Presence

Virtual Reality appears to create a very powerful immersive experience, since it is fully aligned with the POV, and hearing perception of the spectator. It does not allow for any visual or auditory distractions from the surrounding environment. However, it is important to note that the experience is exclusive to one participant at a time, and special equipment is needed for viewing.

D4) Collective

Immersive spaces offer a more collective experience of presence. Many participants can immerse into the same visual composition simultaneously and interact with each other. However, immersive spaces present certain challenges. The virtual space is restricted to the physical environment that the work is presented in; and there might also be unwanted visual or sound distractions caused by the audience.

I now turn to discuss the final project that completes the visual music works created and submitted for this thesis.

⁹⁸ Such examples are discussed in the Introduction, Literature review and Contemporary Practice Review.

5.5 Immersive Visual Music (VR and SAR)

Vorstellung (2022)

The final work is entitled *Vorstellung*. This visual music work is a product of the research conducted for this thesis. It combines observations from the practice experiments and their outcomes, data analysis gathered from the transcripts, and the theoretical work discussed in the Literature Review and Contemporary Practice Review.

Vorstellung incorporates immersive visual music principles identified as best practices in the previous research outcomes. Hence, the project aligns with the “practice by reflection and research” category discussed in the Methodology chapter. (See Table p. 30). To make it easier for the reader to recognise these principles when they are discussed, they are followed by the corresponding number assigned to them in section 5.4 Outcomes chapter.

I collaborated with electroacoustic composer Ross Euan Davidson to create more sophisticated music for this project. Davidson composed the music first, and then I produced the visual composition by interpreting the music. Therefore, this piece demonstrates the practice of the proposed category 5 developed in the Analysis Chapter: “Visual composition founded on the interpretation of pre-existing music and vice versa”.

The theoretical work (Literature Review Chapter) also contributed to the composition of this project, as it combined methods of sound composition and spatialisation deriving from the theories of Wishart, Emmerson, Landy, and Smalley with methods of immersion and virtual space representations by Bolter, Grusin, and Grau.

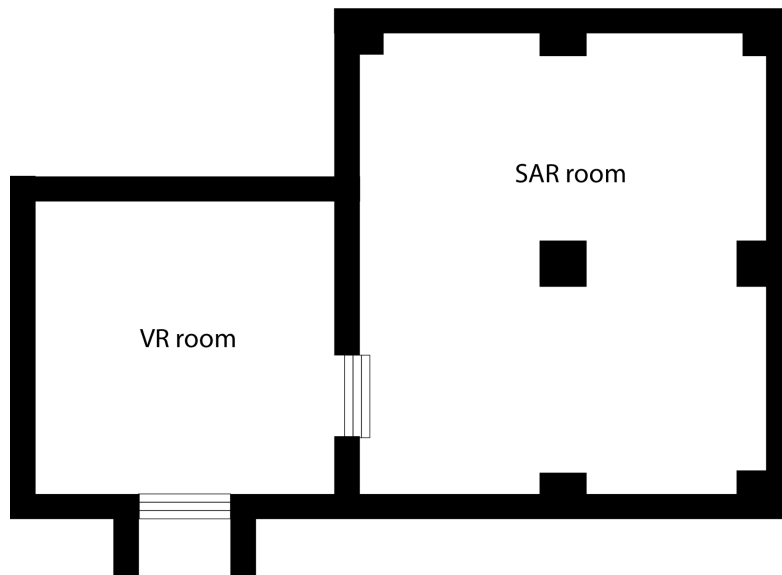
Vorstellung audio-visually represents a fictional factory environment in the middle of a remote location. This project was presented as an immersive visual music installation at the Queen Anne Undercroft at the Old Royal Naval College, Greenwich, in June 2024. The installation expanded into two connecting rooms, each utilising different types of immersive technology. In the first room, a 5.1 sound system was installed, and virtual reality headsets were provided for the audience to experience one part of the project. In the second room, Spatial Augmented Reality and a 5.1 sound system were used to present the second part of the project. Four projectors were set up to map different walls and props within the exhibition space using projection mapping.

Immersion

The technologies selected for this final project are Spatial Augmented Reality (more specifically projection mapping) and Virtual Reality, as these were found to be the most effective technologies in producing immersive visual music during experiments.⁹⁹ *Vorstellung* is split into two virtual spaces that belong in the same simulated world. There is a clear audio-visual and conceptual dialogue between the two spaces; one represents the indoor and the other the outdoor space of a factory environment. VR technology is used in the first room of the exhibition space to simulate the outdoor space, and SAR is used in the second room to simulate the indoor space (see map below) . When the audience moves physically from one exhibition room to another, they are also moving from one virtual space to another. The

⁹⁹ As discussed in this chapter, SAR technology was used for the *Ripples* experiment and VR technology for other projects, including *Mascenery*, *Hades* and *Sea Storm*.

combination of these two technologies provides both a collective SAR and exclusive VR immersive experience (D3, D4).



Queen Anne Undercroft floor map

For both the SAR and VR segments, the virtual location and movement of sound in a three-dimensional space correspond to the visual ones to create coherent and convincing image-sound couplings (C1, C2, C3). For instance, when the audience hears a sound coming from their left side (speaker) and then they see a visual that corresponds or moves on the same side of the screen, it simulates an experience similar to the one we have in a physical and three-dimensional environment. Therefore, this experience reinforces the sense of presence in the simulated world (D1).

Moreover, immersion is enhanced by the simulated indoor and outdoor acoustics linked with the visual representations of the corresponding spaces (C4). For example, in the Spatial Augmented Reality part, the loudness and reverberation effect applied to the sounds give the

impression that they are located in a closed, isolated, and spacious room. The projected visuals represent a virtual landscape that corresponds to these sound characteristics.

The audience can walk in the SAR space, move closer, and explore specific parts of the work (A2). In the VR part, the head tracking technology allows the audience to turn their heads at any time towards a specific direction, while the visuals and sounds correspond to their bodily movements, simulating a natural experience (A1). This kind of freedom and interaction adds an extra level of immersion into the visual music work.

In the indoor/SAR part, the dark space and the loud sounds minimise, to a great extent, the unwanted visual distractions and noise, allowing the image and sound of the installation to prevail. This way, the audience can immerse themselves in what is being presented without much interruption (D1). The three-dimensional graphics were designed to project precisely onto the three-dimensional large-scale surfaces of the physical space; this was done using 3D projection mapping technology, which produced the illusion that the physical and real-size virtual worlds co-exist in the same space (B1).

The shots in both the VR and SAR parts are continuous. As mentioned earlier (see experiment outcomes), continuous shots without cuts simulate natural perception and allow the audience to immerse fully in the simulated worlds being presented (D1). The images created for both the VR and SAR visuals are 3D CG graphics, which are employed (similarly to the experiments) to create the illusion of depth and space (D1). The VR part is made in a 360- animated video format, which captures all the surroundings from the viewer's perspective in

an attempt to create an effective, *transparent immediacy*¹⁰⁰ (B1). The video is rendered in POV and stereoscopic 3D to simulate human visual perception and increase the three-dimensionality of the visuals (D1). Comparing the stereoscopic 3D images of this project with the monoscopic images of previous experiments, it is clear that the former reproduces the perception of space more effectively. Similarly, in the SAR part, the projection of animated textures on physical objects that represent conveyor belts and the incorporation of the architecture also enhance the three-dimensionality of the visuals (B1).



Vorstellung indoors (SAR part) video link: <https://youtu.be/jL0zqeg0No0> (Accessed: 30 June 2024)

¹⁰⁰ The concept of transparent immediacy, as described by Bolter and Grusin, is discussed in the Literature Review.

Visuals and Sounds

The audio of *Vorstellung* is electroacoustic music and the visuals are computer-generated imagery (CGI). The audio-visual compositions of this project represent the indoors and outdoors of a factory located in a remote place. Both immersive technologies used in this project represent three-dimensional space and scale that is coherent with empirical reality, enhancing this way the sense of presence (B1 B2,C2,D1).

The VR component represents the outdoor virtual space from the point of view of a spectator-listener who is standing outside the factory. The visually represented scene is a foggy frozen landscape at night where snow constantly falls. Factory buildings placed around the spectator look aged and deserted, carrying dark textures made of realistic materials like bricks, concrete, and metal. The depth of field and fog increase the realism of the simulated environment (D1). The dark clouds, the sombre gothic aesthetics, the remoteness and frostiness of the landscape, and the lack of indication of life aim to create a sense of being emotionally and physically present in a gloomy and dark scenery (D2).



Vorstellung outdoors (VR part) video link: <https://www.youtube.com/watch?v=bpstxtaXels> (Accessed: 3 July 2024)

The 3D projection mapping (SAR) represents the indoor component of the virtual factory. The visuals here are mainly inspired by the *Mascenery* experiment. However, instead of being rendered in a VR setting (as in *Mascenery*), the *Vorstellung* visuals are projected on physical surfaces in the exhibition space. The materials and forms of the SAR machines are realistic but also stylised to illustrate that they belong in the same virtual world as the ones in the VR part and evoke analogous emotional connotations (D1, D2).

The overall sound structure of *Vorstellung's* imagined indoor part¹⁰¹ is based around factory machinery powering up, followed by sustained activity amongst a range of different

¹⁰¹ Presented in SAR

machines, which then end with a sense of powering down. In spectomorphological terms¹⁰², pitch trajectories are used to create the sense of powering up and down, ascending at the beginning of the piece and descending at the end. The simulated environment was treated as an ecology of machinery, reflecting Wishart's *spatial location of sound* discussed in the Literature Review chapter. Different machines spread across the factory room, from distant to close locations, to the point of audition (B2). The machines would have distinct characters yet also be perceived as connected, mainly through their link to the same tempo underlying each machine's rhythm and through their starting and ending at the same time, implying a shared power source. Reverberation was added to represent the acoustics of an enclosed and isolated environment (D1). The composition of each machine presented particular gestural shaping. For instance, the machine that is first heard at 02:27 is composed of a hammering sound as well as the sound of a belt drive – the inclusion of a belt drive gave the machine a sustained whirring tone that could then be shaped to ascend and descend as the hammering happens, giving more gestural shaping and energy to the sounds than if it were the hammering alone.

The sound composition of the outdoor virtual space features a mixture of wind sounds, which evoke a mimetic discourse¹⁰³, and distorted sounds from ambiguous sources¹⁰⁴ (D1). A layer of ambient wind sound is in continuant phase throughout the composition. Changes in pitch and amplitude produce cyclical or multidirectional motions and moments of tension and release. Towards the middle of the composition, the texture becomes thicker with additional distortions, layers of low-pitch atmospheric sounds and dynamic gestures (pitch change and

¹⁰² discussed in Literature Review practice

¹⁰³ In reference to Emerson's language grid, as discussed in the Literature Review.

¹⁰⁴ This is in alignment with Smalley's third-order surrogacy, as discussed in the Literature Review.

higher amplitude). Granular noise is introduced around 3:30, and ascents and descents cyclically produce a jagged oscillating sound shape. The shaping of the different layers is intended to evoke a sense of strong gusts of wind rushing through the factory site. Sparse percussive metallic sounds of unidentified sources periodically enrich the sound composition.

Image and Sound Relationship

As stated above, in *Vorstellung*, both indoors/SAR and outdoors/VR compositions belong to the 5th proposed contemporary visual music category. The music was composed first, and the visual composition was made as its interpretation. In the outdoors/VR composition, the image-sound relationship is between sequential synchronisation and independent relationship. As discussed in the outcomes of the experiments, these types of relationships can simulate a natural experience when the sounds and corresponding visuals are atmospheric or ambient, such as air, rain, noise, etc. or made to evoke the same mood, emotions, etc. (C4, D2). In this case, it allows the audience to immerse into the visual music composition without requiring their full attention (or the need to capture every single sound and visual event), thereby simulating a real-world presence in a natural landscape.¹⁰⁵ Additionally, both sound and image evoke analogous emotions such as melancholy, isolation and possibly fear.

¹⁰⁵ This is similar to what Watkins (2018) describes as a 'soft fascination' experience in her work *Singing Light 1* and 2.

The image-sound evolution over time is coherent, too (C5). Visually, the increasing snow, speed of the clouds and visual noise towards the middle of the composition are aligned with increasing gestural energy of the wind, distortions and granular noise.

In the indoors/SAR part, some images are paired with the sounds in a precise event synchronisation, whereas others are in a sequential synchronisation (C1). For instance, a repetitive, loud banging sound is synchronised precisely with the animation of a steam hammer's forging activity. In contrast, other sounds that produce industrial ambient noise are synched loosely with the movement of various rotating cogs. The sonic gestures match the energy and motions of the animations, too. The sharp attacks of the percussive steam hammer sounds are represented as fast, dynamic, vertical motions, whereas the sustained spinning energy motions of the conveyor belts and gears are represented with continuous swirling motions of the corresponding visuals (C3). The overall powering up and powering down of the sound components of the composition is visually represented with the gradual starting and ending of machine movements (C5). Towards the middle of the visual music composition, there is a peak point where the sound texture is thick, and all visual objects are moving at the same time. The audio-visual outcome becomes dynamic, loud, noisy and aggressive (D2).

Sound sources' locations align closely with the visual counterparts' locations (C2). When a sound comes from a loudspeaker placed in the corner of the room, a corresponding image is set into motion on the same side of the room (C3). The perception of depth is enhanced by the amplitude of the sound and the proximity of the image (C2). For example, machines that are presented to be far away have lower amplitude and lower scale in perspective than the ones that are closer.

This final project effectively demonstrates the outcomes of the experiments and can be used as a reference for immersive visual music practice. *Vorstellung* sought to bring together many elements put forth in this thesis and, in some cases, even put theory into practice, and enhance or correct issues found in the experiments. The main idea behind this project was to create a contemporary visual music work which retains certain elements of traditional visual music (this includes rhythm, coherent image-sound relationship as well as loose and precise event-synchronisation) but combines them with the introduction of new ones that deviate from the former.

Chapter 6: Conclusion

The research presented in this thesis has demonstrated that contemporary visual music has undergone many changes over the course of its existence. The data compiled to conduct this study derives from various sources (theory, contemporary practice, interview data, and my practice), each contributing to the research differently.

This thesis illustrated how practices used in the composition of early visual music (silent film, black and white imagery, flat shapes, abstract and non-narrative animations) have gradually expanded to incorporate new techniques, ideas, and technologies available to artists at different times. Additionally, the theoretical portion of work discussed in this thesis explored recent immersive media and technologies that are already utilised by other audio-visual artforms (in visual, sonic, and audio-visual arts) that have the potential to simulate space. The research highlighted early on that there are few records of this kind in the development of contemporary visual music, and this gap in visual music practice and research (at least partially) prompted this study. Contemporary visual music artworks were also examined, focusing on immersive technologies to establish current tendencies in the field. The research identified that visual music artists have gradually started using representational and three-dimensional images and referential sounds that are heavily edited or blended with abstract imagery and sound, creating a new hybrid aesthetic.

In order to present a more holistic picture of the current state of visual music, this thesis used a qualitative research approach. A number of interviews with visual music experts from around the world were conducted to create a framework for contemporary visual music while

also identifying areas in its practice that require further development. The data indicated that immersive visual music was one of those areas. One of the primary research outcomes of this thesis was the updated visual music classification compiled into five new proposed categories. The contemporary visual music framework proposed included current trends regarding visuals and sound and image-sound relationships.

The findings from the interviews aligned with those discussed in the Literature and Contemporary Practice Review chapters. Specifically, contemporary visual music sound varies from abstract to referential. While the visuals in current compositions continue to be primarily abstract and non-representational, when representational visuals are used, they are either heavily edited or blended with abstract imagery to produce hybrid outcomes. This identified gap offers an area of exploration and experimentation with the representational qualities of visual music. Additionally, the data analysis showed that the main immersive media and technologies currently used to present contemporary visual music are big screens, projectors, lights, coding, 360 sound, and video. Immersive visual music presentations usually take the form of installations and live performances. This part of the research highlighted that there is room for innovation with the use of Virtual Reality. This technology hasn't been explored extensively within the field of visual music.

The practice component of this research played a leading role in the investigative process. I conducted experiments with various immersive technologies and different representational aesthetics to find effective ways to develop further and enhance immersive visual music practice. The findings from primary and secondary research directed the selection of technologies, which included a) cinema setting, b) Spatial Augmented Reality (immersive space) and c) Virtual Reality. The outcomes of the experiments demonstrated that

Spatial Augmented Reality and Virtual Reality produced immersion more effectively. They also provided a set of principles that can be considered for better practices, including interactivity, spatial sound and visuals, image-sound relationship and presence.

A final immersive visual music project was produced to reflect the outcomes of the research. It was produced according to the proposed classification of contemporary visual music, while the image-sound relationships were informed by the types of synchronisations identified in this research. Additionally, it incorporated key image, sound and media theories discussed in the Literature and Contemporary Practice review and several immersive visual music principles identified in the research outcomes. The piece evoked collective and exclusive immersive experiences by incorporating Spatial Augmented Reality and Virtual Reality technologies.

This Ph.D. thesis contributes to the development of theory and practice of immersive visual music in the aforementioned ways. However, further research can be carried out in other areas of immersion, with the use of different immersive technologies or practices, in the future. Different types of immersion can be explored with an additional level of human technology interaction (HTI). Interactivity via movement sensors and haptic technologies are often key features in various practices, such as VR, AR, and Immersive spaces that could provide an area of research about improvisation and immersion. The different human movements or touch could provide unique real-time visual music works where the visuals and sounds correspond to these stimuli. The live interaction could imitate a real-world human experience and possibly simulate a new immersive visual music practice. This research did not explore haptic perception because its focus was primarily on sight (image) and hearing (sound), the corresponding senses which make up the main components of visual music.

Lastly, further research in the area of visual music could extend to include Artificial Intelligence. AI technology could add an extra layer of experienced reality simulation by performing visuals and sounds that (re)produce real-world or imaginary behaviours.

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Appendices

Appendix 1 – Ox and Keefer and Hill Classifications

Below are the classifications from Ox & Keefer and Hill. Both classifications focus on the making methods of visual music. Hill's classification is an updated version of Ox & Keefer's.

Ox and Keefer's Classification of Visual Music

In Ox and Keefer's classification of visual music, they identify the following four characteristics that define a work as visual music. I reproduce it here, as these make up an important part of the Analysis Chapter of this thesis. Ox and Keefer (2005) claim:

1. A visualization of music which is the translation of a specific musical composition (or sound) into a visual language, with the original syntax being emulated in the new visual rendition. This can be done with or without a computer. This can also be defined as intermedia.
2. A time-based narrative visual structure that is similar to the structure of a kind or style of music. It is a new composition created visually but as if it were an aural piece. This can have sound, or exist silent. Theorist/inventor Adrian Klein wrote in 1930: "...somehow or other, we have got to treat light, form and movement, as sound has already been treated. A satisfactory unity will never be found between these expressive media until they are reduced to the same terms."

3. A direct translation of image to sound or music, as images photographed, drawn or scratched onto a film's soundtrack are directly converted to sound when the film is projected. Often these images are simultaneously shown visually. Literally, what you see is also what you hear. (An early example is filmmaker Oskar Fischinger's *Ornament Sound* experiments c. 1932). There are many examples in Visual Music film of this process, e.g., McLaren, Spinello, Damonte and other contemporary filmmakers, including sections of Pengilly's work in this show. This method has been called a "pure" type of Visual Music.
4. A visual composition that is not done in a linear, time-based manner, but rather something more static like a 7' x 8' canvas. However, as in Klee, the movement of the painted elements can and have achieved a kind of Visual Music, serving as an artist's visual interpretation of specific music.

(Ox and Keefer, 2005)

Ox and Keefer's classification of visual music is understood in this thesis as canon and defines traditional (or classic) visual music practice; this is also clear from the references the writers have used. This classification has been reviewed alongside the interview responses, gathered from the transcript process conducted for this thesis and in the Analysis Chapter was used to create a new framework for contemporary visual music.

Andrew Hill's Classification of Visual Music

Another important classification of visual music used in this thesis to create an updated framework for contemporary visual music and the proposed categories in the Analysis Chapter, is that of Andrew Hill. Hill's classification of visual music is also divided into four main categories. He states

1. A purely visual approach - visual music. For example, Thomas Wilfred's Lumia, or some of the works of Kandinsky or Klee. Works that aim to emulate music, or contain structures and forms inspired by those within music but contain no sonic content themselves.
2. Visual composition to pre-existing musics, such as in some of the early works of Oskar Fischinger, the artistic interpretations of Walt Disney's animators in the 1940 film Fantasia or music videos of the type found on MTV.
3. Audio-visual music, the composition of both sound and image informed by traditions of music. This form is here defined as audio-visual music, because the works contain both sonic and image elements which are regarded as equal components, joined in the context of a work, and structured according to musical principles.
4. The synthesis of visual materials from sound (and vice versa) and the representation of sound visually. This includes visualization software such as those within media players, oscilloscopes and computer algorithms that render visually spectral and waveform images of sonic material (Hill 2010b).

(Hill, 2013, p 6)

Appendix 2 - Demographics, Data Protection, Limitations, Risk Assessment

This appendix supplies some additional information about the qualitative research, including the participants' demographics, data protection, study limitations and risk assessment.

Demographics

The participants selected for the interviews were all adults of different ages, genders and ethnic backgrounds. The age of the participants varied from mid-thirties to late sixties. The research requirement of selecting expert participants may have limited the pool of participants' selection to older ages. However, age was not a criterion of selection and none of the participants' ages were known prior to conducting the interviews (and was only made known, once they answered the questions). The gender ratio of the participants was close to 1:1. One criterion for the interview sampling process was the selection of participants with diverse ethnic backgrounds and country/continent of residence. Diverse cultural representation was aimed at, in order to provide a fair and more universal picture of the state of contemporary visual music.

Data Protection

The interviews were conducted anonymously. No personal information of any participant was shared. The data is only accessible to the author of this research and the supervisors of this study: Professor Adam Stanovic and Joseph Hyde. The data from the interviews is stored on a password-protected computer. The questions, practice and generally the nature of this

study have not been conducted in a manner, which could be deemed offensive, distressing or deeply personal for this particular target group. This research did not require access to records of sensitive, or confidential information, including genetic, or other biological information. The participants were asked to provide some basic personal information, i.e., age, gender, residence, education and spoken languages. However, the participants were also informed that providing this information was not compulsory. Thus, various participants decided not to answer all questions relating to personal information.

All participants signed a consent form confirming that they had received enough information about the nature of this research; that they have been provided with satisfactory answers to any questions they may have had; and with their consent to take part in the study. The participants were informed that they were free to withdraw from this study at any time, without giving a reason for withdrawing. Lastly, the participants confirmed that they understood that this research data may be used for a further project in anonymous form, but they are able to opt out of this if they wish.

Limitations

One of the limitations of this research is that it is more focused on western visual music theory and practice. This is due to a) the strong origins and tradition that visual music has in North America, b) the vast majority of the examined sources are written in the English language¹⁰⁶ and c) the geographical location (UK) that this study has been conducted in, which has greater

¹⁰⁶ See: Literature Review Chapter.

exposure to western media.¹⁰⁷ Furthermore, most of the academic discussions, presentations, and debates in the UK are between researchers from western backgrounds, since it is easier for them to travel to relevant academic gatherings. In order to reduce this disadvantage in the methodological approach of this study, another criterion has been included in the sampling selection strategy, which is the participants' diverse location. Visual music experts who live and work in different continents are exposed to a number of ethno-diverse visual music practices and were thought to provide a more holistic approach to this study. Moreover, it is important to mention that this study consists of a small sampling pool (7 interviewees), which may be considered a limitation of the research. As mentioned, a requirement of this study was to source candidates that were knowledgeable and experienced in the area of visual music. The number of individuals specialised in this area is small, and participants needed to be willing to invest their time; a couple of participants dropped out due to time restraints in their schedules.

Risk Assessment

For the presentation of the experiments and final practice, various technologies and electronic devices were used, such as: projectors, screens, VR headset and lights. To prevent any accidents, all cables were taped down and safe boundaries were drawn around equipment. Since the projects created for this thesis were screened in front of a live audience and took place indoors, the fire exits were easily accessible and cleared of any obstacles.

¹⁰⁷ This refers to the various case studies and references used in this research, from early to contemporary visual music.

Covid-19

To prevent the spread of Covid-19 virus

- All equipment was sanitised after every use.
- Access to the building, social distancing and other measures were taken, according to the most up-to-date Government guidelines.

Appendix 3 - Contemporary Practice Review: Fixed Media

In this section, I review five contemporary visual music works that were presented in fixed media format. The first three visual music works are abstract, and the last two are hybrid, combining representational and abstract elements.

Abstract Visual Music Aesthetics

Synthetic Electro Replicant (2016) by Dave Payling

The overall aesthetic in *Synthetic Electro Replicant* is minimalist and abstract. It explores sonic and audio-visual practice by playing with the synchronisation between sound and image. According to Payling, this work explores how a rigid musical timing structure interacts with tightly synchronised imagery (Payling, 2017). Everything in this visual music work uses computer generated animation. The visuals are animated lines and simple geometric vector shapes (mostly, circles and squares) of different colour. Some of the graphics appear to be three-dimensional yet, in the context of this composition the graphics do not try to imitate the natural world. The first shapes and lines appear slowly and smoothly without any form of complexity. However, as the music speeds up the visual elements create more complex geometric combinations. The colour is mostly flat but vibrant and is used to enhance the variation of the visual motifs. According to Payling, the visuals are inspired by the traditional visual music works of John Whitney (his *Matrix* films, 1971-1972) and Wassily Kandinsky's discussion of the utilisation of point and line in visual composition. Colour was used in this work as a way of enhancing its emotional qualities and "as a means of giving each passage its own character" (Kandinsky, 1914; cited in Payling, 2017, p18).

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A frame from 'Synthetic Electro Replicant' (2016) by Dave Payling

The sound of this composition is beat-based electroacoustic music with a good amount of ambience. The rhythm, musicality and type of sounds used are inspired by electronic dance music. Musical sound used here is another common characteristic that it shares with traditional visual music. According to Payling, the work was designed to integrate musical rhythm in visual music by incorporating sequences; a type of offset synchronisation. Although the technique of syncopation is quite common in the musical field, the “audio-visual syncopation” used in this visual music work is introduced as a novel element. At the beginning of this work, when the sound is ambient, the image-sound relationship is complementary and the synchronisation is loose. As the music progresses, the beat becomes distinctive and the relationship between the two modes turns into 1:1 mapping. Both visual and sound

compositions are presented in sequential parts as it often is the case in classical musical form and traditional visual music works (Mollaghan, 2015).

This work shares a lot of common characteristics with traditional visual music, including the minimalist and abstract visuals; the use of colour as a way of enhancing the affective element of this composition; and the use of musical sound. What differentiates this work from traditional works is the introduction of audio-visual syncopation and the use of beat-based, dance-like electronic music. The latter element is common amongst contemporary visual music works.

Fractal Evolution (2015) by Wilfried Jentzsch

In this visual music work, the visual part is an animated CG fractal composition. The graphics look like a complex abstract cloud, made out of small particles of blue, white and green shades. The movement of the abstract cloud in space makes the graphics appear three-dimensional. The way it glows and slowly moves against the black background resembles a nebula in time-lapse. These kinds of nebulous abstract aesthetics are reminiscent of the works of Jordan Belson; identified as a second phase in his collection of works and termed *gaseous films* (Mollaghan, 2015). The sound composition in *Fractal Evolution* is slow ambient electroacoustic music. All sounds are non-referential, giving the impression of an unusual and mysterious experience.

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A frame from *Fractal Evolution* (2015) by Wilfried Jentzsh

Sounds and visuals are not synched, but they match in mood and speed. The formal image-sound relationships illustrated in this work are the following: lightness to amplitude, colour to timbre, speed and density (Musiques and Recherches , 2021). The method of arranging specific colours to sound parameters is often used in colour organs and traditional visual music works. Much of this work appears to be inspired by traditional visual music practices.

'Dots, Lines and Roughness' (2017) by Elsa Justel

The title of this work describes the visuals, which are indeed made out of dots, lines, and rough (grainy) abstract images. The descriptive naming of the composition is aligned with the history of visual music and its non-representational art tradition; Eggeling's *Diagonal-*

Symphonie (1924); *Lines Vertical* (1960) by McLaren; *Composition with Yellow, Blue, and Red* (1929) by Mondrian and many others.

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A frame from *Dots, Lines and Roughness* (2017) by Elsa Justel

In contrast to *Fractal Evolution* and *Synthetic Electro Replicant* the visuals in this work are diverse. The graphics consists of shapes carrying various colourful and bright textures that are moving in all directions; these often overlap creating large and small-scale abstractions, while granularity is shared amongst most of the images. The sound composition is electroacoustic that follows a specific pace without being rhythmical or musical. The sounds in ‘Dots, Lines and Roughness’ are non-referential; the sound is computer generated and at various points the sounds become noise. Similar to the visual treatment, the sound composition in this work has parts where overlapping sound produces intense moments.

In “Dots, Lines and Roughness” the image and sound run parallel to each other without being synched precisely. There are only a few synch-points throughout the composition that bring the two modes closer together, creating a tighter relationship. However, for the most part their synchronisation is loose.

Hybrid Visual Music Aesthetics

Perpetual Motion (2012) by Andrew Hill

In the beginning of Andrew Hill’s *Perpetual Motion* the visuals look relatively simple, or straightforward, but become increasingly complex over time. Heavily edited video-footage and animated photographs have been blended together to create a *hybrid* abstract-representational composition. The videos and images used in this composition sometimes portray recognisable objects, like metallic handles attached to wooden surfaces (this is easy to identify towards the middle of the video) and other times, these are reduced to simple vertical animated lines (as seen towards the end). The representational images and textures are presented in geometrical patterns or unconventional viewpoints, to enhance the interplay between representation and abstraction.

[this image has been removed from the digital copy of the thesis at the author's request]

A frame from *Perpetual Motion* (2012) by Andrew Hill

The sound composition is electro-acoustic. The nature of the sound is very similar and analogous to the visuals (see later). At the beginning and end of this composition the sounds are electronic, ambient, atmospheric and abstract without a clear reference to the physical world. Yet, in the middle of this composition the sound becomes clearer, in that it evokes concrete sounds, such as: the sound of footsteps, wood, or knocking on a hard surface. The introduction of mimetic and recognisable sounds is something innovative for visual music sound.

In 'Perpetual Motion' there is a clear correspondence between sound and image. Both, image and sound follow the same structure creating an analogous or, corresponding narrative. In the beginning and the end of this visual music work, where the images and sounds are more abstract, the synchronisation is loose and metaphoric. In the middle part

where the images and sounds become more referential, the synchronisation becomes 1:1 mapping. *Perpetual Motion* is a good example of a contemporary work that uses hybrid aesthetics in both its use of images and sounds. In this sense, it differs from the aesthetics used in older visual music styles.

Rami (2015) by Alfredo Ardia

In *Rami* the visual composition is quite minimalist. A series of black and white video footage displaying different parts of a tree is being played one after the other. Overlapping layers of different tones and straight parallel lines move slowly across the screen, sometimes horizontally and other times vertically. The black and white imagery (which is inverted at some parts) along with the blended graphics, reminds the viewers that this visual composition does not try to represent a natural world experience.

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The sound composition is slow and minimalist electroacoustic music. It produces an ambient and abstract sound experience, which is non-musical and non-referential. According to Ardia, the shape and movement of the tree inspired the creation of the sound. In 'Rami' there is a noticeable correspondence between the slow movements of the branches, the crossing lines, and the slow progression of the score. The cuts between the scenes become the synch points of both the visual and sound composition. The abstract sounds, film cuts, abstract graphics, along with the representational imagery produces a hybrid aesthetic that does not try to represent an experienced reality.

Appendix 4 - Data Collection

The extracted quotes from the interviews were collected below, labelled and categorised into codes.

Related codes were organised into themes.

Theme 1 : Characteristics of contemporary visual music

Code : Classifications of Contemporary Visual Music

- A visualization of music which is the translation of a specific musical composition (or sound) into a visual language

- A time based narrative visual structure that is similar to the structure of a kind or style of music.
- A direct translation of image to sound or music, as images photographed, drawn or scratched onto a film's soundtrack are directly converted to sound when the film is projected. Often these images are simultaneously shown visually. Literally, what you see is also what you hear. (An early example is filmmaker Oskar Fischinger's *Ornament Sound* experiments c. 1932). There are many examples in Visual Music film of this process, e.g. McLaren
- A visual composition that is not done in a linear, time-based manner, but rather something more static like a 7' x 8' canvas. (AB:2)

General categories that pertain to the type of artwork it is in a general sense:

Fixed media visual music

Audio-visual performance

Visual music performance

Visual music cinema

Visual music film/ video

Visual music installation

Audio-visual installation (AA:9)

Categories that relate to the technologies:

Video (video music - (Jean piché)

Generative real-time audio-visual

Abstract Animation

Visual music instrument (AA:10)

Visuals are characterized by their qualities of tone in terms of colour hue and degrees of lightness and darkness and how these are then applied to the visual forms and the relationships between forms in the area of the screen (AA:11)

visuals to have a musical quality to them in terms of their vibrancy and motion possibilities and the resonances they can create through the interaction of all the relationships of all the visual components. (AA:12)

I characterise the visual aspects to be independent elements that can be organised, arranged and composed akin to how a music composer organises sounds. (AA:14)

Generally using musical principles or content to structure a visual work. (BB:1)

It is my practice. Since the affordability and ease of use of digital platforms for sound and image have radically improved, the number of “AV” artist has exploded in all genres, whether pop-based or fine art-based or concert support for bands or theatrical abstract(ish) film. (BA:4)

Thus, the central point of visual music is the quality of the audiovisual combination, which can be achieved by different means, such as a structural reference to musical

composition, by transcoding sound into image or vice versa, or by performing sound and image according to the rules of (musical) improvisation. (AC:2)

Characterise vm:

- (1) Visual music performances, mostly non-narrative
- (2) Experimental moving images, also non-narrative
- (3) Music videos (AC:3)

The algorave scene and live coding scene added a new level visibility to visual music.
(AD:10)

Glitch Art

VJ performances (often using existing visual sound software)

Real-time Stop-motion animation (for instance Oddscene)

Montage and Patchwork art (often using 2D or found footage)

Visual Music Performance (New Opera Hero, Holotronica – often combining live music and live visual triggers)

Real-time generative sound art (often using 3D meshes and render engines)

Transcendental, transformative performances (example: Kimatica)

Visual sound art installations and performances (example Analema Group) (AD:11)

Theme 2 : Image and sound

Code: Image-Sound relationships:

visual music that is my passion and it marries the visual art and music (AA:1)

Contemporary visual music is becoming very sophisticated as many masters of the two modes – visual art and music emerge in new art works. Of course, what is of interest is that the visual music work is often a co-production – a visual artist and a musician/composer as well as works that come from the one person. (AA:6)

visuals to have a musical quality to them in terms of their vibrancy and motion possibilities and the resonances they can create through the interaction of all the relationships of all the visual components. (AA:12)

I characterise the visual aspects to be independent elements that can be organised, arranged and composed akin to how a music composer organises sounds. (AA:14)

I see no separation between sonic and visual aspects. (AA:15)

At other times, the sonic part leads the journey and seems to bring the visuals with it (AA:16)

at other times, the visual leads the journey and the sonic is another cue to the behaviour of the visual in the frame. (AA:17)

However, for the most part, for me, it is like the sonic and visual blend together and create a world to which I am now placed into as a sonic and visual spectator. (AA:18)

I am drawn to electroacoustic music for it is in listening to such music, one is not aware of an instrumentation or an orchestration of sound but rather an evolving experience of sound. Listening to music and its sonic characteristics is my starting point for a visual music work. The sonic suggests a visual treatment to which I try to catch through a visual composition process. (AA:19)

Simultaneous event synchronisation – some behaviour or event in the image and sound occur simultaneously resulting in an event synchronisation. (AA:20)

Sequential event synchronisation – some behaviour or event in the image and sound occur in sequence and suggest a relationship in time (AA:21)

Independent relationship – two worlds – image and sound that are combined and seem to match in terms of mood and treatment but not necessarily synchronised. (AA:22)

Dramatic journey – there is a sense of dramatic development and degrees of tension and resolution in both the images and music independently but also in the relationship of the image and music which is based on dramatic development (AA:23)

Formal relationships – this field is vast – a colour linked to a pitch, a shape linked to an instrument. So many possibilities in forging relationships between the formal elements and components of visual, image, sound and music (AA:24)

the relationship between image and sounds is open ended (AA:25)

Sometimes, one can work with mapping a precise event in the visual part with a precise event in the music part with the assistance of a time-coded timeline (AA:26)

Such precise synchronisation can yield very satisfying dramatic results, but I think one needs to be careful to not over rely on creating a visual that is a mirror of the music rhythmic events. (AA:27)

I think synchronisation consists of a range of possibilities from very precise timings of events to a use of synchronisation as one part of the arsenal of expressive techniques one can use to relate image and sound. (AA:28)

If there is one feature of the relationship between image and sound that I attend to, then it is in motion. Motion in many forms, from the overall shape of the music and

visual composition, to the motion of each of the various elements and the motions suggested in their combination. Motion creates textures, forms, sounds, pitches, rhythms, trajectories in both the image and the sound and thus attempting to harness all these motion aspects in their varied form (AA:29)

but at the end of the day, thought, inspiration, planning and attention to the visual music relationship, the image and the sounds are visual music's power. (AA:36)

Thus, the central point of visual music is the quality of the audiovisual combination, which can be achieved by different means, such as a structural reference to musical composition, by transcoding sound into image or vice versa, or by performing sound and image according to the rules of (musical) improvisation. The result of this audiovisual combination should be a new, genuinely audiovisual product (AC: 2)

A large portion of what is commonly defined as “visual music” does not really fulfil the criteria of a meaningful relationship between image and sound (AC:7)

Those works, however, that do work on a meaningful combination of the two use different types of relationship: composing or improvising both elements according to the same set of rules (audiovisual composition or improvisation), different types of transcoding. (AC:8)

the workflow in video art was very similar to that of studio based electroacoustic music (BA:1)

I do not completely agree with the term [visual music] as an umbrella appellation mainly because it was originally applied to synesthetic practices that developed historically (Fischinger etc.). (BA:2)

I was trying to move away from parametric AV coupling. One is not the illustration of the other. Hence the term videomusic which I still use today, where image is composed as the music is composed and deals with sound/image relations as constructs that rise into metaphor and common intellectual discourse. Form, colour, movement. (BA:3)

Electronic music performance is not visually compelling. For myself, any videomusic/AV/VM needs to have imagery that is at least as compelling as the music to be successful. Live AV performance is not in my estimate a determining factor. If there is no obvious way for an audio-viewer to identify the link between gestures on stage and the immediately perceivable result, the presence on stage is not necessary. (BA:6)

relationships between image and sound: but noting a generally consistent approach to synchronisation (BB:3)

relationships between image and sound: Thinking of sculpture that uses sound to drive sculptural motion such as Tony Nicholls. (BB:4)

Electroacoustic music has great potential with visual music and there has been an explosion of exploration in this since 2000s. This correlation comes with the shared interest and focus upon abstraction (BC:6)

Nicholas Cook argues that the paradigm of multimedia is contest, as the materials are pulling against one another to generate meaning. (BC:8)

Thus works must walk a fine line between ensuring that materials are in relationship, but that they avoid conformance. (BC:9)

Voice analyses resonance between different voices, and invites audiences to explore harmonies through a real-time visual representation of sound. (AD:2)

Translating real-time captures of urban noise into a physical, 3D sound sculpture, audiences can explore these soundscapes by drawing trajectories of noise on a touchpad, and experiences these soundscapes spatially in real-time. (AD:3)

The relationships between image and sound are characterized by multiple layers of interaction: (AD:13)

Synaesthesia is a complex, heterogeneous phenomenon, researched by psychologists around the globe. And there is also an artistic and art historic relationship from Kandinsky, to Oskar Fischinger and contemporary artists such as Lisa Park. (AD:14)

Code : Visuals

Contemporary visual music to me is a rich field of interdisciplinary, intermedia and interart creative activity (AA:2)

Categories that relate to the technologies:

Video (video music - (Jean piché)

Generative real-time audio-visual

Abstract Animation

Visual music instrument (AA:10)

Visuals are characterized by their qualities of tone in terms of colour hue and degrees of lightness and darkness and how these are then applied to the visual forms and the relationships between forms in the area of the screen (AA:11)

visuals to have a musical quality to them in terms of their vibrancy and motion possibilities and the resonances they can create through the interaction of all the relationships of all the visual components. (AA:12)

where an element is in the space of the frame, which visual element is dominant, what has gone before and what I anticipate might happen with that visual element in the future. (AA:13)

I characterise the visual aspects to be independent elements that can be organised, arranged and composed akin to how a music composer organises sounds. (AA:14)

at other times, the visual leads the journey and the sonic is another cue to the behaviour of the visual in the frame. (AA:17)

I was trying to move away from parametric AV coupling. One is not the illustration of the other. Hence the term videomusic which I still use today, where image is composed as the music is composed and deals with sound/image relations as constructs that rise into metaphor and common intellectual discourse. Form, colour, movement. (BA:3)

Electronic music performance is not visually compelling. For myself, any videomusic/AV/VM needs to have imagery that is at least as compelling as the music to be successful. Live AV performance is not in my estimate a determining factor. If there is no obvious way for an audio-viewer to identify the link between gestures on stage and the immediately perceivable result, the presence on stage is not necessary. (BA:6)

The range is infinite. There are no stylistic limits to what can be shown and heard. All artists will bring their contribution to the form in wildly different fields and aesthetics..

I personally fit into the experimental tradition.

(BA:7)

The visual and sonic aspects can be extremely divergent. (AC:4)

There is still a large part of visual music that works with visual references to the history of visual music, abstract shapes, moving colours, but not necessarily.

(AC:6)

Abstraction is usually key in the visual aesthetics, though some contemporary works and practices are challenging this. In such cases the aesthetic emphasis rests upon forms or movement rather than the recognisable object thus there is still a partial abstraction, even if it engages more with materiality and textures. (BC:5)

Electroacoustic music has great potential with visual music and there has been an explosion of exploration in this since 2000s. This correlation comes with the shared interest and focus upon abstraction (BC:6)

Early tropes of abstraction still resurface but there is more of an engagement with cinematography and filmmaking practices. (BC:13)

rooted in the cinematic realm more than the musical. (BB:2)

Visual displays visually represent noise thresholds on the windows of the Tate (AD:4)

Colour, analyses colour harmonies between paintings at the National Gallery and translates this data into a 360 visual soundscape. (AD:5)

Visual aspects:

Eclectic

Inspirational

dynamic

often psychedelic

mesmerizing

often multi-dimensional,

vibrant

elevating (AD:12)

Synaesthesia is a complex, heterogeneous phenomenon, researched by psychologists around the globe. And there is also an artistic and art historic relationship from Kandinsky, to Oskar Fischinger and contemporary artists such as Lisa Park. (AD:14)

Code: Sound

I see no separation between sonic and visual aspects. (AA:15)

At other times, the sonic part leads the journey and seems to bring the visuals with it (AA:16)

I am drawn to electroacoustic music for it is in listening to such music, one is not aware of an instrumentation or an orchestration of sound but rather an evolving experience of sound. Listening to music and its sonic characteristics is my starting point for a visual music work. The sonic suggests a visual treatment to which I try to catch through a visual composition process. (AA:19)

The visual and sonic aspects can be extremely divergent. (AC:4)

Musically, there can be found everything from electronic and experimental music to jazz and (European) classical music. (AC:5)

Electroacoustic music has great potential with visual music and there has been an explosion of exploration in this since 2000s. This correlation comes with the shared interest and focus upon abstraction.

(BC:6)

Voice analyses resonance between different voices, and invites audiences to explore harmonies through a real-time visual representation of sound (KIMA). (AD:2)

London has long been one of the epicentres of audio-visual art, characterized by a vibrant club, music and visual art scene, all in conceptual proximity to the field of visual music. (AD:7)

Colour, analyses colour harmonies between paintings at the National Gallery and translates this data into a 360 visual soundscape. (AD:5)

Theme 3: Media & Technology

Code: Contemporary Technology

Machines and technology help the artist to create new types of image and sounds and new possibilities, (AA:35)

I see incredible innovation in the tools of making images, video and music in the computer facilitated the growth of a visual music practice. (AA:39)

I think there are two major types of visual music productions – one consists of fixed media art works and the other are works that are made for performance, thus utilising other technologies for live audio-visual / visual music performances. (AA:7)

Categories that relate to the technologies:

Video (video music - (Jean piché)

Generative real-time audio-visual

Abstract Animation

Visual music instrument (AA:10)

relationships between image and sound : Thinking of sculpture that uses sound to drive sculptural motion such as Tony Nicholls. (BB:4)

Most of the work was post-digital, that is combining analogue and digital technology and ways of presentation; musical instruments can vary considerably, images, however, tend to be projected on a screen and performed in real time. (AC:9)

It is my practice. Since the affordability and ease of use of digital platforms for sound and image have radically improved, the number of “AV” artist has exploded in all genres, whether

pop-based or

fine art-based or

concert support for bands (BA:4)

Increasing access to new digital tools and high-end cameras allow creators to access textures where before they might only have engaged with forms. (BC:12)

we created an immersive 360 artwork, analysing vocal signature patterns using deep-learning methods, projected as a large 360 wave on Ron Arad's Curtain Call. (AD: 1)

Voice analyses resonance between different voices, and invites audiences to explore harmonies through a real-time visual representation of sound. (AD:2)

Translating real-time captures of urban noise into a physical, 3D sound sculpture, audiences can explore these soundscapes by drawing trajectories of noise on a touchpad, and experiences these soundscapes spatially in real-time. (AD:3)

Visual displays visually represent noise thresholds on the windows of the Tate (AD:4)

Colour, analyses colour harmonies between paintings at the National Gallery and translates this data into a 360 visual soundscape. (AD:5)

Over the last 20 years, and increased availability of audio visual programs, software and hardware solutions (Resolume, Isadora), and real-time generative software (Touchdesigner, Unity), a new scene of audio-visual artists emerged globally. (AD:6)

The VJ London forum has long served for an informal as well as formal space for encounter, discussion, and presentation of the visual sound art scene. Since the late

Noughties several pioneering artists participated in talks, live gigs as well as exchanging technical know-how (AD:4 AD:8)

The algorave scene and live coding scene added a new level visibility to visual music. (AD:10)

I prefer experiencing visual-music as performance, due to the immediacy of its presentation, but more and more performances are moving online on YouTube. (AD:15)

I have also experienced several visual-sound artwork as installation (Brian Eno, Chris Levine, AntiVJ, UVA, TeamLab) as well as VR work (Dominique Gonzales-Foerster). (AD:16)

Networking opens the field for real-time visual music performances in more than one venue, or indeed happening at the same time around the globe. (AD:17)

Code: Media

Contemporary visual music to me is a rich field of interdisciplinary, intermedia and interart creative activity (AA:2)

I think there are two major types of visual music productions – one consists of fixed media art works and the other are works that are made for performance, thus utilising other technologies for live audio-visual / visual music performances. (AA:7)

However, when all is said and done, when a visual music work is experienced, its production disappears, and it's the visuals and music themselves are the artwork (as well as the human being's experience of the visual music combination). (AA:8)

General categories that pertain to the type of art work it is in a general sense:

Fixed media visual music

Audio-visual performance

Visual music performance

Visual music cinema

Visual music film/ video

Visual music installation

Audio-visual installation(AA:9)

Categories that relate to the technologies:

Video (video music - (Jean piché)

Generative real-time audio-visual

Abstract Animation

Visual music instrument(AA:10)

70% fixed media screening

20% performance

10% installation (AA:30)

Projection scenarios from single screen to multiple and immersive screens such as in domes and circular presentations appears to me to be an innovation and any sort of development in building screens and projection scenarios (AA:37)

the majority of the visual-music work has been

presented projected film in theatres, on monitors of all sizes; small on laptops and ipads, installed on screens in galleries, projected large in galleries and various surfaces, on exterior monitors and surfaces, and many other methods.

35mm, 16mm film; videotape; many forms of digital media, quicktime, etc (AB:3)

Electronic music performance is not visually compelling. For myself, any videomusic/AV/VM needs to have imagery that is at least as compelling as the music to be successful. Live AV performance is not in my estimate a determining factor. If there is no obvious way for an audio-viewer to identify the link between gestures on stage and the immediately perceivable result, the presence on stage is not necessary. (BA:6)

Concert settings for the most part using video projection, often multiple screens and anything from SD to multiple UHD. (BA:8)

relationships between image and sound : Thinking of sculpture that uses sound to drive sculptural motion such as Tony Nicholls (BB:4)

Typically digital formats presented in a cinema environment.

Less frequently 16mm format in the same setting (BB:5)

Occasionally in exhibition based settings where necessary – ie. Fischinger's *Raumlichtkunst*. (BB:6)

Most of the work was post-digital, that is combining analogue and digital technology and ways of presentation; musical instruments can vary considerably, images, however, tend to be projected on a screen and performed in real time (AC:9)

in post-digital modes of performance, combination with dancers, focus on the body etc. (AC:10)

bio art as in the approach of Claudia Robles Angel (AC:12)

There is still some experimentation with the possibilities of controlling sound and image in real time (AC:11)

Works may take the form of single or multi-screen films (with stereo or multichannel sound), (BC:2)

installations with projection on to flat or mixed surfaces (including smoke or gauze),
(BC:3)

more and more immersive environments are opening up into VR and multiscreen 360°
projection. (BC:4)

But perhaps most accessible is the single screen format, or physical installation in gallery
(BC:10)

The technology of VR is obstructive. (BC:11)

created an immersive 360 artwork, analysing vocal signature patterns using deep-
learning methods, projected as a large 360 wave on Ron Arad's Curtain Call. (AD: 1)

Voice analyses resonance between different voices, and invites audiences to explore
harmonies through a real-time visual representation of sound. (AD:2)

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Glitch Art

VJ performances (often using existing visual sound software)

Real-time Stop-motion animation (for instance Oddscene)

Montage and Patchwork art (often using 2D or found footage)

Visual Music Performance (New Opera Hero, Holotronica – often combining live music and live visual triggers)

Real-time generative sound art (often using 3D meshes and render engines)

Transcendental, transformative performances (example: Kimatica) Visual sound art installations and performances (example Analema Group) (AD:11)

I prefer experiencing visual-music as performance, due to the immediacy of its presentation, but more and more performances are moving online on YouTube. (AD:15)

I have also experienced several visual-sound artwork as installation (Brian Eno, Chris Levine, AntiVJ, UVA, TeamLab) as well as VR work (Dominique Gonzales-Foerster). (AD:16)

Code: Immersion

Projection scenarios from single screen to multiple and immersive screens such as in domes and circular presentations appears to me to be an innovation and any sort of development in building screens and projection scenarios. (AA:37)

completely unfulfilled potential – in AR and VR. (AC:14)

It is everywhere and will likely develop further in the years to come with telepresence, remote performance and total immersive Virtual Reality. (BA:5)

Telepresence may change the field quite a bit. 3D deployment without glasses too. The main challenges will remain the expression of possible realities. (BA:10)

more and more immersive environments are opening up into VR and multiscreen 360° projection. (BC:4)

Abstraction is usually key in the visual aesthetics, though some contemporary works and practices are challenging this. In such cases the aesthetic emphasis rests upon forms or movement rather than the recognisable object thus there is still a partial abstraction, even if it engages more with materiality and textures. (BC:5)

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The future of new mixed reality, augmented reality and VR as well as holographic technology (Hololens, Pepper's ghost) opens up new possibilities for visual music to integrate live performance with new technology and to provide new, immersive and engaging visual music experiences to audiences around the globe. (AD:20)

Code: Innovation

I think the innovation in visual music is in the quality of the content of the work and in the talent and skill of the artist that can bring forth good content. (AA:31)

visual treatment of all the visual components in the image and how they are composed over time and how they are forged to relate to the sound and music is the main source of the content of the work. (AA:32)

Attention then to the content – to the work – to the composition is where innovation is at work. This is for both fixed media and performance works. (AA:33)

I think innovation lies in the attention to the art of and the artistic results. (AA:34)

Machines and technology help the artist to create new types of image and sounds and new possibilities, (AA:35)

but at the end of the day, thought, inspiration, planning and attention to the visual music relationship, the image and the sounds are visual music's power. (AA:36)

Projection scenarios from single screen to multiple and immersive screens such as in domes and circular presentations appears to me to be an innovation and any sort of development in building screens and projection scenarios.

(AA:37)

Perhaps an innovation of the future would be to build and design architecture that can facilitate visual music presentations(AA:38)

Computational methods and software and programming languages that can facilitate the transferring of data between images and sound outputs is also innovative.
(AA:40)

Creativity and innovation have nothing to do with technology. Many contemporary works fail because they rely only, or too much, on tricks and technology (AB:4)

in post-digital modes of performance, combination with dancers, focus on the body etc.
(AC:10)

There is still some experimentation with the possibilities of controlling sound and image in real time, (AC:11)

bio art as in the approach of Claudia Robles Angel (AC:12)

alternative modes of sound and image control; (AC:13)

completely unfulfilled potential – in AR and VR. (AC:14)

It is my practice. Since the affordability and ease of use of digital platforms for sound and image have radically improved, the number of “AV” artist has exploded in all genres, whether pop-based or fine art-based or concert support for bands or theatrical abstract(ish) film. (BA:4)

It is everywhere and will likely develop further in the years to come with telepresence, remote performance and total immersive Virtual Reality. (BA:5)

Moving away from mimetism and into more complex sound-image relations. It needs to get closer to a filmic experience without becoming story-telling. It needs to evolve into the meta-narrative sphere. (BA:9)

Telepresence may change the field quite a bit. 3D deployment without glasses too. The main challenges will remain the expression of possible realities. (BA:10)

relationships between image and sound : Thinking of sculpture that uses sound to drive sculptural motion such as Tony Nicholls. (BB:4)

I imagine kinaesthetic and haptic technologies that add a corporeal element (BB:7)

Increasing access to new digital tools and high-end cameras allow creators to access textures where before they might only have engaged with forms. (BC:12)

Early tropes of abstraction still resurface but there is more of an engagement with cinematography and filmmaking practices. (BC:13)

Access to technology has a massive impact. As tools become more accessible more opportunities emerge (BC:14)

The possibility to access textures via increasing resolution of image capture of projection has enabled new possibilities. (BC:15)

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The VJ London forum has long served for a normal as well as formal space for encounter, discussion, and presentation of the visual sound art scene. Since the late Noughties several pioneering artists participated in talks, live gigs as well as exchanging technical know-how (AD:8)

Festivals such as the Art Futura Splice Festival and now the Crux Events serve as a hotspot for visual sound and music artists to present their work. (AD:9)

The algorave scene and live coding scene added a new level visibility to visual music. (AD:10)

I prefer experiencing visual-music as performance, due to the immediacy of its presentation, but more and more performances are moving online on YouTube. (AD:15)

I have also experienced several visual-sound artwork as installation (Brian Eno, Chris Levine, AntiVJ, UVA, TeamLab) as well as VR work (Dominique Gonzales-Foerster). (AD:16)

Networking opens the field for real-time visual music performances in more than one venue, or indeed happening at the same time around the globe. (AD:17)

Academic centres of excellence such as the CCRMA at Stanford or Queens University Belfast lead the way in academic exploration of the field. (AD:18)

Distributed and collaborative workflows as well as the ever-increasing speed and power (speed and resolution) of real-time render engines mean that the future of visual music can be both distributed as well as promising to be perceptually transformative. (AD:19)

The future of new mixed reality, augmented reality and VR as well as holographic technology (Hololens, Pepper's ghost) opens up new possibilities for visual music to integrate live performance with new technology and to provide new, immersive and engaging visual music (AD:20)

Appendix 5 - Interview Questions

This appendix includes the interview questions sent to the visual music experts.

Profile

Age:

Gender:

Residence:

Education:

Languages

Questions

1) Please briefly outline your education, occupation, and background knowledge in the arts

2) What is your experience in visual music or audio-visual art in general?

3) What is contemporary visual music to you?

4.i) From your experience as an organiser, (as an artist or as a visitor) how would you characterise most contemporary visual music works? (You can classify them in different types if you wish)

4.ii) How would you characterise visual and sonic aspects? (How do they look? How do they sound?)

4.iii) What are the relationships between image and sound?

5) How was the majority of the visual-music work you have seen presented, and in what sort of media?

6.i) Where do you see innovation in contemporary visual music?

6.ii) Where do you see this innovation in terms of technology?