

Towards a Practitioner Model of Mobile Music

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Abstract

This practice-based research investigates the mobile paradigm in the context of electronic music, sound and performance; it considers the idea of mobile as a lens through which a new model of electronic music performance can be interrogated. This research explores mobile media devices as tools and modes of artistic expression in everyday contexts and situations. While many of the previous studies have tended to focus upon the design and construction of new hardware and software systems, this research puts performance practice at the centre of its analysis.

This research builds a methodological and practical framework that draws upon theories of mobile-mediated aurality, rhetoric on the practice of walking, relational aesthetics, and urban and natural environments as sites for musical performance. The aim is to question the spaces commonly associated with electronic music – where it is situated, listened to and experienced. This thesis concentrates on the creative use of existing systems using generic mobile devices – smartphones, tablets and HD cameras – and commercially available apps. It will describe the development, implementation and evaluation of a self-contained performance system utilising digital signal processing apps and the interconnectivity of an inter-app routing system. This is an area of investigation that other research programmes have not addressed in any depth.

This research's enquiries will be held in dynamic and often unpredictable conditions, from navigating busy streets to the fold down shelf on the back of a train seat, as a solo performer or larger groups of players, working with musicians, non-musicians and other participants. Along the way, it examines how ubiquitous mobile technology and its total access might promote inclusivity and creativity through the cultural adhesive of mobile media. This research aims to explore how being mobile has unrealised potential to change the methods and experiences of making electronic music, to generate a new kind of performer identity and as a consequence lead towards a practitioner model of mobile music.

Dedicated to my mum Maureen and my brother Tony.

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Chapter 1. Introduction

A desktop computer user is sitting with a computer at a desk. A laptop user might have taken the computer to a coffee shop, library, airport, or meeting room... but largely will be sitting with two hands on the keyboard, the device on some surface. Mobile device contexts are more varied, and more difficult to predict and discover (Barbara Ballard, 2007, p.82) ¹.

This practice-based research investigates the mobile paradigm in the context of electronic music, sound, and performance. It explores mobile media devices as creative tools and modes of artistic expression in everyday contexts and situations, working in dynamic and unpredictable conditions. The intention is to question the spaces commonly associated with electronic music – where it is made, where it is listened to and experienced. Through practice-based research and this written exposition, I will consider the idea of mobile as a lens through which a new model of electronic music performance can be interrogated. This thesis claims that mobile music has unrealised potential to change the methods and experiences of making electronic music, and as a consequence generate a new kind of performer identity.

In the last two decades mobile media has advanced to become the dominant mode by which we manage our everyday experiences. A smartphone is often the last thing we look at before sleeping, the first thing we consult on waking up (Greenfield, 2017). An average user will tap, swipe and click their smartphone 2,617 times each day (dscout, 2019) ². It often feels indispensable and we tend to carry a mobile device with us at all times. Yet this same device has a range of input modalities – a touchscreen, an inbuilt microphone, integrated camera lenses and onboard sensors – as well as various ways of monitoring audio output. There is an almost overwhelming host of audio processing and music production apps designed specifically for the mobile platform, particularly on Apple's iOS operating system. This thesis explores the implications of our habitual engagement with mobile devices, and its significance for electronic music, and will consider the creative paradigms that they offer regarding musicianship, soundworks and performance.

¹ Ballard, B. (2007). 'Designing the Mobile User Experience'. Chichester, UK: John Wiley and Sons.

² <https://blog.dscout.com/mobile-touches> accessed 29 March, 2019.

Mobile devices have been used for artistic performance since at least 1998, when Oliver Wittchow repurposed a Gameboy into a looping instrument, Nanoloop (Essl and Rohs, 2009). Since then, mobile music has developed into a vibrant area of research, particularly since the iPhone was released. Georg Essl and Sang Won Lee have discussed ongoing challenges facing mobile music research, yet in their survey into the current state and future prospects of mobile devices as musical instruments, they state: ‘we will not review literature that engages with performance practice’ (2017, p.364). But what is mobile performance practice? What happens when the electronic musician becomes mobile? What kind of material is produced, how does it impact on established recording and compositional practices, and how might it affect the practitioner? How does it change the musician’s experience of making music and what new performance spaces are introduced? These are the gaps in existing knowledge and theories that I will be investigating, to discover the potential and implications of mobile devices for making electronic music beyond the studio.

My own experience of electronic music production has historically been situated in a recording studio environment, a place designed for ‘recognisable, manageable, understandable and unproblematic scenario[s]’ (De Paula, 2013, p.12). This research will examine a mobile device as an autonomous performance system in everyday situations and scenarios, in disparate locations from rural to urban environments. It will investigate what new techniques are involved, what are the negotiations and workarounds needed when using closed, blackboxed systems such as apps. Although there have been taxonomic reviews of iOS and Android apps (Dubus et al., 2012; Axford, 2015), app design is in constant flux and thus needs updating. This practice-based research will address the gap in knowledge on how mobile music presents real challenges to the assumptions and expectations of electronic music beyond the studio.

However, it could be observed that musicians from art-music traditions tend to shun product-orientated approaches to music making, there are still anxieties regarding the aesthetic authenticity and cultural legitimacy of mobile technologies (Briggs and Blythe, 2013). Consumer technology and commercially available systems such as apps are often criticised as inauthentic, even held in disdain (Butler, 2014). There is a view that mass-produced devices and off-the-shelf software facilitates a form of standardised music, the surface gloss of a controlled consumption market model (Damião, 2018). Programmer and digital instrument designer Akito van Troyer

castigates mobile apps as *embedded musicality* systems that prohibit users from incorporating a personal musical language. Van Troyer argues that ‘only experts in computer music... can program their own music software can make truly original music’ (2018, p.133).

Similarly, Essel and Lee summarise that consumer apps are often too tightly incorporated with commercial interests to allow open creative exploration. Many apps have a narrow musical focus such as sequencing, and should not be considered as music systems (Essel and Lee, 2017). Is it true then, that consumer technologies stifle artistic production, and only experts in programming can create original works with mobile devices? This thesis will revise and challenge the ways in which expertise, discipline and formal roles are perceived in innovative processes in the context of mobile media, and attempt to provide new insights from the informed perspective of a reflective practitioner.

1.1 Framing the Field: Existing Mobile Music Studies and Theories

There exists a range of research and theory exploring a smartphone’s capacity for creative musical applications and the physical act of mobility as a performance paradigm (Tanaka, 2004, 2010; Behrendt, 2005, 2010; Gaye et al., 2006; Essel, Wang and Rohs, 2008; Wang, 2009; Tahiröglu, 2010; Snyder and Sarwati, 2014; Order, 2014; Essel and Lee, 2017). Mobile music as a specific genre was indentified and theorised at the Mobile Music Workshop (MMW), a series of events between 2004 and 2008 organised by a collective of researchers, artists and academics including Frauke Behrendt, Lalya Gaye, Kristina Andersen and Atau Tanaka.

The MMW group were integral in promoting the idea of mobile music as a form of new media practice that encompassed music activities, sound art and community-based projects. Mobile music was classified as a term that:

...covers any musical activity using portable devices that are not tethered to a specific stationary locale; in particular those where the activity dynamically follows users and takes advantage of the mobile setting, thereby leveraging novel forms of musical experience (Gaye et al., 2006, p.22)³.

³ Gaye L., Holmquist L.E., Behrendt F., Tanaka A. (2006). ‘Mobile Music Technology: Report on an Emerging Field’. NIME'06, Paris, France.

Many of the emergent practices and theories from this time are covered in detail by Behrendt's taxonomy of mobile sound art as 'placing sounds', 'sound platforms', 'sonifying mobility' and 'musical instruments' (Behrendt, 2010). This period was marked by an avant-garde ethos that combined the research and development labs of mobile phone corporations with new media art festivals and academic conferences. Musicians and researchers were typically drawn to the idea that mobile phones are accessible to everyone both professionals and amateurs, making musical performances possible in locations other than concert halls or galleries. Mobile audio recording applications such as *RjDj* allowed anyone to interact with, even consciously contribute to the soundscape of an environment (Droumeva and Andrisani, 2011). Yet despite there being a wide range of literature available on app design and mobile sound theory, there remains a gap in knowledge regarding the performative aspect of mobile music, on mobile music practice as it currently stands.

NIME (New Interfaces for Musical Expression) research has been primarily concerned with the technical aspects of designing specific, single use applications, or the geo-locative and networking capabilities of mobile media devices (Bau et al., 2008; Wang, 2009; Essl, 2010; Roberts et al., 2012; Iglesia, 2016; Essel and Lee, 2017). The NIME community's early adopters explored mobile media as new platforms for music making – mobile music was differentiated from existing forms of practices that were clearly distinct from traditional music systems. However Owen Green has suggested to the NIME community there is a need to 'move beyond a focus on technical systems and bring into consideration questions of context' (2016, p.1). Similarly, Koray Tahiröglu (2010) argues it is important to be aware of the unrealised potential of mobile music by giving equal weight to the performer, audience, technologies and cultural forces when making them mobile. Drawing from Tahiröglu and Green's arguments, I propose that providing insights from a practitioner's point of view could be an appropriate way of complementing and strengthening research activities in the field of mobile music studies.

Another cornerstone for framing the field is the study of mobile listening habits afforded by the arrival of personal stereos and lightweight headphones. Paul du Gay's examination of the Sony Walkman in *Doing Cultural Studies* (Du Gay et al., 1997, 2013) is pioneering in its approach to analysing a consumer device as a cultural object. The work informs this research's effort to differentiate new forms of new

media practice, and with regards to its examination of technological and cultural convergence. Similarly this research draws on the works of cultural theorists who take mobility as their central concern; Ian Chambers' analysis of personal stereos as enablers of modern nomadism (Chambers, 1994), Michael Bull's in-depth studies into Walkman and iPod use and his theory of individualised 'audio bubbles' (Bull, 2001), and Jean-Paul Thibaud's *Sonic Composition of the City* (Thibaud, 2003). Thibaud reminds us, 'the sound of the city – the traffic, the people, the sheer aural chaos – inevitably intrudes through one's headphones' (Thibaud, 2011). As people engage with their surroundings through music, the apparently passive activity of listening on headphones is instead, distinctly active. The new paradigms of sound and music production resulting from mobilisation has been classified as *Situated Composition*, an approach that entails multiple relationships between a practitioner, their situation and their surroundings (Thulin, 2017).

Over the course of this thesis, Brandon LaBelle's notion of *headscapes* (2015) will be referred to, describing mobile mediated soundworks that highlight the discrepancies fostered by wearing headphones. The unsettling experience of walking while listening to sound overlapping and augmenting urban settings brings to mind Janet Cardiff and Georges Bures Miller's audio walks. This leads on to the notion of the city environment as a site for musical performance, with the development of interactive artworks using headphones such as Layla Gaye and Ramia Mazé's *Sonic City* (2002-4), Christina Kubisch *Electrical Walks* (2006-16), Noah Vawter's *Ambient Addition* (2006), and Atau Tanaka and Petra Gemeinboeck's 'multi-media mobile artwork' *Net_Dérive* (2006). Tanaka's theories on the potential of consumer mobile devices to act as a gestural form of musical instrument are particularly relevant (2006, 2009, 2010). His research exploiting the smartphone's sensor input modalities and its ability for signal processing and audio synthesis encouraged us to think of mobile practice not a passive act of consumption, but as a proactive and participatory activity (Tanaka, 2004). The smartphone's encapsulation of sensor inputs, sound synthesis, digital signal processing and audio output in a self-contained object moved it beyond a mere consumer icon, into something closer to a powerful, expressive musical instrument.

Yet while NIME research has often dominated mobile music, other branches of studies have expanded the focus to account for the artistic and social consequences of

mobility. For example Locus Sonus ⁴, a research unit attached to the Art Academy of Aix en Provence, Aix/Marseille University and the French National Centre for Research (CNRS), has been prominent in their research into the new auditoriums and new means of sharing listening experiences. Director of operations Peter Sinclair and co-director Jerome Joy have created an environment for artists, programmers, engineers and theoreticians to embark on a wide range of practical projects, creating a pool of shared knowledge through creative research.

Locus Sonus have close connections with *Wi: journal of mobile media* ⁵, an in-house publication of the Mobile Media Lab at Concordia University, Montreal. Under the direction of managing editor Owen Chapman, Wi continues to publish a vast online resource of written material with the emphasis on the connection between mobilities research and media studies, new media arts and communication. Similarly a team at CRESSON (Centre de recherche sur l'espace sonore et l'environnement urbain) in Grenoble ⁶ have been exploring the sonic experiences of places and ambiances. Member Jean François Augoyard's doctoral dissertation '*Step by Step: Everyday Walks in a French Urban Housing Project*' (1979) explores the theoretical and methodological consideration of walking and listening in an urban environment.

The subjective experience of a city mediated through sound and mobility draws from related theory laid out by the French Situationists, who coined the term psychogeography to describe the practice of exploring cities through the *feelings* of people towards a space ⁷. This practice brings with it terms such as *détournement* and *dérive*, strategies for walking as a way of transforming experiences of an environment. The Situationists believed that rediscovering play was a remedy for the 'poverty of everyday' generated by consumer society, they wanted to break the 'spectacle' that enforces passivity rather than participation. These concepts are important in positioning this research project's claims.

⁴ <http://locusonus.org/wiki/index.php?page=Home.en>

⁵ <http://www.mobilities.ca/index.html>

⁶ <https://aau.archi.fr/>

⁷ Guy Debord's (1955) definition of psychogeography is "the study of the precise laws and specific effects of the geographical environment, consciously organised or not, on the emotion and behaviour of individuals" <http://www.monocularartimes.co.uk/city-tours/psychogeography/definitions.shtml> accessed 11 July, 2019.

Another important artistic and scientific hub with connections to mobile music based in France is GRAME, (Centre National de Creation Musicale) in Lyon. GRAME have released a range of *SmartFaust* (2014) performance apps for both iOS and Android, that employ a mobile device's motion sensors to turn it into a gestural musical instrument through Faust notation language (Michon et al., 2015). *SmartFaust* is also the title of a series of participatory concerts such as *Battle de Smartphones* (2016-19), with audience and performers using their phones, directed and composed by Xavier Garcia ⁸. IRCAM's research centre in Paris has its own unique approach to gestural mobile performance, with its CoSiMa web audio application developed by Norbert Schnell and Benjamin Matuszewski (2019). Using Soundworks, a web-based framework for networking mobile phones as music systems, *CoSiMa – Collaborative Situated Media* – is a platform for collective interaction with players working together to creating melodies and rhythm patterns rendered through their smartphones ⁹.

There are comprehensive collections of mobile music studies available (Essl and Rohs, 2009; Snickars and Vonderau, 2012; Hjorth et al., 2012), with perhaps the most extensive overview being Gopinath and Stanyek's two volumes of *The Oxford Handbook of Mobile Music Studies* (2014). Yet I would argue there is an absence of sustained and detailed research regarding the use of iPads and the practice that arises from using them in music improvisation, performance or sound art projects. To reiterate, there remains a gap in knowledge on the perspectives and praxis that arise from being mobile ¹⁰.

1.2 Aims and Objectives

The aim of this thesis is to advance existing research into mobile music studies by focusing on the practice itself, on how mobile music as a holistic practice impacts on the practitioner and their creative outcomes. Rather than focus on the technical aspects or locative capabilities of mobile media, this thesis emphasises the consequences of mobility on sound production and music performance, and offers insights from the perspective of practice-based research. A further aim is to discover

⁸ <http://www.grame.fr/events/battle-de-smartphone>

⁹ <http://cosima.ircam.fr/>

¹⁰ A recent exception is Camille Baker's *New Directions in Mobile Media and Performance* (2018), yet her research differs from this project in that her interests lies in wearable technologies, designing for smart-fashion projects.

what new strategies and techniques are involved when working with consumer mobile apps, what are their potentials, what are the negotiations and workarounds needed when using these closed, seemingly blackboxed systems? How might ubiquitous mobile technology and its total access help promote inclusivity and creativity through the cultural adhesive of mobile media? And what does mobile as a principle bring to the wider discourse of electronic music making? By highlighting its democratising effects, this thesis aims to build upon the existing resources available to other electronic musicians and offer a different model of a mobile performer.

The first objective of this research is to question the spaces commonly associated with electronic music – where it is made, listened to and experienced. How might mobile practice counteract the isolation of making electronic music from where it is often situated, such as the recording studio?

The second objective is it to devise, develop and refine an autonomous performance system using generic, consumer devices and mobile apps, a system that does not require the usual apparatus associated with electronic music production – a mixing desk, cables, power supplies and sound cards.

The third objective is to consider the idea of mobile as a lens through which a new model of electronic music performance can be interrogated, one that might have the potential to generate a new kind of performer identity in the process.

Rather than sitting at a table, with a laptop screen acting as a physical barrier, I will devise an autonomous performance system that allows movement and encourage a ‘heads-up’ interaction. This objective echoes the work of Dan Iglesia, designer of the open-source application *MobMuPlat* (2012) and co-leader of the Princeton Laptop Orchestra (PLOrk). In his presentation *The Mobility is the Message*, Iglesia proposes a mobile performance model as: ‘...self-contained, hand-held, mobile, battery-powered, with minimal software or hardware conflicts, minimal technical learning curve and no cables to lay down ahead of time’ (2016, p.56). Theoretically a mobile performance system allows the electronic musician the mobility of an acoustic instrument, and the ability to move about with minimal setup and perform as a self-contained individual.

Atau Tanaka suggests one of the clearest ways to test this theory is to examine a system's ability to enter into different musical contexts while still retaining a sonic identity: 'The performer's ability to navigate these different contexts ... is a testament to that instrument's richness' (2010, p.5). Working across a wide range of situations will demand different stylistic and performative practices from the musician and their system. Building on both these suggestions, this practice-based research will implement and evaluate a mobile performance system using existing systems; as a solo performer, in duos or larger groups of players, with both musicians and non-musicians and other practice-based researchers.

1.3 Methodology

To address these aims and objectives, this research's methodology integrates different theoretical elements as a reflective part of the unfolding research. The practitioner model of mobile music brings with it the elevation of walking as a theoretical and artistic practice. As Gopinath and Stanyek state: 'If mobile music performance has a core repertoire, the "walking" piece" would be one essential genre' (2014, p.11). Throughout this thesis I will introduce a number of ideas, theories and concepts from schools of thought and practice that are not always associated with mobile music studies. They will provide the foundations of this research's claim towards a practitioner model of mobile music, a means to underpin my own practice and underpin the work of others within the branches of mobile mediated practices.

1.3.1 Theoretical Framework

This research draws from the concepts of the Situationist *dérive* (Debord, 1958, as quoted by McCartney, 2014), and both Francois Augoyard and Michel de Certeau for their rhetoric on the practice of walking in the everyday. For de Certeau, the only way that we can understand a city is through taking to its streets, it is through walking that we encounter real activity and real events (De Certeau and Rendall, 1988, p.96). I will reference Michael Bull's investigations into the use of personal stereos and lightweight headphones (2007, 2013), as well as social theorists Shuhei Hosokawa and Paul Du Gay and his team's investigation on the significance of the Walkman as a starting point for cultural analysis. Everyday objects are never simply functional, they gain significance as part of their user's own histories.

I will also address Nicolas Bourriaud's concept of *relational aesthetics* (1998, 2002), where the authenticity of an artwork is located within the relations of the process and the artist's 'lived' experience (Jagodzinski, 2014, p.6). To explore this dimension of lived experience, this thesis will adopt a phenomenological approach to addressing mobile devices as tools that might help us to question the world we live in, as well as ourselves. A phenomenological description is a first-person account of experience; 'in the same way one that one talks about self-awareness or the way one forms an image of oneself' (Auster, 1992, p.130). Phenomenology is a branch of philosophy initially developed by Edmund Husserl, a philosophy furthered by theorists such as Martin Heidegger and Maurice Merleau-Ponty. Heidegger's *Being and Time* (1927, translated 1962) developed the fundamental concept of *being-in-the-world*. Morley and Georgi tells us the ability to reflect on one's own experience, subjectivity and presence can open up dimensions of the lived experience that might otherwise be inaccessible (Morley, Georgi and Georgi, 2017). They argue phenomenology allows the researcher to therefore conduct a first person analysis of their own descriptions.

For this research project however, I shall concentrate on a version of this method based on the thoughts of Merleau-Ponty (1962). For Merleau-Ponty, space is not universal but relational; the phenomenal field is the flow of experience that acknowledges the entanglement between an individual and the context they find themselves (Parmar, 2019, p.107). There are two main topics of discussion within the field of phenomenology that I deem relevant to my own practice: Firstly, Milena Droumeva and Vincent Andrisani investigations into the cultural phenomenology of mediated aural practices (2014), and their attempt to contextualise phenomenology within the practices of sound listening and musical composition. And secondly, I will draw on Gabrielle A. Hezekiah's exploration of phenomenology to expand on the interpretation of sound and moving image (2010), to 'see' phenomenologically as an approach for understanding mobile media.

This research will cite Jean-Paul Thibaud's notion of *ambiance*, as an atmospheric sensitivity of the world (2019). Thibaud defines *ambiance* as not only a question of perceiving a landscape, or measuring an environment, but of feeling situations in common and experiencing the sensory contexture of social life. Our way

of being sensitive to the spaces we inhabit is changing and we need to pay attention to the background of ordinary practices:

What is taken for granted and usually goes unnoticed is the basic material of an ambiance. A way of walking, looking or speaking...the height of a stair or the material of a sidewalk (Thibaud, 2019) ¹¹.

Thibaud asks us to think about how we explore and experiment with new forms of inquiry into ordinary, everyday practices. Sarah Pink claims an autoethnographic practice can draw on the phenomenological anthropology of Tim Ingold, and its attention to the multisensory experience that is inextricable from the ways that researchers, artists and those who encounter our work encounter and learn in and with the environments we move through (2019). Taking an auto-ethnographic stance, an artist might reflectively anticipate future encounters with his or her practice. Artists can construct an archive of sensory knowing by documenting their own feelings and practices through writing, audio or video recording in the process of making.

1.3.2 Practical Strategies

As practical strategies for this research, I will devise a working methodology that employs generic, consumer mobile devices and associated sound processing apps to act as an interactive performance system, a hybrid of musical instrument and portable recording studio. This methodology has precedents from which I refer to Essel, Wang and Rohs' (2008) definition of 'generic' as a platform that is not designed with a specific performance in mind (a negative definition), but that is open to flexible and varied use without trying to prefigure artistic intent (a positive definition). In other words, an existing generic device is simultaneously high-level, i.e. abstracting the more mundane and repetitive development tasks, while being universal enough to allow a wide variety of creative possibilities.

Miranda and Wanderley assert that an interactive performance system can be thought of as a musical instrument by virtue of its possessing sensor inputs, signal processing capabilities and a sound output (2006, p.26). This research considers three

¹¹ <http://translating-ambiance.com/> accessed 10 October, 2019.

key technical aspects that define generic mobile devices as musical instruments: its input, processing and output capabilities. This research will explore these defining characteristics in detail; a mobile device's touchscreen, microphone and camera lens.

I will focus particularly on digital signal processing (DSP) apps to process audio captured by a mobile device's inbuilt microphone, as its fidelity is optimised for close range recording as well as capturing background noise from longer distances (Pakarinen et al., 2011). This approach builds on existing NIME research into a mobile device's microphone as a generic sensor for mobile assisted performance (Misra Essl and Rohs, 2008). In addition to recording sound, the microphone can serve either as prosthesis, a performative strategy or an extended method of listening. Can this approach to signal processing augment both public and private spaces with itinerant modes of engaging with electronic sound? I would argue that through practice-based research and participatory experiments, DSP apps could be an ideal method to examine the unique sonic qualities of a mobile device and the extended mobility that it affords.

Apps might be seen as either a motivation or a barrier to artistic creativity, and pre-coded systems are often thought of as prescriptive, or embedded technologies (Franklin, 2004). One method I will be employing to navigate their perceived limitations is to investigate the interconnectivity of apps, and this research will consider a previously unexplored technology *Audiobus* (2014)¹², a third party app that does not generate sound itself but acts as an inter-app routing system. Audiobus uses the Inter App Audio (IAA) protocol that allows apps to announce audio input and outputs to each other. Like this, separate apps can be partitioned into input, processing and output slots. IAA allows single purpose, standalone apps can be chained together, similar to a guitarist patching together a series of effects pedals to create unique sounds. I will examine whether app interconnectivity could be a method of reclaiming agency over these seemingly closed, blackboxed systems. This informs my choice to discover whether it is possible to devise a unique performance system out of pre-existing systems.

¹² Audiobus Pty Ltd. (2013). Audiobus [Mobile app] <https://audiob.us/apps/> accessed 22 January, 2014.

Another significant reason driving my decision to use generic devices stems from my background rooted in electronic dance music and DJ culture. The history of modern dance culture is founded on artists experimenting and reinterpreting technologies in ways other than they were intended. DJs misusing variable-speed turntables to mix and scratch vinyl records at dance parties (Ficke and Ahearn 2002), Roland's TB-303 Bass Line accidentally becoming the definitive sound of 'acid house' (Brewster and Broughton 2006). Jeffrey Boakye recounts how Noel Davey, an aspiring musician who could not afford a Yamaha DX-7, came into possession of a Casio MT-40 keyboard. Building a track entirely from the keyboard's 'Rock' preset, he created 'Under Mi Sleng Teng', a commercial hit that in turn led reggae music production away from live instrumentation to a harder, electronic sound: 'a preset on a mid-range Casio keyboard actually changed the face of modern dance music, forever' (2017, p.22). Dance music culture is inextricably intertwined with commercial and often overlooked products and systems, wrestling out possibilities in ways that manufacturer would never have envisioned.

1.3.3 Postproduction or Plunderphonics?

Should the use of pre-existing apps to make a performance system be considered a form of *Plunderphonics*? John Oswald (1985) coined the term plunderphonics, describing an approach to making music by taking one or more existing audio recordings and altering them in some way to create a new composition. The musician's sampler becomes essentially a recording and transforming instrument; simultaneously a documenting device and a creative device. Claire Bishop (2004) tells us it is often hard to identify who has made a particular piece of 'relational art', since it tends to make use of existing cultural forms and remixes them in the manner of a DJ or programmer (2004, p.54). This strategy is referred to by Bourriaud as 'postproduction' and is elaborated in his follow-up book to *Relational Aesthetics*:

...more and more artists interpret, reproduce, re-exhibit, or use works made by others or available cultural products . . . These artists who insert their own work into that of others contribute to the eradication of the traditional distinction between production and consumption, creation and copy, readymade and original work (2002, quoted by Bishop, *ibid.* p.61).

Oswald's article describes the development of the plunderphonics process when artists sample an original track, overlaying new material and sounds on top until the original is masked and then removed, often using scales and rhythmic beats. Yet Oswald admits, it is essentially a studio-based technique. To restate this research's objective, it will address the gap in knowledge on how mobile music presents real challenges to electronic music making beyond the studio. And although employing existing commercial apps, I will not be using pre-existing audio recordings as the basis of creating new works. DSP using a device's microphone to capture environmental sounds aligns the research within the field of soundscape composers such as Hildegard Westerkamp rather than plunderphonics. The enquiries carried out for much of this research will be held in situ, in real-time, rather than in postproduction.

1.3.4 The Carry Principle

As discussed at the beginning of this introduction, Barbara Ballard argues that mobile contexts are varied and difficult to predict and discover. A mobile environment is crucially different to the desktop environment: 'most of the mobile users are not sitting attentively at a desk... They are out and about, they are social, they are moving' (2007, p.10). Ballard suggests that carrying a mobile at all times changes a user's behaviour. How does a user's needs change when they are no longer sat at their desks? Being mobile means that a user's location and social context may change, technical resources cannot always be relied upon, and physical world navigation often has to be accomplished at the same time. I would argue the implications of these behavioural changes arising from mobility are worth examining in the context of electronic music.

Ballard coined the term The Carry Principle to describe the core features of a mobile media device: 'small, personal, communicative, multifunctional, battery-powered and always connected' (ibid., p.71). This combination of features makes a mobile device feel indispensable; it becomes an ever-present part of the user's life. Consequently we tend to always carry a mobile with us, all the time. Therefore, this research borrows from Ballard's definition of the Carry Principle as a conceptual framework for its artistic investigations. Adopting the Carry Principle allows me to identify and delineate the media devices I will be examining, while acting as a rule-based procedure for creating a body of artworks.

The combination of theoretical and practical elements acts as a conceptual structure based on grounded theory, to interrogate the creative paradigms that might arise from using only devices that are small, portable and battery-operated. A result of this practice-based research and my chosen methodology has forced me to re-evaluate my relationship with mobile media, and this thesis will demonstrate how I arrived at a practitioner model of mobile music.

1.5 Chapter Review: An Overview of the Thesis

Chapter 2 of this thesis lays the groundwork for this research project, tracing an historical line connecting the transistor radio, the personal stereo and the mobile phone, and their relationship with new forms of music listening, making and performance. There will be a consideration of walking and listening as a theoretical and artistic practice, including a discussion on the development of field recording as an aesthetic practice (McCartney, 2014). The primary focus will be to identify key practitioners in the field of mobilised performance, audiowalks and soundwalks, reviewing seminal works by artists such as Janet Cardiff and Georges Bures Miller, Owen Chapman, Jessica Thompson, Justin Bennett and Toby Butler.

Chapter 3 sets out the context, foundational work and the reasons for my embarking on this research. It explains how the research coincided with a period of transiency, frequently travelling between two similar but very different geographical sites – the UK and France. This leads on to an overview of my practice-based research into the feasibility of a mobile performance system across a wide range of musical and artistic situations. The chapter describes how playing with individual musicians with an iPad allowed me to step away from the metaphorical electronic musician's workstation. As a result, I begin to formalise a model for a reduced, singular performance system as one device, one lead and one sound source.

Chapter 3 will also cover my precarious membership in Paris' music improvisation scene, as an 'outsider' electronic improviser at STEIM in Amsterdam, working with the Royal College of Music, Stockholm, and collaborating with Edinburgh University's *LLEAP* ensemble. In evaluating my performance system, I discuss the problems integrating it into established musical structures. These early experiences appeared to confer existing research into mobile music, and the

difficulties in a public's perception of ubiquitous technology as a musical instrument, or the culturally understood gestures associated with music making (Bowen, 2013).

Chapter 4 demonstrates this research's fieldwork exploring ambulatory and walking practices. I will present for examination a selection of case studies of my developing strategies for transforming the sounds of rural and urban spaces into new sonic material: *remixing the environment*. I introduce the idea of *headphonic* performance as a key conceptual term – a private, internalised experience of creating electronic sound. I suggest that headphonic performance builds on existing practices of soundscape composition and audio walks. However, rather than working with recordings in a dedicated studio, situated composition is made on site, in situ, encompassing the place, situation and practitioner into the artwork. These works relate back to the primary objective of this research; to question the spaces commonly associated with electronic music.

The chapter also provides examples of portable loudspeaker performances, held outside in public spaces, at street festivals and arts events, often in dynamic and unpredictable conditions. In an attempt to establish a more inclusive approach to mobile performance practice, the chapter includes case studies ranging from guerrilla interventions to a 'marching band' of non-musicians, to working with classes of school children as a self-directed orchestra. This research's approach to mobile performance is closer to Nicolas Bourriaud's concept of Relational Aesthetics (1998, 2002), with an emphasis on process, openness and social contexts. The studies offer new knowledge in the democratising effects of mobile apps, grounding them within previous research into the social affordance and commonality of mobiles (Bryan-Kinns and Healey, 2004; Parkinson et al. 2012; Bowers and Shaw, 2014; Yang and Essl, 2015). It suggests that iPads and other mobile media platforms' total access allows for all levels of understanding and knowledge, and can help promote inclusivity and creativity to a younger audience through the cultural adhesive of mobile media.

Turning to the visual aspect of this research, chapter 5 considers the implications of using mobile cameras, including a discussion on the ethical and legal standing of recording on public transport and in public spaces. Patrick O'Keefe and Georg Essl argue the camera allows one to either interpret the information provided by the

camera as literal – images that represent a world, to be interpreted and displayed as presented – or as information to be abstracted and used to drive music performance (Rohs, et al., 2006; Rohs and Essl, 2007; O’Keefe and Essl, 2011). Chapter 5 also unpicks the historical parallels of artists from other disciplines who have employed the camera in public spaces to generate their work; Walker Evans and Helen Levitt’s hidden camera portraits on New York’s subway (1938-41, 1978) to Marc Augé ‘In the Metro’ (1986, 2002) and Stefan Rousseau’s ‘Riding the Tube’ (2019). I will discuss the shift in my own research processes as visual documentation evolved into a performance strategy itself, raising ethical questions with regard to voyeurism and permissions that demanded methodological adjustments.

In conclusion, chapter 6 will restate this research’s claim that mobile music has the potential to change the methods and experiences of music making, and consequently generate a new kind of performer identity. I will delineate and define the implications of mobile media devices in the context of my own practice, while drawing wider conclusions regarding their utility in artistic production in general. Through an experiential process of practice-based research, the artworks and events in this thesis suggest a range of creative possibilities for mobile mediated music, sound and performance. Field notes will appear written in italics, to define the boundaries between the phenomenological description of my practice and the systematic exposition of my research. I will employ an autoethnographical approach to describe and analyse my personal experiences, drawing from the argument that creative research questions are often inseparable from artist identity, experiences and culture (Ellis, Adams and Bochner, 2011).

Accompanying this written exposition is a USB key with a portfolio of audio recordings and videos as supporting evidence. I hope the reader will find it useful, and possibly essential, to be pointed to the appropriate recordings while reading the thesis. Much of the material is also collected online as a Tumblr blog ¹³, to allow readers to engage with this research from their own mobile device.

¹³ <http://steranko.tumblr.com/> The blog is linked the Walking Artists Network: <https://iamthewalker.com/author/the-carry-principle/> and my twitter feed @steveotronics contains mobile-related information and links.

Chapter 2. Being Mobile: Background and Context

Musica Mobilis: “Music whose source voluntarily or involuntarily moves from one point to another, coordinated by the corporal transportation of the source owner(s)”. Shuhei Hosokawa ¹⁴.

To be able to understand the framework for a practitioner model of mobile music, we must first understand how and why mobile auditory devices are employed, and how they subsequently shape subjective experience. This chapter will provide a broad overview of mobile mediated sound practices, tracing an historical line connecting the transistor radio, the personal stereo and the mobile phone, and their relationship between new forms of listening, making and performing. I will discuss how portable consumer objects have afforded new experiences that are relevant to this research; they allowed users to create ‘customisable, mobile mediated environments that anyone could carry with them wherever they went’ (Cohen, 2016, p.371). Mobile media scholars such as Michael Bull have argued that personal stereos were used as a practice of urban life, a strategy for managing ‘the contingency of everyday life’ (2000, p.3). The personal stereo remediates a cinematic experience to everyday practices, making the urban chaos personal, yet social in terms of establishing new coherences.

The transistor radio, the Walkman and its inheritor the MP3 player paved the way for discovering creativity in the act of walking (Verstraete, 2017). Pieter Verstraete points out a fundamental aspect that these mobile auditory devices share is the affordance of a ‘secret’ theatrical experience. Drawing from cultural theorist Shuhei Hosokawa’s text as a point of departure, Verstraete takes idea of the use of portable music media (or as he refers, *musica mobilis*) to experience walking and listening to music as a ‘secret theatre’ (ibid. p.2). This chapter will consider how mobilised modes of listening can create new auditory experiences that are simultaneously public and private, forging new relationships between a user, inconspicuous by-passers and their surroundings. Throughout this chapter there will be a consideration of walking as a theoretical and artistic practice, the act of making meaning through sensory

¹⁴ Hosokawa, S. (1984). *The Walkman Effect*, in ‘Popular Music 4, Performers and Audiences’.

experiences by way of soundwalks, audiowalks and other mobile sound art contexts. It will examine significant examples of artists and musicians' appropriation of portable auditory devices in their attempts to extend the boundaries of musical agency. By considering the background and context of the mobile paradigm, my goal is to uncover some of the complex effects of mobility on music and sound practices, and to lay the groundwork for this research project.

2.1 Mobile Music Studies

Mobile music studies are still a relatively new field of research, covering a diverse range of disciplines that reach far beyond the study of smartphones (Farman, 2012; Goggin, 2011; Goggin and Hjorth, 2009). There are comprehensive collections of mobile music studies available; Essl and Rohs' *Interactivity for Mobile Music-Making* (2009), Snickars and Vonderau's *Moving Data: The iPhone and the Future of Media* (2012) Hjorth et al. *Studying Mobile Media: Cultural Technologies, Mobile Communications and the iPhone* (2012), and Patricia Clough's *The Philosophical Carpentry of the App* (2014). Perhaps the most extensive overview of mobile music practices is the two volumes of *The Oxford Handbook of Mobile Music Studies* (2014). Sumanth Gopinath and Jason Stanyek's introduction to the aesthetics of mobile music remains the most definitive account of the mobilisation of performance to date. Yet even they admit that attempts to define the boundaries of mobile music practice are often contradictory, 'there are too many types of mobile music' (ibid. p.2).

More recent research can be found in Georg Essl and Sang Won Lee, '*Mobile Devices as Musical Instruments - State of the Art and Future Prospects*' (2017), Max Schleser and Marsha Berry '*Mobile Story Making in an Age of Smartphones*' (2018), Andre Damião '*Considerations Towards a More Critical Practice in Mobile Music*' (2018), IRCAM's Benjamin Matuszewski and '*Situated Networked Music Systems*' (2019), the Montluçon *Art Mobile* (MAM) exhibition (2019), Camille C. Baker, '*New Directions in Mobile Media and Performance*' (2019) and Martin Koszolkó, '*Electronic Music Production and Affordances of iOS Apps*' (2019).

There also exists a wide range of practical and technical material from the NIME archives, exploring a mobile phone's capacity for rich, creative musical applications

and the physical act of mobility as a performance paradigm (Tanaka, 2004, 2009, 2010; Behrendt, 2004; Gaye et al., 2006; Essel, Wang and Rohs, 2008). However Essl and Rohs' discussion on mobile practice and research activities admit: 'we will not review literature that engages with performance practice' (2009, p.364). Jordan Frith and Didem Özkul argue for a more expanded focus in mobile media research, one that goes beyond simply 'the phone' (2019, p.293).

These studies into the effects of the mobile paradigm on music and sound practices are the grounding for this research. They inform my intention to advance existing research by focusing on mobile sound practice itself, how it impacts on the practitioner and their surroundings, and the creative outcomes that arise from 'being mobile'. Yet despite being a wide range of literature available there remain gaps in knowledge regarding mobile music practice as it currently stands.

2.2 Always On, Always On Them

While the smartphone has become possibly the dominant communication technology of our time, mobile mediated music borrows, alters and adds elements to its telephonic antecedents. Mobile media have been around far longer than mobile phones (Goggin, 2009; Farman, 2012; Hjorth et al., 2012). Many studies tend to focus on the latest technologies, and often reinforce the idea the experiences and effects of mobility are very new, even revolutionary. Mary Morley Cohen argues however that much of today's media culture is in fact a holdover from earlier debates: 'we fail to see how our understanding of today's mobile media—and even the language we use to describe it—is part of a tradition that has been developing for over a century' (2016, p.372). Cohen considers the transistor radio to be responsible for the creation of the mobile media experience.

Small, battery-powered radios dramatically opened up contexts in which people could listen to music outside the confines of their own homes. Where previously, families would gather together to listen to music variety programs and drama on a stationary radio set, the portable radio shifted the practice beyond the domestic sphere. Mobile listening developed into a mass phenomenon as the 1950s and 60s witnessed huge sales of portable transistor radios – they were arguably the first globally successful electrical consumer item (Rothenbuhler and McVourt, 2002,

p.367)¹⁵. Consequently listening to music on the radio diversified into a more individualised activity, as people began to develop their own distinct listening habits and musical tastes.

Cohen references Marshall McLuhan's book from 1964 *Understanding Media*, in which McLuhan proposed the main reason radios were so successful is they created a personalised environment that altered the way the listener experienced and interacted with the world. The radio created 'fountains of auditory space' that followed a listener around in public (McLuhan, 1994, p.221). The transistor radio transgressed borders, redefined spaces and kept a listener connected to a wireless network wherever they went.

Of particular relevance to this research project was the inclusion of an earpiece that allowed users to listen to music privately. Attaching the device to the listener's body created a sense of immediacy, erasing the distance between the apparatus and listener, between the medium and audience. MIT technology and society expert Sherry Turkle describes the continual use of our mobile phones create such an extension of ourselves that they have 'become like a phantom limb' (2011, p.61). Paradoxically, as well as being a private experience, listening could also be a disruptive force as transistor radios had built-in loudspeakers that allowed the auditory space to go well beyond the user. Because their mode of reception is both private and public, transistor radios created new mobile soundworlds that could be distracting or enhance concentration. It is one of the contradictory effects of the mobile mediated experience, a theme that I explore in my own practice and will discuss later in this thesis in chapter 3.

As the radio became a social, technological and economic phenomenon, artists appropriated that medium in their attempts to extend the boundaries of musical agency. John Cage borrowed this ubiquitous device as a music compositional strategy for *Imaginary Landscapes IV* (1951), written for twelve radios and twenty-four performers with each performer manipulating either the volume or tuning dials. Instead of considering radio primarily through its ability to broadcast music, the device itself was repositioned as an 'instrument' (Patterson, 2002). Cage was

¹⁵ According to business historian Quentin Skrabec, the transistor radio was 'the most popular communication device in history', and until around 2010 the total global production of transistors was estimated at over 7 billion radios (2012, p.97).

attempting to transform the cultural associations of operating a radio into a performative act.

2.3 Taking the Audience Outside

Around the same time and in the same city of New York, the musician Max Neuhaus was developing a series of broadcast works. *Public Supply* (1966, 1968) combined a radio station with a telephone network to create a long-distance, participative performance space. Listeners were invited to phone in and make any kind of sound they wanted, using their mouth or tapping the telephone receiver like a percussive sound-making object. Neuhaus said that radio; ‘can give us a live ear into a space which can be anywhere or nowhere; it can also be completely electronic’ (Neuhaus, 1966, p.3). Neuhaus was increasingly experimenting with sound art, shifting from performative to ‘Place’ works. Abandoning his practice as a percussionist, he was attempting to jettison the concert hall as a performance space altogether and considered walking as a way of exploring transitional sound spaces and thoroughfares.

Between 1966 and 1976, Neuhaus organised a series of walks where the audience would meet up at various locations around New York. Everyone would have their hand rubber-stamped with the word LISTEN, and then follow Neuhaus (who would say nothing) along busy highways, past electric power stations, industrial locations and under flyovers: ‘Why limit listening to the concert hall? Instead of bringing these sounds into the hall, why not simply take the audience outside – a demonstration in situ’ (2003) ¹⁶. His intention was to make the audience appreciate their sonic surroundings in a more nuanced way, and not dismiss the sounds of the city as simply noise.

This work chimed with the expanded-field arts practices of the 1960s, with the Happenings and Fluxus arts movements and their aim to ‘collapse the distance between art and life’ (Labelle, 2013, p.68). For example, Alison Knowles *Shuffle* (1961), Ben Vautier *Run* (1963), Benjamin Patterson *Tour* (1963), Milan Knížák *Walking Event* (1965) and Cornelius Cardew, Christopher Hobbs and the Scratch

¹⁶ Neuhaus, M. 2003. <http://www.max-neuhaus.info/soundworks/> accessed 30 January, 2015.

Orchestra's *Parsons' Walk* (1969)¹⁷. Richard Long, Jan Dibbets, Nancy Holt and Robert Smithson were also extending their art into an environmental context; Long's minimalist landscape works first disrupted pop art when he took a train from Waterloo, found an ordinary country field and walked up and down it, photographing the traces and exhibiting them under the title *A Line Made by Walking* (1967). Long commented: 'The world outside the studio represented a fantastically colossal opportunity to engage with the physical world... that took me into the landscape' (2017)¹⁸. While Alvin Lucier's *Hartford Memory Space* (1970) devised a performance derived from recordings made outside the concert hall. Performers would return to the hall and recreate the sounds they heard outside, using written notation or tape recorders acting as memory devices.

The legacy of the tape recorder as a 'memory device' was expanded in Luc Ferrari's *Presque Rien No. 1 – Le Lever du Jour au Bord de la Mer* (1967-70). Although *Presque Rien* appears to be a single, untouched field recording of the sounds of a small fishing village in Croatia, it is actually a carefully edited work; several hours of audio have been compressed down to a twenty-one minute piece. Yet rather than stressing the craftsmanship that went into the editing process, Ferrari emphasised its apparent artlessness, referring to it as *anecdotal listening*; 'because really almost nothing happens musically, [they] are more reproductions than productions: electroacoustic nature photographs' (as cited in Grubbs, 2014, p.62). Ferrari's stance of comparing music composition to taking a photo snapshot on holiday caused something of a controversy with his music contemporaries, '...who said it wasn't music! (ibid., p.61). Not only was Ferrari was challenging notions of what defined music, he was attempting to reposition experimental tape music as an art form that anyone could participate in (Drott, 2011). He was casting field recording less as a work of art, and more of an exemplar of a democratised artistic practice.

¹⁷ Performed in Euston Station, London, *Parsons' Walk* involved walkers criss-crossing the station at different randomly determined speeds, waiting for different lengths of time at chosen points and then setting off in a different direction. Michael Parson recounts this intersected with the activities of bona fide travellers as they hurried or waited for their trains. 'The Scratch Orchestra and Visual Arts', *Leonardo Music Journal*, Vol. 11. p.8.

¹⁸ https://www.theguardian.com/artanddesign/2017/apr/16/richard-long-earth-sky-houghton-hall-interview?CMP=Share_iOSApp_Other accessed 16 May, 2017.

This research's objective to question the spaces associated with music making beyond the studio draws from these pioneering artists and their experimental activities. The suggestion that ubiquitous technologies and their total access might help promote inclusivity and artistic creativity is also an important foundation stone that this research project hopes to build on. In addition, the emphasis on the physical action of walking and listening as an artistic act was a means to increase awareness of the surrounding soundscape.

2.4 Soundscapes and Soundwalks

When you take your ears for a soundwalk, you are both audience and performer in a concert of sound that occurs continually around you. By walking you are able to enter into a conversation with the landscape (R. Murray Schafer, 1978, p.71).

The terms soundscape and soundwalks are perhaps most closely associated with the Canadian school of environmental sound studies of the World Soundscape Project (WSP) in Vancouver. Initiated in the early 1970s by musician and writer R. Murray Schafer, the WSP sought to raise awareness of the Earth's ecology through field recordings, music composition, active listening and educational projects. Their first publication, *The Vancouver Soundscape* (1973) was a study on the changing dynamics of the local sound environment around Vancouver, using a mixture of field recordings and sound-based music composition. A soundscape came to be defined as the sound of a specific location and its inhabitants, captured at a specific time. This approach to sound composition has continued to be developed by other members of the WSP such as Barry Truax, Bruce Davis and Hildegard Westerkamp.

Although R. Murray Schafer introduced the term soundwalk, it was Westerkamp who contributed in defining, refining and spreading the practice. She described her own distinct approach to soundwalking as 'listening to the environment ... exposing our ears to every sound around us' (1974, p.81). Westerkamp's organised soundwalks aimed to highlight the rapidly changing and disappearing sound environments in nature, through a combination of concentrated listening while moving at a walking pace. The soundwalk, then, can be defined as an invitation to explore a soundscape through movement.

Field recordist Andrea McCartney expands on this definition, proposing that soundwalking can be a practice that involves both listening *and* recording. McCartney refers to Westerkamp's non-intrusive style of field recording, suggesting the German-Canadian composer was learning about the Canadian soundscape 'with an immigrant's displaced ears' (McCartney, 2014, p.220). Yet the inclusion of traces of her presence as a recordist goes against the grain of established ideologies of audio recording: 'The recordist's perspective is written into the recording, into the listening, touching, experiencing and moving through the space' (ibid. p.221). In the studio, recorded sounds are generally isolated from each other and from the outside world. By contrast, a soundwalk is far from detached from its surroundings; both environment and listening are inherently connected.

Westerkamp herself describes the microphone as a *moving ear* that allows her to hear the 'tiny, quiet and complex sounds of nature' (1994, p.19). This working methodology is particularly notable in her compositions such as *Kits Beach Soundwalk* (1989) that encompasses field recording, poetry, story-telling and electronic treatment of hidden, everyday sounds. Antonella Radicchi's *Guide to Soundwalking* (2017) states that listening consciously to our surroundings increases our awareness of the quality of the sonic environment. By reactivating our ears, we become increasingly aware that we live constantly immersed in noise, from traffic and the urban environment. But, rather than coping by wearing headphones, soundwalking is an action designed to address urban alienation and habituation to noise through active listening techniques.

John Levack Drever adds that Western music culture has spent centuries retreating from the sounds of everyday life, enclosed behind 'padded walls' of the concert hall or the recording studio, where concentrated listening becomes possible (2009, p.166). It is an anathema for ordinary sounds to spill into the auditorium or the studio, cocooned in their acoustically neutral bubbles. Thus one of the underpinning goals of soundwalking is to circumnavigate the notion of unwanted, habitual sounds through a process of de-sensitising and consequently 're-sensitising' in order to catch a glimpse of the 'invisible, silent and unspoken' of the everyday.

In tandem to the WSP's work in Vancouver, the French philosopher and musicologist Francois Augoyard advanced the discourse regarding walking at the

research centre CRESSON (Centre de recherché sur l'espace sonore et l'environnement), in Grenoble, France.¹⁹ Augoyard's doctoral dissertation *Pas a Pas* (1979, English translation, 2007) was an early example of a reflexive research methodology in which experiences of the inhabitants of a housing project in Grenoble are linked to walking and sound in urban environments. His work was influential on Michel de Certeau's theoretical essay "Walking in the City" (from *The Practice of Everyday Life*, 1984), examining the ways people repurpose the language and objects of mass culture to make them their own: 'walking, like language, are both creative acts where you can improvise, make connections, take short cuts, take thousands of decisions in the present (de Certeau, 1984, p.97). Both Augoyard and de Certeau draw from the Situationists' interest in the material and psychological patterns of the city street and their impact on the individual, referred to as a psychogeography.

Augoyard is also responsible for *Phenomenology of Listening* with Henry Torgue (2005), an alphabetical sourcebook of eighty sonic and auditory effects such as echo, anticipation, vibrato, and wha-wha. Their accounts of sonic effects combine information about the physical spaces in which sounds occur with cultural contexts, embodiment, individual auditory and sensory experiences. From a phenomenological standpoint based in the work of Husserl, Merleau-Ponty (1994), their use of the term embodiment suggests that our senses are interconnected (Pink, 2009). Sarah Pink claims that our perception of sight, sound, taste and smell are not independent sensory modalities, but part of a complex sensorial web inseparable from one another. Howes (2005) further extends the concept of embodiment out into the environment and soundscape via an emergent paradigm of emplacement, 'the sensuous interrelationship of body-mind-environment'.

This harks back to Westerkamp's suggestion to not only focus on sound, but to extend a soundwalk to *all* the senses: 'When you walk into the conservatory, you are entering an artificially created, tropical environment... does it look and smell and feel tropical? (1974, p.21). This grounds the idea of a soundwalk as a physical exploration of a place that highlights a listener's own embodied presence in their surroundings. Yet a recurring theme in academic and popular criticism of the mobile media

¹⁹ CRESSON's interdisciplinary research interests include acoustic architecture, urban acoustics, urban sociology and the sonic environment. Its team members include Jean-Paul Thibaud, Nicolas Tixier and Sylvie Laroche, and their work on sound and urban ambiances is available online in both French and English (<https://www.ambiances.net/>).

experience was that listening to music on personal stereos isolated a listener from the world around them.

2.5 Between Private and Public Worlds

When the first personal stereo, the Sony Walkman, was released in 1979, the device met with a wave of enthusiasm that exceeded all expectations. Like the transistor radio, it made music portable in a new way, allowing users to immerse themselves in recorded sound in public places rather than domestic spaces. The Walkman has been described as the ultimate object of contemporary nomadism (Chambers, 2004), a fusion of two technologies – the cassette player and stereo headphones – and two different listening practices. Previously, headphones had been used purely in stationary listening contexts, where subtle acoustic details mattered such as operating telephone exchanges, taking dictation at an office or devoted listening to stereo recordings and transmissions (Weber, 2009, p.77). Iain Chambers suggests that by bringing what was conventionally thought of as a private act – individual listening – into public spaces, the Walkman disturbed the boundaries between private and public worlds (Du Gay et al. 2013, p.106).

However, it was the initial sight of people openly wearing headphones in public that provoked alarm and even indignation: ‘There’s something strange or not quite right about this’ (Hosokawa, 1984, p.176). As the Walkman was initially targeted towards a teenage audience, the sight of young people enclosed in their own intensely private world appeared as anti-social behaviour. Cultural theorist Shuhei Hosokawa identified very early on that the Walkman user’s autonomy could be considered an urban strategy, an autonomy-of-the-walking-self. The user listens ‘...not only to something secret but also to the secret itself, a secret in the form of mobile sound: an open, public secret’ (ibid. p.177). According to Hosokawa, the Walkman effect transforms the device into a ‘secret theatre’ through its ability to aestheticise the practice of walking (Verstraete, 2017).

A similar theme is taken up by Michael Bull’s enquiries into people’s use of their Walkman (2000, 2007, 2013). Bull argues that personal stereos helped people as a way of micro-managing everyday life experiences by creating a portable, and more importantly, a customisable soundscape: ‘Mobility is inscribed into the very design of personal stereos, enabling users to travel through any space accompanied by their own

individualised sound world' (2000, p.3). Rather than disconnecting listeners in what he called a hermetically sealed 'audio bubble' (2008, p.29), the personal stereo remediates music listening and movement into a cinematic experience, making the urban chaos highly personal, yet social in terms of establishing new coherences. Bull's work informed other media studies in understanding how mobile mediated practices impacted on public spaces (Haynes, 2010; de Souza e Silva and Frith, 2012).

More recently Bull has extended his ideas in a book-length examination of MP3 players and the private music practices of "iPod culture" (2008). In comparison to the Walkman, the iPod's capacities allowed for greater quantities of music in the form of compressed MP3 files to be stored on it. Apple's iPod fitted discreetly into a pocket, and once its click-wheel was set in operation it could play back an uninterrupted flow of music curated into playlists to match different events and situations. Bull suggests the sheer amount of music available on the iPod transformed mobile listening into more like a strategy for mood maintenance. Unlike the Walkman, it became rare for users to switch off their machines for lack of appropriate music – the iPod allowed its users to carry large slices, or perhaps their entire music library on a single, portable device. Pieter Verstraete points out the affordance of the 'secret' theatrical experience of portable stereos, forging new relationships between iPod users, inconspicuous by-passers, and their surroundings (2017, p.2). The world between the earphones of the iPod user is remediated into a cinematic experience, impacting on the listener's cognitive processes²⁰.

Tyler Bickford opines that mediated aural practices afforded by headphones are the 'extreme manifestation of post-modern fragmentation and mobility' (2014, p.338). It is argued that consumers have become so accustomed to experiencing their own physicality through the mobile media experience, that successive generations of listener find it increasingly difficult to leave their headphones behind (Droumeva and Andrisani, 2011). The problem can be seen from another angle when Bull argues that mobile listening affords an 'unprecedented ability to weave the disparate threads of the day into one seamless and continuous soundtrack ... The dream of living one's life to music becomes for some users a reality'' (2013, p.64). Headphones transform

²⁰ Both the iPod & Walkman are now historical artefacts, prompting the emergence of so-called 'iPod nostalgia' – the longing for a single purpose device: <https://www.trustedreviews.com/opinion/ipod-classic-nostalgia-is-much-more-than-retro-cool-2913972> accessed 20 December, 2014.

how we experience our immediate surroundings, as they channel sound directly to the inner ear, situating the listener in both real and unreal worlds.

2.5.1 Audio Walks

This brings me momentarily to Brandon LaBelle's description of headphonic space, a space between the ears that forces the listener out-of-sync with the exterior world. Wearing headphones, LaBelle suggests, 'define[s] a very different acoustic reality to that of our physical position' (2015, p.225). Sound artists have long been exploring this sense of aural dislocation, exploiting how headphones can be potentially subversive and how they can play havoc with our sense of meaning. Janet Cardiff and George Bures Miller have used the term audio walk to describe their approach to the discrepancies fostered on headphones, by transposing one acoustical space onto another.

In their first audio walk *Forest Walk* (1991), site-based recordings are overlaid with sound effects and diegetic music to accompany a dramatic monologue by Cardiff. *The Missing Voice: Case Study B* (1999) is a film-noir styled tour around the streets of Whitechapel in London. Wearing a Walkman, the listener follows directions from Cardiff's whispering narration, interweaved with binaural field recordings of the actual locations and fragmentary bursts of music. Similarly *Her Long Black Hair* (2004) is a story following the trail of a mysterious dark haired woman, using Cardiff's voiced instructions on an iPod to navigate the 19th century pathways in Central Park, New York. The audio walk incorporates photographs, narrative shifts between the past and present, visual observations, stream of consciousness and local history²¹. In both these works, the listener's visual reference is continually forced out of line between the real-world environments the listener walks through and the disembodied voice and imaginary auditory environment in the listener's headphones.

While Cardiff and Miller artworks encourage this slippage with overlapping narratives, their definition of an audio walk greatly differs from other mediated walks, which can appear as audio trails, audio guides or museum guides. A museum guide generally combines non-diegetic music with informative information, paced to encourage a visitor to look at specific artefacts or architectural features. For instance

²¹ <http://www.cardiffmiller.com/artworks/walks/index.html> accessed 13 September, 2016.

at Kenilworth Castle, the visitor can experience: ‘Our complimentary audio tour... brings the site's 900 year history to life’ (English Heritage, 2015). The *Ground Zero Sonic Memorial Soundwalk* (2002) is a powerful and evocative audio guide, devised in the wake of the 9/11 attacks on New York’s twin towers. It includes reportage, oral testimonies, archive audio clips, soundscape compositions and music, drawn together within a narrated history spoken by writer Paul Auster. This fusing of past and present is one of the salient features of located oral history audio walks, and contributes to the transmissive power of the embodied experience of mediated auralities of personal stereos and headphones.

The sound artist Justin Bennett creates performative audio walks using a variety of media devices; transistor radios, CD players, iPods or mobile phones. Bennett’s approach weaves narrative with the specific acoustic environment and physical structures of different cities. For instance, in *Secret City* (1997) and *Rumours/Resonances* (2001), spoken directions and observations are randomly determined and broadcast to a small FM receiver. He plays with different possibilities to sound recording, sometimes employing a cinematic approach to give the feeling that the listener is a character in a film, other times a simulated radio contact with the narrator or the breakdown of the equipment (Bennett, 2015). His use of scores – usually maps, sketches and diagrams – are combined with text, to highlight secret sounds of the city. Bennett’s audio walks sometimes take a political overview, for instance *Zuidas Symphony* (2008) tackles gentrification and the use of public space with its periodic ‘pirate radio’ broadcasts from an imagined group of squatters. Whereas *Ticket to Amsterdam* (2010) and *Ticket to Istanbul* (2011) superimpose the sounds of one city upon the other using binaural recordings, Bennett’s later works such as *Teletrofono* (2012) interrogate usually inaudible phenomena using ultrasound, very low frequency (VLF) radio, contact microphones and hydrophones.

2.5.2 Embodied and Wearable Interactive Systems

We are beginning to establish how mobile mediated auralities can be a critical tool for creating new sensory experiences, to overwrite onto the sonic environment or reveal the inaccessible sounds of a city. While personal stereos are not a prerequisite for audio walks, a number of artists and researchers have attempted various kinds of embodied playback systems to create auditory environments when moving.

Christina Kubisch also understands the power of headphones, and the ability to tune in to the resonances of inaudible phenomena. Her cycle of *Electrical Walks* (2006-16) uses specialist induction headphones to transform electrical signals that exist outside the human hearing range. Kubisch's headphones capture electromagnetic signals discharged from a variety of everyday objects – television screens, lighting units, cash machines and hidden power cables – and transposes them into sequences of tones that modulate or alter speed depending on the listener's movement (Kubisch 2009). Interviewed in *Pink Noises*, she explains: 'Atmosphere and sensual experience are very important to me. Much more than systems or programs' (cited in Rodgers, 2010, p.111). *Electrical Walks* reveal an inaccessible spectrum of sounds that go under a cloak of invisibility, hidden sounds but of an incredible presence.



Figure 2.1: Pre-Mobile: Wearable Computing at MIT (1996). Image courtesy of Steve Mann.

Steve Mann is recognised as the 'Father of the Wearable Computer', developing automated capture equipment such as *WearComp* (1980), a backpack worn computer that included a hand-held keyboard, mouse and input controls with a head mounted display with video capability. Although Mann was pioneering in his research into wearables, his early prototypes could be quite obtrusive (Figure 2.1) and often made people ill at ease. For instance, in 2012 he was assaulted in a fast food restaurant in Paris for wearing his Digital Eye Glass (2012)²². Gopinath and Stanyek comments

²² S. Mann: 'Physical Assault by McDonald's for Wearing Digital Eye Glass', blog, 16th July, 2012: <http://eyetap.blogspot.ch/2012/07/physical-assaultby-mcdonalds-for.html> accessed 4 May, 2018.

that Mann's Cyborg imagery is an aesthetic very much of its time, tied to the emergent practices of 'interactive art' of the late 1990s and early 2000s where digital multimedia art forms often took input and output data to be used during a performance itself (2014).

The notion of a wearable and interactive system provides us with context to Layla Gaye and Ramia Mazé's *Sonic City* (2002-4) and their approach to the urban environment as an 'interface' for musical performance (Gaye et al., 2003). Gaye and Mazé's prototype system involved a smaller backpack containing a laptop, a set of headphones and sensors fastened to the walker's clothes with duct tape. As a group of volunteers walked around Stockholm, their movements created electronically generated rhythms mapped to data detected from the sensor inputs. Sometimes sounds were triggered by the user's proximity to metal objects such as fences and gates, even different times of day generated different music elements. As a concept, *Sonic City* utilises the unplanned and uncontrollable effects of navigating a city as a way of merging movement with electronic sound. Gopinath and Stanyek describe *Sonic City* as 'one of the founding works of an experimental type of mobile music' (2014, p.11). Although Gaye and Mazé's rudimentary system might now appear rather bulky and cumbersome, the work stands as an important forerunner of mobile-mediated auditory performance. It also marks the drive to soundworks that relied on the body, shifting the focus from listening to pre-recorded sounds to generating new sonic material in real-time.

One of the most striking examples is Jessica Thompson's *Walking Machine* (2003), a wearable system of headphones and contact microphones that enables a user to listen to the amplified sound of their own footsteps on different surfaces and materials. Similarly her *Freestyle SoundKits* (2006) are wearable devices that generate and broadcast electronic dance beats as a user walks along the street. Thompson's playful approach to a mediated auralty is informed by her own experience of walking in urban environments, an approach she describes that enables her to 're-make a sense of a place' (Thompson, 2015)²³. The act of generating sound while walking transforms Thompson's experience of her surroundings. This embodied approach to sound performance chimes with Susan Kozel's involvement

²³ <http://wi.mobilities.ca/jessica-thompson-mobile-sound-and-remaking-place/>

with her designs for interactive technologies, an approach she refers to as ‘performing phenomenology’ (Kozel, 2007). For Kozel, performing with interactive systems acts as a catalyst for understanding how we encounter other people and ourselves through technology.

Noah Vawter’s *Ambient Addition* (2006) was intended to address the issue of intrusive urban noise, while incorporating the sound that intrudes through headphones. Vawter’s Master’s project at MIT was to develop a headphone system that integrated environmental sound with a synthesized musical soundscape using digital signal processing (DSP). Combining a micro DSP board encased in a Walkman sized plastic enclosure with a pair of transparent shell headphones fitted with embedded microphones, *Ambient Addition* allowed the wearer to filter out perceived dissonance in the sounds of the city, while remaining aware and connected with their immediate environment. Vawter’s design rules were the device must be portable and fit in the pocket, it should run on batteries, have no exposed circuits or excessive dangling cables and not require a connection to a desktop computer or laptop (Vawter, 2006, p.51). In a demonstration video for the MIT Media Lab, we can see a figure (perhaps Vawter himself) actively involved in walking the streets with the device, exploring the city terrain in a rather atypical way, gravitating towards unlikely sound sources²⁴. Like *Sonic City* and *Electrical Walks*, *Ambient Addition* was intended as a participatory walking experience, but differs in its use of real-time DSP as a way of transforming environmental sound.

Around the same time, artists and researchers began taking an alternative point of view in considering market-driven products like the mobile phone. Musician and researcher Atau Tanaka was attempting to draw out some of the idiomatic characteristics of mobilised music performance with his collaboration with Petra Gemeinboeck in a ‘multi-media mobile artwork’ *Net_Dérive* (2006). Tanaka and Gemeinboeck developed a prototype wearable device using two 3G (third generation) mobile phones with a Bluetooth GPS module stitched into a spandex scarf. Although 3G phones had been on the market since 2005, their processing and networking capabilities were still relatively limited, but Tanaka’s and Gemeinboeck’s goal was to develop more of a community-based, location aware performance system (Tanaka,

²⁴ <https://www.youtube.com/watch?v=igHCiemsyeE> accessed 27 February, 2015.

2014). For *Net_Dérive*, three participants wore the scarf system as they roamed an area surrounding the Maison Rouge Gallery in Paris, each following directional instructions from one of their phones. Meanwhile, the second phone's inbuilt camera would transmit a series of photographs back to the gallery. Each individual's location was used to generate synthesised rhythms, switching between radar-like bleeps to complex polyrhythmic patterns. An audio stream from the mobile's microphone was also cut-up, processed and mixed in amongst the electronic sounds.

The performance employed the mobile phones' onboard multimedia capabilities to transform the urban environment into a virtual canvas, creating a new type of locative artwork (Tanaka and Gemeinboeck, 2009). *Net_Dérive* established some of the core elements for employing mobile devices as performance systems: 'working in dynamic, changing situations, in situ or in vivo locations ... creating a bidirectional exchange between audience and producer' (p.178). The convergence of movement, data capture, image uploads, real-time location tracking, experimental music techniques and art installation all combine to make *Net_Dérive* an important key in understanding this practice-based research's framework for a practitioner model of mobile music. The work differentiates mobile mediated performance from existing forms of practices, and presented possibilities that were clearly distinct from traditional interactive audio systems. It also coincided with other new media art festivals, academic and scientific conferences and NIME (New Interfaces for Musical Expression) research into mobile phones as a music performance paradigm.

2.6 NIME and MMW

Atau Tanaka is an example of a NIME researcher drawn to the idea that mobile phones were accessible to both professionals and amateurs. Performances could be held outside in locations other than concert halls or gallery installations. He was part of an impromptu community of researchers, designers, musicians and hackers (including Lalya Gaye, Frauke Behrendt, Kristina Andersen, Lars Erik Holmquist) who considered the potential of mobile devices for musical activities, sound art and community projects (Gaye et al., 2006). Under the title *The Mobile Music Workshop* (MMW), the group held a series of events between 2004 and 2008, and are integral in identifying, developing and promoting the theory of mobile music as an innovative field of creative practice.

The MMW's collections of conference and workshop papers provide a fascinating glimpse into the open-ended, positive creativity of this time (Kirisits et al., 2008). This period helped to establish mobile music studies as a research field in its own right, and to create scientific and artistic legitimacy around it (Tahiröglu et al. 2012). Many of the experiments, practices and theories that emerged during MMW are covered in detail by Frauke Behrendt's taxonomy of mobile music, breaking it down into four categories: musical instruments, sonified mobility, sound platforms and placed sound (Behrendt, 2010). Focusing on the spatial and social practices of newly emerging locative technologies of mobile phones, Behrendt speaks of walking becoming a form of 'remixing', where the experience of space and the distribution of sound allows a participant to 'create their own version or remix of the service by choosing their path through the sounds' (Behrendt, 2012, p.268).

2.7 Ringtone Works and Phone Art

I must briefly rewind to the advent of early mobile phone technology, and how it coincided with a fertile period of experimentation marked by an avant-garde ethos. As 3G mobile phones became a social, technological and economic phenomenon during the early to mid-2000s, artists attempted to repurpose that media by using mobile technology for non-instrumentalist purposes of artistic production. By making artworks that critiqued, provoked and even made fun of consumer devices, they sought to gain insights often overlooked in the rush of product development. As Atau Tanaka states: 'Inserting creativity into the research process allows us to better understand the creative potential of mobile media' (2009, p.184). This spirit of experimentation is particular relevant to this research project, inspiring me to look beyond the passive consumerism of ubiquitous mobile technology and focus instead on how it might promote inclusivity and creativity.

The arrival of mobile telephones in many of the world's metropolis and other urban centres introduced new sonic events into the cultural landscape. Aside from the novel experience of hearing private, intimate conversations in public, were the short melodic phrases generated by simple oscillator-tone ringtones. Ringtones not only alerted a user of an incoming call, they acted as a means of social identity, a temporary and interchangeable sound signature. Sumanth Gopinath describes the near ubiquitous presence of tinkling treble frequencies of beeping mobile phones, that

differentiated the soundscape of the moment from the then-recent past (2013, p.xiii). Perhaps most notorious ringtone was the Nokia 6100's signature Nokia Tune (1998); a thirteen-note phrase based on an arrangement of Francisco Tárrega's *Gran Valse*²⁵. Within a very short space of time personalised ringtones flourished into a burgeoning global business, even with its own top ten download charts. The realisation that people were carrying small, rudimentary synthesizers provoked numerous ingenious artistic responses from artists, musicians and designers.

Alison Craighead and Jon Thomson's installation *Telephony* (2000) is recognised as the first mobile ringtone work: a group of forty-two Nokia phones arranged in a grid across the wall of a 'white-cube' art gallery. The disruptive presence of ringtones in cinemas, theatres and concert halls had become a contentious subject, and Golan Levin's *Dialtones: A Telesymphony* (2001-2002) played with this taboo in the form of a large-scale concert performance. The audience registered their phone numbers at a series of terminals, and in exchange new ringtone melodies were automatically transmitted to their phones. Levin conducted the dialling and ringing of each of the audience's devices, prompting LEDs to light up whenever a phone rang.

The work heralded a profusion of ringtone compositions; Bernd Kremling's *From the Hand to the Cell Phone* (2001), *MobilSymfoni* (2001), *Spring Cellphony* (2001), *SIM-phone-ya (New Ring Cycle)* (2002) and Brucker-Cohen's *Musical/Devices* (2002) all positioned the sound of massed ringtone in musical contexts. The art collective Ligna's *Wähit die Signale! Dial the Signal* (2004), explored the idea of a 'distributed' instrument with a concert for 144 mobile phones en masse, and Knowles and Paek's *3001: Massively Multiplayer Musical Instrument* (2007) built on the notion of public participation and collective composition.

In tandem to this approach was the emergence of phone art that sought to critique, provoke and destabilise. For instance, Jed Ela's *Ironphone Cadeau2000* (2001), a torturous hybrid of mobile phone and domestic steam iron, or Arthur Elsenaar and Taco Stolk's *BuBL SPACE* (2004) that deliberately attempted to jam mobile signals within a short radius and thus sought to pop the 'bubble' of

²⁵ This was also a practical solution. The limitations of programming monophonic sequences for the .NRT file format, a stripped down version of MIDI, only allowed simple rhythmic subdivisions using 12-tone equal temperament' (Porter, 2004). The melody line was limited to 30 seconds or less, and the small piezo speakers on a phone limited their frequency range to around 300 to 3,000 hertz, with little bass response.

connectivity. Usman Haque's large-scale installation *Sky Ear* (2004) probed the electromagnetic activity caused by mobile signal transmission, while the arts collective Troika took an overtly political and techno-subversive approach to their work. *Tool for Armchair Activists* (2005) was a system that encouraged users to send anti-government SMS messages to an ad-hoc loudspeaker and amplifier arrangement in London's Parliament Square, and *SMS Guerilla Projection* (2005) projected confusing and absurd text messages onto public highway road signs from hidden projectors. Poetic, absurd and predominantly the domain of activists and performance artists, these examples I have discussed demonstrate an important strand of mobile phone art from this period. Frauke Behrendt argues that many of these projects discussed here were:

marked by an avant-garde ethos and launched in the nonmainstream context of media art festivals, academic conferences or within research and development labs of mobile phone corporations. The arrival of the iPhone, however... changed this situation (2012, p.289).

Can this be true? Is it possible that smartphones in general, and the iPhone in particular, swept away this creative spirit in its wake?

2.8 The Smartphone Turn

Larissa Hjorth, Jean Burgess and Ingrid Richardson's study on cultural technologies states the arrival of the iPhone on 20th June 2007 was a turning point, a cultural moment that ushered in the smartphone era (Hjorth et al., 2012). As an object, the iPhone was a technological convergence of mobile communications, internet connectivity, a multi-touchscreen, GPS locative positioning, and a multi-media playback system. It was seen as a multifunctional, modern day Swiss army knife (Goggin, 2012). In tandem with the iPhone and its imitators came an explosion of commercially available, standalone 'abbreviated software applications', more commonly known as apps. Yet the conglomeration of sound technologies, from its inbuilt microphone and loudspeakers, offered new paradigms for listening to audio (Crawford, 2014). Compared to the 3G phone, the increased processing power of smartphones allowed real time digital signal processing and audio synthesis, enabling more advanced music making and performance tasks to be carried out on a single device (Wang, 2009; Mancini et al., 2010; Snyder and Sarwati, 2014; Order, 2014;

Yang and Essl, 2015; Essel and Lee, 2017). As we saw with Du Gay's approach to the Walkman as a cultural object, Hjorth and her team identify the study of the iPhone as a means of understanding today's situated media practices.

2.8.1 Adam and Atau: 4 Hands iPhone



Figure 2.2: Adam and Atau, *4 Hands iPhone* (2009-11). Image courtesy of Atau Tanaka.

An important canonical interaction for music performance with a smartphone is *4 Hands iPhone* (2009-11) by Adam Parkinson and Atau Tanaka. As I have already discussed, Tanaka had already been exploring the application of mobile technology, but this work takes the smartphone's encapsulation as a self-contained object and aims to move it beyond a mere consumer icon. The iPhone is presented not as a shiny, desirable technology, but considers the device as something closer to an expressive musical instrument (Tanaka, 2010). It was also my own point of entry to the field of mobile music when I accidentally stumbled upon a video on YouTube²⁶. The clip features the two performers dressed in black emerging from semi-darkness, in deep concentration (Figure 2.2). With a device in each hand, their physical gestures appear to produce a maelstrom of crackling textures, drones and spectral voices. Parkinson is statue-like, as if trying to freeze the sounds he is making, while Tanaka seems to create flashes of noise with a flick of his wrist.

Both performers deploy their devices to control the pitch, speed and synthesis parameters of different audio samples, using their thumbs to move across the

²⁶ The video is currently unavailable, but a 3 minute extract can be seen here: <https://www.youtube.com/watch?v=ICk2Jo8CyUg> accessed 8 October, 2019.

multitouch screen to manipulate the sounds. The iPhone's inbuilt accelerometers – which serve as tilt sensors to reposition photographic images from portrait to horizontal mode – are reappropriated to capture each performer's movement into sound making gestures²⁷. Tanaka's theories on exploiting the smartphone's sensor input modalities and its ability for signal processing and audio synthesis encourage us to think of mobile music not a passive act of consumption, but as a proactive participatory activity (2010). And the fact that all system components – sensor input, signal processing, sound synthesis and audio output – are encapsulated into one device sets it apart from the laptop model for digital music performance that usually requires a spectrum of audio software, drivers, controller hardware and cabling.

2.8.2 RjDj: Meta-Listening or Mind-Twisting Hearing?

For their performance system, Parkinson and Tanaka used open source Pure Data (Pd) ported over to the generative and interactive audio app *RjDj* (2008). RjDj employed Pd objects to make audio synthesis 'scenes', in essence a Pd patch. RjDj's code was utilised in developing the programming software *Libpd* (2010) by Peter Brinkmann, author of *Making Musical Apps: Real-time Audio Synthesis on Android and iOS* (2012). Brinkmann describes RjDj as a 'pure data-runtime for mobile devices' and actively encouraged communities of users to download his library of scenes²⁸.

Developed and marketed by Michael Breidenbruecker and Reality Jockey, a small start-up company headed by Robert Thomas and Frank Barknecht, RjDj was positioned as a way of opening up the 'blackbox' of closed operating systems using open-source APIs for creating and configuring content. Reality Jockey attempted to promote a new genre of 'reactive music'; interactive versions of existing music recordings using the mobile's internal microphone to alter the audio by triggering a set of signal processing filters:

Composers of reactive music often make heavy use of sensory input, which makes the environment of the listener part of the music that is heard. Compositions are called "Scenes". Scenes have a different musical structure than traditional compositions and they often have no clear beginning and end. Some

²⁷ During a conversation with Atau, he explained that by 2007 most of his body sensor-capture devices he had built for the group Sensorband had ceased functioning. It was a revelation for him to discover the iPhone possessed all the system components he had been working on, embodied in a single device.

²⁸ <http://www.martin-brinkmann.de/generativemusic.html>

scenes promote active listener involvement and others promote passive listening (2010)²⁹.

The use of ‘sensory’ input is discussed in Kate Crawford’s essay, *Four Ways of Listening with an iPhone*, in which she talks about RjDj producing a sensation of meta-listening (2014). Listening to the environment through one of the app’s reactive scenes creates a displacement in the realworld – listening to a place in the present, but strangely modified (ibid., p.216). Using the app becomes a form of digital immersion, producing an almost hallucinatory listening experience, a ‘mind-twisting hearing’ (Kincaid, 2008)³⁰. Crawford draws similarities to Don Idhe’s *A Phenomenology of Sounds* (1976), where a listener hears sounds in a double form; the in-ear style of earbuds ushering in the surrounding environment with unusual closeness while at the same time transforming perceived sounds through digital signal processing. The RjDj user walks through space, listening to the ‘hearing of space’.

Milena Droumeva and Vincent Andrisani advance this theory of meta-listening, employing the term ‘cultural phenomenology’ as a way of informing the character of the RjDj experience as an embodied and a cultural practice (2011, p.2). Inspired by Maurice Merleau-Ponty’s phenomenology of perception (1962) and the phenomenology of listening (Erlmann, 2004; Augoyard and Torgue, 2005), Droumeva and Andrisani prepared and led a soundwalk for the Vancouver Soundwalking Collective using RjDj. Employing a variety of digital signal processing features (multiple delays, pitch shifts, reverberation and onset-driven textures), the soundwalkers shared four iPod touch devices, each running an RjDj scene designed specifically for the event. Droumeva and her team were impressed that RjDj was not limited to the mediated listening experience, but rather it was ‘the malleability of phenomenological perception [that] transformed the nature of both the soundwalk and headphone listening as micro-cultural systems of engagement’ (ibid. p.11).

In 2013 Reality Jockey closed its website and removed its apps from circulation, including RjDj, with most of its links no longer available on the internet. But the exchange of free and open source materials for programming mobile apps continues. Brinkman’s Libpd was used to build Chris McCormick’s PdDroidParty (2011) for

²⁹ <https://puredata.info/downloads/rjdi>

³⁰ https://www.youtube.com/watch?v=WPrIPcyemdM&feature=emb_logo

Android devices ³¹, which directly inspired the iOS app PdParty (2018) by Dan Wilcox ³². And Libpd is also at the heart of Daniek Iglesia's MobMuPlat, or Mobile Music Platform (2014), a powerful set of tools and customisable visual interfaces for both iOS and Android platforms ³³. Although I have stated this research is focused on the practice that arises from mobility, and not the technical aspects of mobile app design, I have used MobMuPlat many times in school workshops and I will touch on this in the following chapter.

On a final note, Crawford considered that the option to record individual scenes in RjDj suggested new possibilities. Quoting Jean-Luc Nancy, she asks 'can one make a listening listened to? Can I transmit my listening, unique as it is? That seems so impossible and yet so desirable, so necessary too' (2008, p.5). Despite its brief existence, RjDj offered a tantalising glimpse of an *a priori* impossible opportunity – to 'hear another's listening'.

2.9 Conclusions

In this chapter I have identified the contextual background for this research, bringing together a diverse range of artistic practices and theories to support my claim of a practitioner model of mobile music. We have observed a historical line that connects portable consumer devices and the new paradigms that emerge from listening, making and performing music outside the studio or concert hall. I have examined walking and listening as a bodily exploration of a place, one that challenges the spaces commonly associated with music. I have considered how expanded-field practices extended auditory practices into an environmental context, from Fluxus scores to rule-based procedures for walking and listening.

Another set of issues taken into account is how the autonomy of mobile auditory devices has been employed as a strategy for managing the sometime oppressive nature of travel, routine and urban environments. The notion of mediated aurality also raises questions about what it means to be immersed in a mobile listening experience. It was the affordance of personal stereos as a 'secret theatrical experience', according

³¹ <http://droidparty.net/>

³² <http://danomatika.com/code/pdparty/guide>

³³ <http://danieliglesia.com/mobmuplat/>

to Hosokawa, that began to create novel relationships between a user and their surroundings.

From soundwalks to wearable interactive systems, from the headphonic space of audio walks to the avant-garde ethos of telephone art, from the smartphone as a gestural music instrument to the cultural phenomenology of digital signal processing apps, this chapter has established a contextual area that this research will be exploring. I have discussed audio recording cast as an exemplar of a democratised artistic practice, and how desirable consumer technologies might be examined beyond their outward cultural meanings. These illustrative examples provide a grounding for this practice-based research; situating mobile-mediated sound as a strategy for extending the boundaries of musical agency, and as a phenomenological approach to expanding our subjective experience of the world.

Chapter 3. From Improvising Machine to Situating Composition

The motivation for this practice-based research sprang from a specific mix of interests, frustrations and situations. As I have mentioned, my background is rooted in electronic dance music and DJ culture as a studio-based music producer. In 2012, I began attending music improvisation workshops held every week at the Église Saint-Merry in Paris, under the direction of Frederic Blondy. Playing with a wide-ranging mix of musicians – from amateur players to conservatoire students, from hobbyists to seasoned veterans of the Paris free improvisation scene – I found it frustrating that I was unable to respond to rapidly changing musical situations with my current performance set-up of a laptop running Max patches.

Usually I was positioned to one side, sat at a table obscured behind my laptop screen with an array of cables, mixing desk and loud speakers. As the musicians bobbed and weaved around in front of me, I always seemed to be always reacting, lagging several steps behind the musical action. Despite all the sound resources at my disposal, compared to traditional music instruments I was simply unable to engage in a playful or coherent dialogue with the other improvising musicians. To counteract these vexations I hoped to find alternative possibilities for artistic expression, to discover a new lexicon of electronic sound that did not involve a laptop, digital audio workstations or desktop computing interfaces of a QWERTY keyboard and mouse.

Another significant reason driving my decision stems from my having abandoned my own recording studio and all my previous music instruments and equipment. While studying for a Master's degree at Edinburgh University, I created an installation *The Sound of Memory* (2010) that re-animated the broken hardware and abandoned data storage systems in my studio. The amount of obsolete media I had acquired over the years seemed to resemble layers of geological strata, each describing a different stage in audio technology. By 2013 I had to sell up the studio, and with long-standing work partner Sally Rodgers, we methodically destroyed all the

countless ‘abandonware’ in the work space; floppy disks, SyQuest disks, cassettes and multi-track tapes³⁴. This moment seemed a *Tabula Rasa*.

Both of these events acted as catalysts for undertaking this practice-based research, contributed in identifying new paths of inquiry. This research has also coincided with a period of transiency, with my constant travelling between two similar, but very different geographical sites – the UK and France. A place that George Perec referred to as ‘*Entre France et Angleterre*’ (quoted by Schilling, 2019, p.30). The work was often carried out on public transport, in crowded conditions with interruptions and limited resources. In an attempt to document and capture the shifting fleeting ambiances of places and experiences, it was vital to have light, portable and resilient equipment that could be easily carried. With no studio space to work in anymore, I was forced to adopt these transient spaces for my enquiries and music making. A cafe, a waiting room, the fold down shelf on the back of a train seat; these were the impermanent sites of my new work habitat.

3.1 Preliminary Enquiries: OSC

I had initially considered using my Sony Android smartphone to control various Max patches, as was I familiar with Max software. I began with *Max/MSPControl* (2012) for the Android platform, but found the app would continually crash. I managed to arrange a face-to-face meeting with the app’s designer Matt Benatan. Benatan described how he originally intended *Max/MSPControl* as only as a private, experimental project for an audio-visual controller interface to trigger visuals. He explained the difficulty with the Android platform is that, although its mobile operating system is built on open source software Linux, there is no unilateral level for app development. An Android app must function on hundreds of different devices – with no two brands of device the same, and each with its own set of hardware features³⁵. Consequently there is simply not the same level of coordination in music app design on Android as there is on iOS.

Instead I began experimenting with Open Sound Control (OSC) for controlling desktop audio software with my iPad. OSC is a protocol developed by the Berkeley

³⁴ The results were presented as an installation *Breaking Media* (2014) at Morley College, London.

³⁵ There are currently nine different platform versions running on Android devices, from Gingerbread 2.3.7 to Pie 9.0: <https://developer.android.com/about/dashboards/> accessed 20 April, 2020.

Centre for New Music and Audio Technology research centre (CNMAT), allowing communication between computers and multimedia devices over a wifi network. First contenders for the iPad were *Mrmr OSC Controller* (2009) and *Fantastick* (2009) apps, both early host programs for controlling Pure Data and Max. I also examined in more detail Hexler's *TouchOSC* (2010), a popular system for sending and receiving OSC and MIDI messages using a third-party application, *TouchOSC Bridge*. TouchOSC comes with a set of predesigned templates that can be customised using its free editor application, and potentially be made to control any kind of audio software; from PD to Max, from Ableton Live to Logic, Modul8 to Supercollider. After initial problems selecting the correct port numbers, I was able to easily interact with Ableton Live beyond point and click, to include multi-touch gestures and device movement.

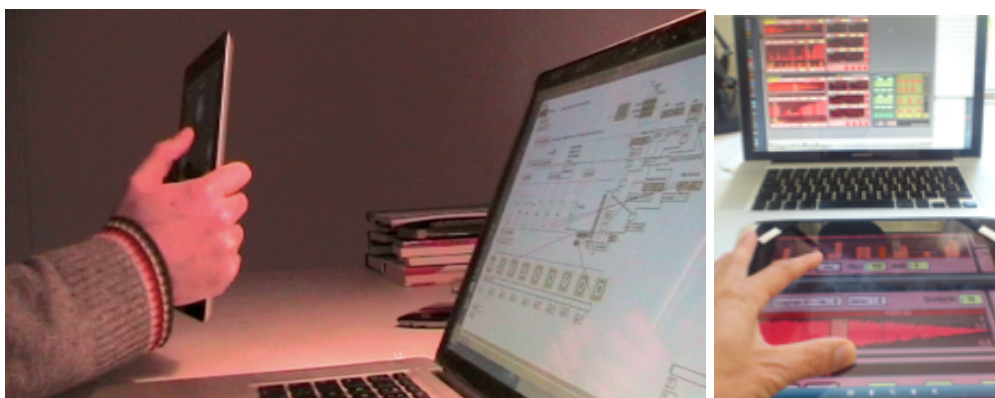


Figure 3.1: Using GyrOsc to control Max, and LogMeIn to control Ableton Live. Source: Author.

I found the most reliable and responsive of the OSC options as controller for Max was GyrOSC (2011) by Kevin Schlei, a stripped down version of his TC-11 (2013) synthesizer app. Schlei suggested downloading an applet by David Collins, which converts data to MIDI³⁶. Although the app is a Max standalone, I was able to open it by choosing the 'Show Package Contents' on my Mac and copy the .mxfile contents to a new Max patch. I then added a simple Max synthesis patch, mapping parameters to data generated by the rotation, magnetic field and gravity sensors on the iPad (Figure 2.1, left). Additional on/off controls were accessed with a series of buttons and the results can be seen in the clip 'gyrOSC_test.dv'³⁷.

³⁶ <http://davidbcollins.com/2011/08/07/maxmsp-patch-gyrosc-to-midi/>

³⁷ Media file: 01_gyrOSC_test.dv http://youtu.be/_SBOfDDBMc

Another approach investigated was implementing mirroring desktop software. Remote desktop control applications such as *LogMeIn* (2013) and *Parallel Access* (2013) allowed me to control Max and Ableton by mirroring the desktop onto the iPad (Figure 2.1, right). These were only 14-day trials, and LogMeIn has since become a fully paid yearly subscription service. Sadly, Cycling '74's own attempt at a mobile app for Max, *MIRA* has never got past its beta stage and seems to have been abandoned. As it currently stands, there is limited implementation between Max and iOS. Yet all these trials were conducted while still sat at a table. Each approach used a touch screen device solely as a controller for laptop audio software; each needed additional soundcards, audio interfaces, amplification and an ad-hoc localised network.

In their research considering mobile phones as music performance platforms, Georg Essel and Ge Wang argue that it is the autonomous nature of a mobile that brings it closer to being an instrument. Miranda and Wanderley assert that an interactive performance system can be thought of as a musical instrument by virtue of its possessing sensor inputs, signal processing capabilities and a sound output. Atau Tanaka suggests one of the clearest ways to test this theory is to examine the system's ability to enter into different musical contexts, while still retaining a sonic identity: 'The performer's ability to navigate these different contexts ... is a testament to that instrument's richness' (2010, p.5). Playing as a soloist, within a small group or in a large ensemble will demand very different stylistic and performative practices from both musician and their system. What is the difference between a mobile device as a performance system in comparison to the standard laptop and controller setup found in contemporary digital music performances? These models were the driving motivations for this initial phase of my research enquiries. If I was to truly consider Tanaka's description of a mobile device as a self-contained sound-producing object, I needed to be independent of desktop audio software and focus instead on the autonomous aspect of the iPad.

3.2 An Improvising Machine

One of my first points of call was to return to the improvisation workshops at the Église Saint-Merry. There was an initial novelty amongst the other players at my not having to install my usual performance system, one that would involve a large amount

of physical equipment and cables, often with a lengthy set-up time. Instead I pulled out my iPad out of my bag, tapped on an app and begin to play immediately. It was my intention to consider the iPad as an improvising machine, in reference to John Bower's idea of 'musical machines...for improvised electro-acoustic music' (2002, p.27). I became interested in the heuristic designs of apps that borrowed elements of video gameplay, such as *SoundPrism* (2010), *Caelestis* (2011) *Gestrument* (2012) and *Musyc* (2013). Many of the apps incorporated the iPad's tilt sensors, mapping the device's movement to synthesis algorithms or audio effects parameters. For example 'Bouncy', a 'scene' on RjDj employed the device's accelerometers to introduce a spatial element to controlling electronic sound; the angle, position, height and speed of movement capture gesture metaphors in a unique manner. Essl and Rohs' investigations into the accelerometers on an iOS device shows that they are so fast (~1000Hz) that there is no perceivable delay or impact on performance speed meaning many physical motions can be captured as data for sound interactions (2008, p.204). However, tilting as a performance gesture does have its limitations due to the lack of a reliable position reference, and maintaining sustained pitched material is extremely difficult.

At the same time, adopting a ludic approach to the improvisation sessions meant that several of my co-performers did not warm to my musical intentions. They openly dismissed the iPad as a toy rather than an serious performance system. This was compounded by the rudimentary synthesis of the apps in comparison to the sound synthesis of Max patches I had previously been creating on my laptop. I was getting remarks on how 'cheap and tinny' the iPad sounded, with some members of the workshop group complaining that the sound level was undynamic and unresponsive. Workshop leader Fred Blondy added that my constant opening and closing of different apps during the sessions 'doesn't afford social playing'.

In addition to learning new playing techniques, I having to adapt to an eco-system of apps that were in constant flux and often changing. Barbara Ballard stated that mobile design is unstable and the constant introduction of additional features, or 'feature creep', is an inherent part of the development process (2008, p.77). As an example, a favourite granular delay processor app *ADelay2* (2013) radically re-worked its operating features after a design update. It was difficult to access some of the delay feedback parameters I utilised before, and added features made it feel less

intuitive to work with. Despite the later inclusion of a ‘classic’ interface, I found it impossible to replicate the same processing sounds I had been previously using. This provoked fierce resistance from one of the established members of the improvisation community, who commented: ‘Learn how to play your instrument before coming here, this is not the time to be experimenting!’

I was having second thoughts on whether this was a valid route to be taking in my investigations, doubting my own ability as an improvising musician. But music improviser John Stevens of the Spontaneous Music Ensemble defends personal exploration as totally valid. Developing a playing technique is only a means to an end, the application is more important than technical ability (cited in Bailey, 1992, p.98). For Stevens the key is in the taking part, of being involved. On these grounds, I would argue that putting myself in these uncomfortable situations was an essential part of practice-based research.

3.2.1 Clandestine Sessions



Figure 3.2: Clandestine sessions with Dominique Wisniewski and Paula Velez. Source: Author.

On balance some musicians were more sympathetic to my plight and suggested meeting in informal get togethers. A small group of us would rent cheap rehearsal rooms during off-peak times and meet up to play for several hours. Like many improvisation outfits, there was no particular reason for playing; there were no concerts to rehearse for, no product release to promote, no objective other than the pleasure of simply playing together (Figure 3.2). These clandestine sessions allowed me the time and space to explore this new medium without the pressure of disrupting a larger group. I was able to experiment with the various free or inexpensive apps I

had downloaded over the week, and test their capabilities through a process of trial and error. Incrementally, I began to develop a working relationship with my iPad, getting to know its idiosyncrasies and quirks.

The following year, 2014, coincided with a profusion of more expansive and experimental music apps released for the iPad. As processing speeds and memory storage improved, developers began incorporating the inbuilt microphone to record and sample audio in real-time. I was drawn to *Borderlands Granular* (2013), a granular synthesis app designed by Chris Carlson that affords a direct interaction with audio files through visual representations of sound as ‘clouds’. The graphical user interface (GUI) of *Borderlands* allows for touching, pinching and sliding waveforms and control parameters with both hands, in marked contrast to the point-and-click of desktop computing interfaces.

Similarly, incorporating *Samplr* (2012) by Marcos Alonso allowed me to hone the idea of the iPad as an improvising machine. *Samplr* originally began with a set of pre-installed audio files, but successive versions have improved by adding features such as live input recording, sound file copying and pasting. *Samplr* is an example of how iOS apps were starting to fully exploit the potential of touch-screen interactions. Its playable waveform design (‘touch the music!’), includes a two-finger gesture to operate adjustable looping points, the Y positioning onscreen to control volume, a bowing ‘e-bow’ style function, simulations of magnetic tape and vinyl turntablism, or samples chopped up and arranged across a piano style keyboard. Standard effects such as reverb, delays, hi and low filter passes have a separate visual interface, and all screen gestures are recordable. With such a rich array of controls, it was possible to construct densely layered textures of sonorities very quickly.

3.2.2 iPad Study with Orchestral Percussion

An example of the kind of experimental sound material produced by *Samplr* can be heard in *soundstudy-ipads-orchestral* with noise artist Amit Patel, aka @dushume³⁸. In a rehearsal studio at DMU equipped with orchestral percussion – a xylophone, tympani drums and tubular bells – we embarked on a series of music improvisations using two iPads, each running *Samplr*. Although the source material originated from

³⁸ Media file: 02_soundstudy-ipads-orchestral https://soundcloud.com/steve_jones/soundstudy-ipads-orchestral

striking each acoustic instrument, the transformation of audio through the combined apps using four hands creates an expansive soundworld. One person will play an arrhythmic pattern while the other weaves textures in and out, exchanging ideas and then the mood shifting abruptly. The recording suggests how apps could be used to facilitate experimentation; how the physical act of touching of visual representations of sound in Samplr afforded a dynamic and fast flowing improvisation. It also hints at how the playability and gestural expressiveness of sound apps pointed towards a more open-ended approach to making music.

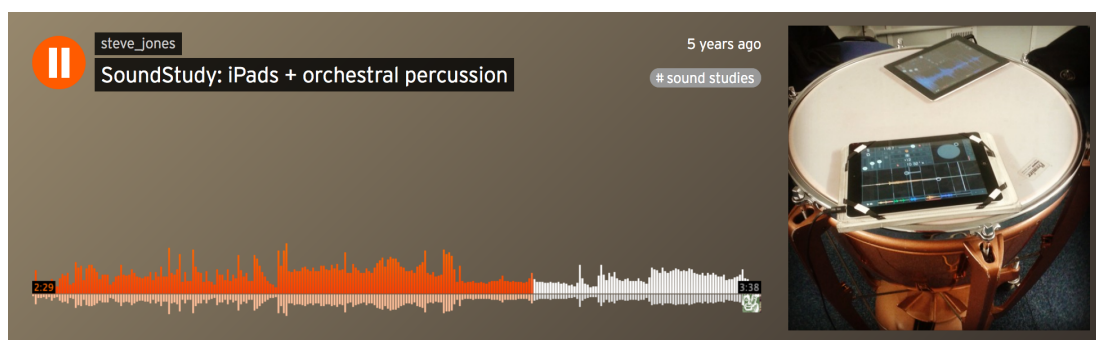


Figure 3.3; SoundCloud post of iPad Study with Orchestral Percussion (2014). Source: Author.

2014 also saw the introduction of the background audio function on iOS allowed multiple apps to be opened at the same time. I could, for example, start with Samplr to record and playback samples to generate rhythmic pattern, open a different synthesis app such as Moog's *Filtatron* (2010) to play as a top-line, and process the entire output through an effects processor like *ADelay 2* (2012). Rather than having a unified digital audio workstation to layer up sound material, I was learning to adapt to employing a system of individual apps, all operating independently.

3.3 App Culture, Informality and Conviviality

Music technology – any technology – is not simply an artefact ... it is rather, always bound up in a social system (Taylor, 2001, p.17.)

At the start of this research I had received an iPad 2 as a birthday gift from a group of my friends, but for the first few months it sat untouched in its box. Adam Greenfield's book *Radical Technologies* (2017) reminds us that for all its revolutionary capabilities, a mobile device is incomplete at the time of purchase: it remains unusable until activated by a commercial service provider. At first, a user is asked to

choose which corporate ecosystem they wish to participate in, either Apple's iOS or some level of Google's Android operating system – neither are compatible with each other. Even after a user account is established by authenticating means of payment, the majority of a mobile device's functionality comes in the form of a standalone 'abbreviated software application'; more commonly known as an app.

Apps are one of the primary ways consumers engage with software. They have become a benchmark feature of mobile computing, functioning as a controlled, end-to-end integration of commerce and software (Snickars, 2012). Since the launch of Apple's iOS mobile application store in 2008, apps have rapidly become a highly successful and pervasive form for the distribution of the software commodity. The app economy is a truly global economic phenomenon; figures for the period of 2012 to 2014 show that forty five billion apps were downloaded from Apple's App Store, while Android's Play Store platform delivered more than fifty billion downloads (Miller and Matviyenko, 2014). This figure has risen from 143.7 billion app downloads in 2016 ³⁹ to an estimated 194 billion mobile apps in 2018 ⁴⁰. In the context of audio production and digital signal processing apps, how does a user navigate their way around the myriad of available options?

How to study such a massive quantity of apps, many of which are minimally distinct? There have been previous attempts to review and catalogue apps available on both Android and iOS platforms (Dubus et al., 2012; Axford, 2015), but these have become out of date. Carolin Gerlitz and co-workers (2019) ⁴¹ ask how are we to study software that is purpose built for continual updates, or intended only for particular locations, events or time periods? They propose that apps offer researchers new and fruitful methodological and theoretical questions: how to capture a user's 'experience' of an app, or conceptualise the ways apps are presented, discovered and consumed in app stores and on various devices? Gerlitz and her team suggest we should consider the *relationality* of apps; apps are not stand-alone objects but inherently entangled in multiple socio-technical assemblages and operate on different levels. To critically and

³⁹ <https://www.statista.com/topics/1729/app-stores/>

⁴⁰ <https://www.appannie.com/en/go/state-of-mobile-2019/>

⁴¹ Gerlitz, C. Helmond, A. Nieborg, D. van der Vlist, F. (2019). 'Apps and Infrastructures – a Research Agenda', in *Computational Culture* (7) accessed 30 January, 2020.

comprehensively study apps, we need to account for the multiple social, technical and material layers beyond a user's default experience.

To help navigate my way across this vast new terrain of sound and music apps, I turned to social media platforms. One of the longest running and most knowledgeable resources of online app culture is *PalmSounds* by Ashley Elden, who has been involved in mobile music making since the first generation of 'palms' – handheld digital Palm-Pilot devices (Snickars, 2010). His twitter account @PalmSounds provides one of the most comprehensive lists of different genres of apps, regular news on app updates, free or price drop offers. PalmSounds is now amalgamated with @cdmblogs⁴² and has proved to be an invaluable source of information for mobile music making. Doug Woods's *soundtestroom* differs in his use of YouTube as his primary blog platform. Doug has pioneered a distinct format for his demonstrations, tutorials and app reviews. Most soundtestroom videos features simply an iPad screen and his hands, shot in real time often with long pauses, mistakes and an informal, freewheeling voiceover. Since launching @thesoundtestroom, the channel has built up a considerable fan base of thousands of subscribers and millions of views on YouTube⁴³. Talking to Doug, he described the soundtestroom as:

a community of users, a friendly place for people to visit on a regular basis. And we always try and answer all comments and questions and if we don't know the answer we try and put them in touch with someone who does (Woods, 2014, personal communication).

Jakob Haq's *Haq Attaq* has absorbed the visual format and made it his own. Employing fast, chopping video edits as a method of compressing time, Jakob is recognised within the mobile music community as an articulate spokesperson promoting the creative possibilities of iOS apps and hardware. His videos have warmth and a humour that belies the care and attention spent working on each broadcast, featuring various long running memes and his signature tic of constantly cleaning the iPad screen with a cloth⁴⁴. I invited Jakob to speak at *Mobilise* (2017) as an example of the public face of innovative mobile music practice, and I will discuss this event in more detail in the next chapter. Jakob recorded a video for the event and

⁴² <https://cdm.link/category/apps/>

⁴³ <https://www.youtube.com/user/thesoundtestroom>

⁴⁴ <https://www.youtube.com/jakobhaq>

I am including it on the accompanying portfolio as an example of the community's palpable enthusiasm and passion for mobile music ⁴⁵. This convention of informal, interconnected groups allows participants to evaluate music more by its direct contribution to sociability than musical prowess or content.

Haq and Woods are in regular contact with app developers, their YouTube platforms acting as sites for both shared information and commercial promotion. They often run competitions to win apps in conjunction with developers, pushing promotion codes that can be redeemed in the app store. This begins to blur the lines between consumer, fan and producer; participants feel they are making a positive contribution to the development of their favourite apps. This chimes with Henry Jenkins's concept of 'media convergence', where fan culture is seen as active, critically engaged and creative. Haq Attaq and the soundtestroom share an affinity with that Jenkins describes as 'knowledge culture meets commodity culture' (Jenkins, 2006). Alternatively, it could be criticised as essentially continuous beta testing or what Chris Rojek (2013) analysis of pop culture refers to as co-operative labour. Jenkins cites Pierre Levy's notion of Collective Intelligence as a new informal knowledge space:

The distinction between authors and readers, producers and spectators, creators and interpretations will blend to form a reading-writing continuum... each helping to sustain the activities of the others (Levy, 1997, p.121).

Woods suggested I investigate Clif Johnston's *Apptonica*, a record label dedicated to iOS devices and Tim Webb's *Discchord* website, both trying to raise awareness that the iPad should no longer be considered a gimmick. A similar theme is taken up by producer *Henny Da Bizness*' attempt to raise the perception of iOS apps as the domain of the amateur, while Martin Koszolko notes the iPad Musician Facebook group has a current membership of over 9000 users that includes a large number of 'bedroom music producers' and experienced musicians (2019, p.188). There is both seriousness and a sense of conviviality that runs through many of these online forums. The mobile music community's participatory culture might never fully escape the influence of commodity culture, and vice versa, but it seems they are learning how to participate outside any formal setting.

⁴⁵ Media file: 03_Mobilise_JakobHaqIntro.mp4, n/a online.

3.3.1 A New Folk Instrument?

It was from my personal experiences seeking out apps through social media, interviewing YouTube vloggers and app developers, and through my participation with online forums that I began to draw comparisons between the transmission of shared knowledge and the informality of folk music. In an article written for *Organised Sound*, I attempted to position the mobile device as a new form of folk instrument (Jones, 2016). I compared the folk transmission of data between communities and the informal dissemination of knowledge provided by these informal discussion groups. Nowadays, affiliations and online communities are built and strengthened through social media, and it is the mobile device itself that often that facilitates these activities.

There is an immediate problem linking music made on an iPad and the cultural connotations associated with traditional folk music. First we must establish how we categorise music; different genres of music follow different sets of socially accepted rules. Simon Frith suggests that music is heard through three overlapping and contradictory grids of discursive practice: classical, pop and folk (Frith, 1998). Broadly speaking, classical music is primarily composed of sophisticated forms of notation, there is a lineage of teaching and learning; it takes time to understand classical music's constructions and heritage. In contrast, pop music is more strident and exuberant; pop's main imperative is commercial success coupled with maximum public access.

The idea of folk music is more difficult to neatly summarise, its traditions have evolved through the process of oral transmission with a community that determines in which forms the music survives (Marinus, 1954, p.23). Yet folk music cannot only be restricted to the domain of acoustic instrumentation, it can also be electronic. Matthew Collins' insightful examination of the emergence of Acid House in the UK during the late 1980s and early 1990s describes techno dance music as 'the new folk music, the voice of the culturally dispossessed' (Collins, 2009, p.218). Folk music does not simply belong to the past, but is an adaptable sound that reflects social change, embraces commerce and entrepreneurship.

In the *Organised Sound* article, I referred to Robert Ashley's 'Music with Roots in the Aether' (1975), a series of video portraits of celebrated American composers.

During Ashley's interview with Gordon Mumma, they discuss what defines a folk instrument; is it a question of the age of the instrument? Is it possible to have a modern folk instrument? Mumma defines a folk instrument as something mass-produced, that anybody can use. While an instrument demands a certain amount of skill to be developed in its operation, it also allows for a wide range of abilities. 'It's how people use them'⁴⁶. Mumma expands on this theory by suggesting his racing bicycle might be regarded as a new folk instrument. The same bike can be used for either the mundane chore of cycling to the shops or in a highly competitive six-day racing tournament. In the same way, an acoustic guitar allows for a wide range of playing ability; from the basic strumming of three chords to the highly complex classical or flamenco styles of playing. Not only will a folk instrument allow this range of playability, but audiences will also differentiate between the different levels. Similarly, a mobile device like an iPad allows for all levels of capability or understanding, what is important is *how* we use them.

3.4 One Device, One Lead, One Sound Source

Having refined my performance system of iPad and apps, I was no longer physically bound to a table. I could now stand up, move about and experience music making from a radically new perspective. I met with my new affiliation of co-players in rehearsal rooms aimed at rock and jazz groups, with soundproofed rooms and often a selection of guitar amplifiers. I discovered amplifying the iPad through a bass guitar amp combination gave the sound an intensity and raw texture, something I had learnt from watching the cassette artist Aki Onda⁴⁷ during a performance in the Palais de Tokyo art gallery. In conversation with Aki, he declared a guitar amp lent 'grit' to the sound of his Sony Walkmans; it scaled up the weak amplification of the smaller devices.

My touch-screen gestures helped transmit the physicality of my playing, while a single direction of sound created a sense of 'instrument' to the other players. Yet it confounded all my previous assumptions of what electronic music should be: that electronically generated sound should be heard in stereo or multiple sound sources.

⁴⁶ Ashley, R. (1975), 08.05s http://www.ubu.com/film/aether_mumma.html accessed 3 January, 2013.

⁴⁷ <http://www.akionda.net/cassette.html>

As a result I began to theorise my reduced performance system as: one device, one lead and one sound source.

With the file *Hand Held Orchestra* (2014) on the accompanying portfolio ⁴⁸ you can hear and see an example of my implementation of this performance system with improvising musicians, Dominique Wisniewski and Paula Velez. The range of apps I was using can be distinguished either as sampling, synthesis or direct signal processing using the iPad's inbuilt microphone. They demonstrate how this minimal system deepened my engagement with the other performers; you can see my physical proximity with them, lost in the pleasure of playing as freely and loudly as possible.

This period marked a significant departure from my usual approach to working with DAW audio software. My body language had changed, now leaning forward, concentrating and reacting to changing scenarios. This introduction to non-DAW (or should that be post-DAW?) music making was forcing me to rethink my own tendencies and habits acquired from expecting a DAW to do most of the heavy lifting. My previous understanding of electronic music using audio software ran from left to right across a monitor screen, while most apps of this period abandoned this temporal structural design, allowing an open-ended approach to playing that was more suited to free improvisation. Mobile apps required constant, sustained interaction for them to generate sound, demanding to be continually played to keep the ball in play so to speak. Yet these sessions were held in rehearsal rooms or intimate contexts, with direct contact with other players. I needed to interrogate how this new performance system might fare in a larger group with other other electronic instruments, in more formal and perhaps academic environments. I discovered things are never as we expect them.

The first opportunity to test the system was at Shackle's 'Converging Objects' improvisation workshop, under the direction of Anne La Berge and Robert van Heuman at STEIM studios, Amsterdam, during December 2013. Out of a group of fifteen electronic musicians, I was the only one without a laptop (see Figure 3.4). All the other participants had a range of instruments, some traditional, others with various audio hardware, drivers and hacked controllers, all requiring multichannel outputs to the main sound system. The amount of physical equipment created numerous

⁴⁸ Media file: 04_Hand_held_orchestra.mp4
<https://steranko.tumblr.com/post/106510184938/handheldorchestra>

technical issues, and subsequently long setup times for fixing logistical issues and problematic sound cards. In contrast my self-contained system allowed me to be actively mobile, always on, ready to play.



Figure 3.4: *The Odd-One Out*, Emergent Objects STEIM, Amsterdam (2013). Source: Author.

Nevertheless I felt the approach I had chosen did not always fit within STEIM's ethic of building bespoke electronic instruments or physically hacking existing systems. My one consolation was discovering the artist Tiago de Mello at a separate concert, witnessing him deftly use *TouchOSC* on his smartphone as a laptop controller. Watching his performance, I realised my own mobile performance practice was still at an early, formative stage.

The feeling of being the odd-one-out continued with other group collaborations. For example in April, 2014, at a cultural exchange concert between the Dirty Electronics Ensemble and the Royal College of Music, Stockholm (KMH) at De Montfort University, I felt ungraceful as I disrupted the meditative drones of a seated laptop orchestra during a John Cage work. In the documentation video *KMH_DMU*⁴⁹ I can be seen struggling to control the *AriVibes* (2012) app as wails of feedback are generated between my iPad and a Dirty Electronics cardboard speaker I was carrying.

Similarly at a performance with the University of Edinburgh's LLEAP ensemble (Laboratory for Laptop and Electronic Audio Performance Practice) at DMU, May 2015, I became increasingly uncomfortable being perceived as 'the one with the iPad'. Standing with an iPad generated a sense of visual dissonance; I often felt myself exaggerating my physical gestures as a way of over-compensation. In the context of experimental music, it was the other performers' instrumentation – ranging from a hybrid turntable to a violoncello, from laptops to DIY electronic devices – that were generally understood as music performance instruments. In the end I choose to

⁴⁹ Media file: 05_KMH_DMU.mov n/a online

sit in the audience, and the video *audience feedback* (2014)⁵⁰ captures a moment during the concert. Encouraged by the performer Max Wainwright, I attempt to highlight and make a positive of the continual problem of audio feedback when using the iPad's inbuilt microphone and loudspeakers. I also hoped that improvising with a performer from the position of the seated arena might put into question the barrier between stage and audience.

Why was it so problematic to integrate mobile mediated performance into established electronic musical structures? Was there an insurmountable limitation to consumer mobile devices as an authentic expression of experimental music? In his PhD dissertation 'Mobile Phones, Group Improvisation and Music', Nathan Bowen tackles the difficulties in the public perception of mobile music and culturally understood gestures associated with music making, suggesting most people are unable to view the mobile device as a musical instrument 'in any viable and permanent sense' (2013, p.114). He concedes that the notion of the mobile as an instrument is defined by its indeterminate quality, and will most likely to remain confused. Perhaps rather than focusing on notions of musicality and virtuosity, it was time to shift my attention to working in other contexts? Maybe I needed to widen the horizon of the research beyond purely musical performance situations?

3.5 Expanded Recording with Mobile DSP

"It is past midnight. I am crouched near a small pond on the Île de Ré, off the west coast of France, fumbling for my phone's torch setting to read from the burnt-out screen of my Zoom H4 recorder. This location has been a long-time favourite for field recording – an incongruous looking space by day, but one that erupts into life at night with the call of frogs, insects and other unseen wildlife. However, it is a Saturday night and the start of the island's holiday season. The constant shouts and laughter of partying, the muffled thump of music and passing scooters all threaten to overwhelm the sound of the spot's usual inhabitants. I abandon my initial attempt to make a recording with binaural in-ear microphones, and swap the Zoom over to the iPad's output. I begin to play with AriVibes, a signal-processing app described by its designers as a 'handheld

⁵⁰ Media file: 06_Audience_Feedback.mp4 <https://bit.ly/2Y4uo1J>

musical augments. This process is repeated several times over the night; endeavouring to make a 'clean' binaural recording, stopping, and experimenting with other DSP apps to while away the time. Eventually I abandon the session as a failure".

These field notes were written after what I had perceived as a disastrous night's field recording. However it was only on listening back the next day that I was struck by the unexpected results. The Zoom recorder played each audio file sequentially with no pause, constructing a new narrative between real and transformed soundworlds. With the recording *Xtended Field Recording: Saturday Night Fever* (2013)⁵¹ I had, by chance, stumbled upon a novel way of combining field recording and electronic music that was not made in a studio. By this, I am drawing from Thom Holmes' definition of electronic music as 'music using electrically produced or modified sounds' (2015, p.5). Digital signal processing (DSP) using the iPad's inbuilt microphone offered a novel method for transforming sound in real-time, while introducing uncontrollable elements of chance to the process. It was a defining moment.

3.5.1 Xtended Field Recordings

In an effort to replicate the results, I continued with this rather crude method of in-device editing, similar to the in-camera technique of filming shots used in cinematography⁵². *Xtended Field Recording: Corsica Soundscape* (2013)⁵³ is an example of the fieldwork undertaken; I wanted to discover how far this methodology could be taken, both technically and physically.

In parts of the recording, I can be heard wading in the shallows of the Mediterranean Sea. Although I was using the app *Samvada* (2012), a simulation of a Sitar instrument, I am using its accompanying drone function for signal processing. The audio from the iPad's inbuilt microphone is passed through a comb-filter system and controlled with a simple set of slider GUI objects. Holding the device horizontally and using two or three fingers of my left hand, I am reconfiguring the app's slider controls into performance control gestures.

⁵¹ Media file: 07_SaturdayNightFever.wav <https://bit.ly/2CRJWvY>

⁵² For example, straight 8.net's challenge to make a short film on one cartridge of super 8 film with no editing: <http://www.straight8.net> accessed 22 September, 2013.

⁵³ Media file: 08_CorsicaSoundscape.wav <https://bit.ly/2CrgcoH>

The top right hand slider (see Figure 3.5) shows the dry/wet signal is used to shift between the mic input and the processed signal. On the left, the tone, sustain and pluck sliders are used to alter the texture of the pitched signal, while a simple reverb adds a wider spatial element to the mix. The key and harmony settings also alter the scale of the pitched filtering, modulating across harmonisations based on classical Indian raga tuning. In this way, the app is no longer used as an imitation of an acoustic instrument, but instead is employed as a multitouch signal processing system.

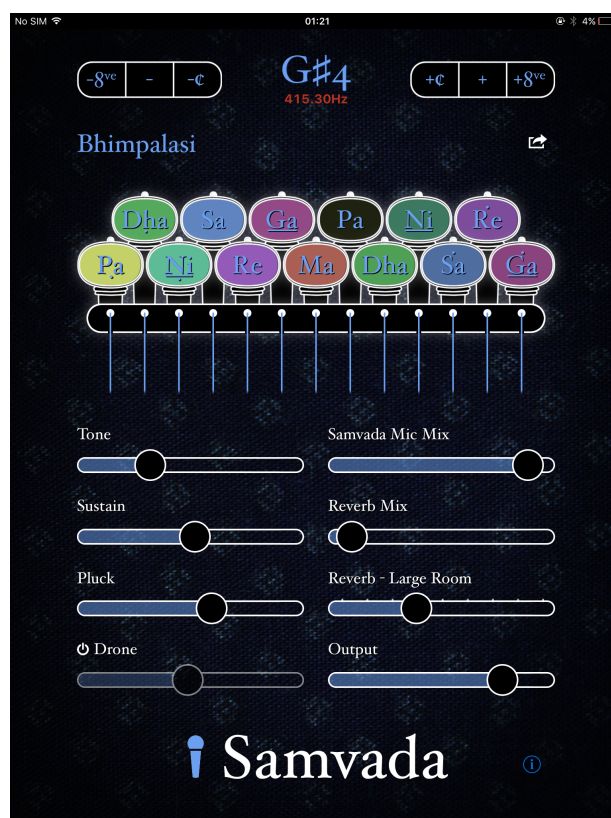


Figure 3.5: Samvada's slider GUI objects. Screen grab.

Extending the practice of field recording with real-time DSP processing of the sound environment also began to raise my awareness of the amount of human-generated noise imposed on my surroundings. The studies from this period was mostly made while on holiday in Corsica, and so there was a constant underlying soundtrack of holidaymakers enjoying themselves. Engaging with the physical world with a mobile performance system highlighted the multiple layers of sound that I might have otherwise ignored. Biologist and environmental activist Bernie Krause has defined these sonorous states into three categories: Geophony – the sound of wind or waves, Biophony – the sounds made by organisms in their habitat, and Anthrophony – the

sounds and noise that we humans make (Krause et al., 2011). Krause compares and contrasts archived field recordings as a way of demonstrating man's impact on the general health of the Biophony, by showing how levels of bird song decreases with increased human and industrial activity. This dovetails with Kate Crawford's thoughts on how mobile devices' convergence of multiple forms of 'aural listening' amplifies and augments them into new forms of attentiveness and perception (2012, p.214). Through these studies, I found that by listening to the soundscape through reactive audio apps heightened my awareness of human anthrophony.

By applying the same mobile performance system I had developed with improvising musicians to field recording, I reflected on how the act of making and listening intently to electronic sound while situated outside brought about an overwhelming sensation of absorption. This all-consuming agency brings to mind psychologist Mihaly Csikzentmihalyi's research into artistic practices in the development of his theory of flow. Csikzentmihalyi tells us being 'in the flow' is a feeling of '...focussed concentration, with a loss of self-consciousness balanced with a sense of control, where people are so involved in an activity that nothing else seems to matter' (1990, p.4). Making these 'xtended field recordings' required a more subjective experiencing of the challenges when working outside the studio, processing feedback about progress while continually adjusting my actions.

There was something about physically holding an iPad – its heft, its weight in my hands – that afforded an interaction close to what Robert Rowe calls the 'player paradigm' (Rowe, 1999). Rowe's classification of the instrument and player paradigm is useful in distinguishing the differences in interactive computer system behaviours. The instrument paradigm describes a computer's functions in the same way that a traditional acoustic instrument might be – predictable, direct and controlled. The same gestures or musical input result in the same and replicable responses. The player paradigm describes an interactive system's behaviour much as an independent performer would with a sense of independence and autonomy. A music interaction differs from a computer interaction; we do not 'use' an instrument, we 'play' it. Rather than operating a computer I was starting to feel as though I was playing an instrument, a music performance system.

Utilising the app Samvada as a harmonic filter on sounds in the landscape is reminiscent of Jean-Claude Risset's 'Sud' (1985), an electroacoustic work that similarly uses three categories of sound material: natural, human and synthesised sounds (Couprie, 2005). Using sonograms, Risset combines sounds recorded in the *Massif des Calanques*, south of Marseille, with sounds synthesized on a computer in Marseille, with further treatment via another computer at GRM in Paris.

The practice of employing comb filters to real world sounds is also evocative of Paul Lansky's 'Night Traffic' (1990). Lansky would make field recordings of passing cars on busy highways and process them with a computer in his studio: 'I sometimes use the computer as a camera on the sounds of the world and the sounds of the world then colour the music' (cited in Chadabe, 1997, p.134). The critical difference between these artists' work and my own approach is that rather than taking recordings back to a studio to be processed with a powerful computer, the recording and processing are made and listened to on location using a small, battery-powered device. To borrow from Lansky, I was using my iPad as a camera to capture the sounds of the world, which goes on to colour and form the music.

3.5.2 Audiobus and Inter App Audio

Yet although I had now established a performance system using DSP apps, I still had to carry a Zoom hard disk recorder with me. The arrival of *Audiobus* (2014) marked a significant change by allowing me to record directly to the iPad. Audiobus introduces the concept of inter-app routing. It does not generate sound itself, but is a third party app that employs the Inter App Audio (IAA) protocol to allow apps to announce audio input and outputs to each other. Audiobus partitions apps across input, processing and output slots. Like this, single purpose apps can be chained together like a set of guitar effects pedals. Now the signal stereo output could be recorded internally, thus eliminating the need for a separate hard disk recorder.

I found a free app TwistedWave Recorder, abbreviated as *TWRecorder* (2014), to be the most reliable of the iOS audio editor applications for recording in Audiobus. Figure 3.6 demonstrates how Audiobus allows individual apps to be partitioned into input, processing and output slots. In this example, Samvada is the signal input with added harmonics; *Echopad* (2012) acts as a delay effect and touchable audio sampler (represented as vinyl record decks) while TW Recorder is patched to the stereo

output. Now, despite only having access to one app at a time onscreen, I could move about while cradling the iPad under one arm, interacting with the screen without having monitoring it visually.

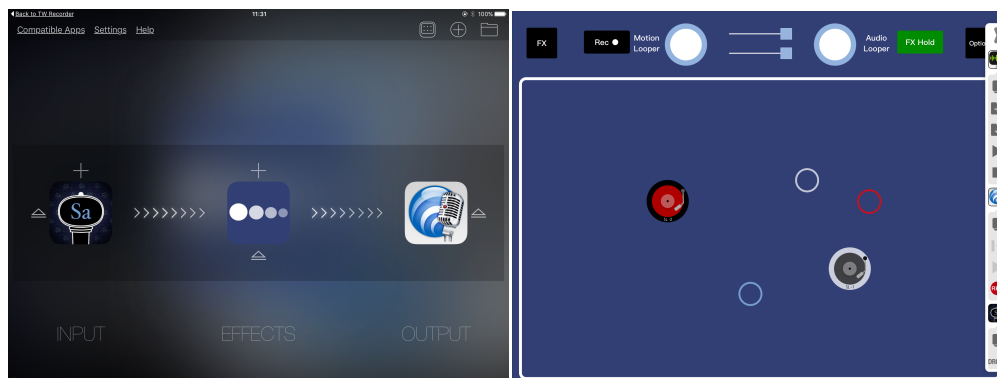


Figure 3.6: Audiobus partitioning apps into input, processing and output slots. On the right, a performance view of Echopad with Audiobus controls as a vertical strip. Screen grabs.

Having less physical equipment to carry had a direct impact on the kind of environments I could now explore. The added element of freedom of movement allowed me to experiment with mobile audio processing in places that previously would have been out of bounds. The interconnectivity of apps promised to be a way of regaining a sense of ownership when constructing a performance system out of existing systems.

3.5.3 Non-Places

2014 marked a period when I often had to travel between the UK and France, sometimes commuting back and forth in a day. Life as a passenger modulated between moments of activity, stress and intense boredom. Time would be spent waiting, hurrying or missing connections, spending money on things I did not particularly need. There were moments of suspended time in waiting rooms, on platforms or in cafes, but always dominated by the clock. Travel brought me into contact with what Marc Augé refers to as non-places:

... the air, rail and motorway routes, the mobile cabins called ‘means of transport’ (aircraft, trains and road vehicles), the airports and railway stations, hotel chains, leisure parks, large retail outlets (1995, p.79).

For Augé, these indeterminate, ever expanding non-places are the real spaces of contemporary life. Adriana de Souza e Silva has written extensively on the concept of

mobile technologies as interfaces to these anonymous spaces. Personal mobile technologies help people manage and control their interactions in public spaces, helping people to ‘choreograph an economy of attention that simultaneously distances and re-approximates them from urban space’ (de Souza et Silva and Frith, 2012, p.28). She argues that mobile technologies allow a user to accomplish what she refers to as a blasé attitude. Research has shown that physical travel and mobile devices are becoming interdependent, modifying each other and changing the conditions in which working practices occur (Haynes, 2010). Mobile technologies are changing not only the nature of work on the move, but dramatically altering the way in which being on the move is perceived.

Yet portable technologies have been around as long as there has been public transport, going back to the introduction of the railways in Victorian England. Citing Shivalbusch (1986), de Souza e Silva states the train ‘...annihilated space and time by compressing travel time between two points’ (ibid. p.38). In tandem with the new railway system came new hand-held – the book, the paperback novel and the newspaper. Reading helped fill the increased time spent travelling, as well as a method of avoiding visual contact with other passengers. The reader could be absorbed in their newspaper/novel without being perceived as withdrawing from their surroundings. There are obvious similarities with contemporary auditory technologies – the Walkman, the iPod and mobile phones. Portable, hand-held technologies can function as a technologically enabled filter, or as de Souza e Silva terms it, an interface on our engagement with public spaces and how we manage our attention spans.

Often commuting up to Leicester and De Montfort University, I found myself employing DSP as a way of managing my attention span, to keep myself amused and mask out the often tortuous creaking of East Midland Trains’ aging rolling stock. *Non-Places* is a set of studies from this period, featuring the app *Turnado* (2014)⁵⁴. Turnado was one of a new generation of audio effects apps, a multi-effects processor allowing up to eight separate arrangements to be manipulated simultaneously using multi-touch gestures. The studies demonstrate how advanced mobile sound

⁵⁴ Media files: 9_NonPlaces_EastMidlands_01.wav; 10_NonPlaces_Train2Leicester.wav; 11_NonPlaces_GardDuNord.wav; 12_imonthetrain.wav https://soundcloud.com/steve_jones/nospace-traintoleicester

processing had advanced in less than a year. In comparison to Samvada, Turnado affords a more rhythmic and dynamically changing soundworld. Turnado is designed for manipulating pre-recorded sound files, to act as what is described as an ‘audio-mangler’. But being positioned inside Audiobus allows Turnado access to the iPad’s inbuilt microphone; it becomes a standalone, real-time audio processor. Yet rather than think of it as ‘mangling’ audio, I considered it more as remixing the sound environment.

3.5.4 Remixing the Environment

For the sake of discussion, when I think of a remix I am drawing from my past background rooted in electronic dance music. As previously discussed, the term *Xtended* borrows from dance music, a reference to the extended 12” vinyl remix. A remix is concerned more with creating a new variation of an existing track, taking elements of pre-existing materials and combining them to form new material.

This approach can be traced back to New York disco and Jamaican sound systems, and their respective impact on the UK’s underground dance music scene (Brewster and Broughton 2006). The creative innovation of the disco remix by DJs such as Walter Gibbons was to extend an original piece of music to create long, repetitive instrumental sections specifically for dancers. The disco remix was in turn influenced by dub reggae pioneers such as King Tubby and Lee Scratch Perry, who used the process of recording to subtract and erase, rather than add layers of musical material (Henriques, 2011). Tubby developed the technique of taking pre-recorded multitrack tapes, and stripping away excess ornamentation to emphasise the elemental power of a song’s rhythm pattern (Veal, 2007). Jeffrey Boakye states: ‘King Tubby is largely recognised as a pioneering figure in electronic music production, who may or may not have invented the concept of the remix’ (2017, p.20). I emphasise these artists as recognition that my understanding of electronic music stems from the dance floor, rather than the concert hall.

Social theorist Alexander Weheliye offers a theoretical framework to understand the remix, arguing the term has its origins in Africa. African craftsmen are skilled in repurposing and recontextualising found materials; the remix ‘...highlights the amalgamation of components and the processes of recombination as much as it accentuates individual parts’ (Weheliye, 2005). Media theorist Eduardo Navas

suggests it is the act of selectivity that makes it possible to remix; by choosing to select we have the options to modify, add, or delete something from the original source (Navas, 2017). Laurence Lessig considers the significance of remix and media, stating: ‘There’s nothing essentially new in remix... All that’s new is the technique...it is creativity supported by new technology’ (2009, p.82). Yet although new technology provides us the tools to transform one set of media onto another, Lessig argues that remixed media only succeeds when it reveals something new. Drawing from each of these examples, the consensus view suggests that the remix is an active process, a way of creating new meanings.

Finally, in the study *Soundwalker* (2014)⁵⁵ I had finished a session with the Paris improvisation collective, but as I left the rehearsal rooms I continued to play with Turnado while walking home. Still in the mindset of improvising with musicians, I began to react to the signals picked up by the microphone and processed through Turnado. I had to stop for a moment and steady myself. It was an intense, almost overwhelming experience hearing traffic and birdsong processed and looped, overlaid onto the localised soundscape. There was a tension between the street scene I was looking at, and the synthesised soundscape I could hear in my headphones. Continuing to walk and play, I was forced to remove one of the headphone cups to stay vigilant of speeding traffic and other pedestrians. The resulting recording I called the SoundWalker – as in someone walking with sound – but was unaware of the implications of the term.

I have discussed in the previous chapter how the German/Canadian composer Hildegard Westerkamp coined the term soundwalk as an approach to raising awareness of rapidly changing sound environments: ‘an embodied method of personally connecting with the soundscape through focused listening while physically moving through space’ (Westerkamp, 1974, p.81). The combination of walking and concentrated listening was intended to establish an observational and embodied relationship with the micro-details of environmental sound. Unwittingly I was following Westerkamp’s footsteps exploring the soundscape through walking.

⁵⁵ Media file: 13_SoundWalker.wav n/a online

3.6 Situating Composition

Brandon LaBelle covers the subjects of soundscapes and soundwalks in great detail in his overview of the sonic arts in his chapter ‘Soundmarks’, comparing it to the 1970’s Land Art movement’s attempts to extend works out of the gallery (Labelle, 2015).

Samuel Thulin also lists some of the many artists known for incorporating site-specific sound in their compositions – Pauline Oliveros, WSP’s Barry Truax and field recorder/performer Andrea McCartney – with a caveat that examples of environmental sound practice are too numerous for a single article. Yet Thulin identifies a new group of composers, musicians and aural artists who employ mobile sound production technologies (Thulin, 2017). This emergent practice he conceives as situated composition, which ‘emphasises the interconnections between the situation in which composition unfolds and the process of composition’ (ibid. p.73). Rather than considering environment as a background to composition, it becomes an essential element in the compositional activity itself.

Among the various artists under discussion, Thulin includes my own work as an example of a musician taking an environmental sound approach to mobile practice. The significant difference to the precursors of soundscape composition is the use of mobile devices and audio production apps to engage in sound processing in the same environment in which they are recorded, rather than taking recordings back to a dedicated studio. Thulin notes that the process of listening, performing and recording simultaneously harks back to R. Murray Schafer’s idea of creating a soundscape where performer, audience and composer are the same person (Schafer, 1977). A mobile mediated approach shifts the focus of audio production away from sonic fidelity and control to the development of what Thulin calls an ‘embodied and emplaced’ approach to working with audio.

More critically, Thulin recognises that mobile devices and apps are less powerful than prior sound production technologies and are still in need of legitimising. Mobile apps continue to be perceived as ‘prescriptive technologies’, their built-in constraints preventing a user from any useful decision-making (Franklin, 2004). Yet this attitude ignores the community of practitioners who are aware of the pre-coded limits of apps. The interoperability of apps afforded by Audiobus offers a way of regaining a sense of agency with pre-existing apps. Thulin quotes Howard Gardner and Katie Davis in

The App Generation (2013): ‘apps simultaneously present creative opportunities and circumscribe the act of creation’. It is therefore constructive to understand mobile sound practice as a complicated tangle of negotiations and compromises, of hacks and forced fits. Thus mobile interfaces, sounds and environments all inform one another, they are constitutive of a new, mobile-mediated approach to soundscape composition.

As an example of my emergent practice as a situated composer, I present *Sounds of the Valley* (2014), a mobile soundwork of southeast France, using an iPad running Audiobus, Echopad and TWRRecorder⁵⁶. The space informs the sound, the sound informs the remix. Although the piece has similarities with soundscape artists, its composition and signal processing are situated in the same place in which they are recorded. It also shows my adapting to working outdoors, to actively engage with the world around me through music apps. As Land Artist Richard Long said in an interview with the Guardian: ‘The world outside the studio represented a fantastically colossal opportunity to engage with the physical world, that took me into the landscape’ (Long, 2017)⁵⁷. This case study suggests that mobile-mediated music might counteract the isolation of making electronic music from where it is situated.

3.7 Conclusion (or how I learnt to stop worrying about mobiles as music performance systems and start engaging with the world)

I will now summarise the ground covered in this chapter – the research’s initial investigations into the feasibility of mobile devices acting as performance systems. We have examined a group of case studies and soundworks, and I have tried to put them into perspective using the framework of this practice-based research and my chosen methodologies. The examples draw on research conducted by Miranda and Wanderley’s attempting to define an interactive performance system, along with Tanaka’s exhortation to examine this model in a variety of musical contexts. The studies are also grounded in Jean-Paul Thibaud’s notion of ambiance as an atmospheric sensitivity of the world (2019). From experiments with an iPad as a DAW controller with OSC, to working with groups of improvising musicians, from incorporating walking practices in the development of a system for ‘situating’

⁵⁶ Media file: 14_SoundsoftheValley.wav <https://bit.ly/2YefjuX>

⁵⁷ https://www.theguardian.com/artanddesign/2017/apr/16/richard-long-earth-sky-houghton-hall-interview?CMP=Share_iOSApp_Other accessed 16 April, 2017.

electronic sound, these introductory pieces relate to this research's claim that mobile music has the potential to change the methods and experiences of making electronic music, and consequently generate a new kind of performer identity.

Reducing my performance set-up to a singular system of one device, one lead and one sound source, I would become so engrossed in playing I abandoned myself to the 'flow'. Gesture, physical setting, auditory environment and the embodiment of the device act together as an independent agent, similar to Rowe's notion of the player paradigm. Augmenting public and private spaces with itinerant electronic sound creates a new experience of these spaces. And when music making is a way of engaging with physical places, it suggests that musical activities can become closer to what Francois Bonnet describes as a 'phenomenal investigation, rather than a music of identification' (2016, p.296). Using mobile apps allows music-based and audio recording practices to become something close to a phenomenal investigation of a place, a way of altering and remixing sound that intensifies the auditory perception of a location. These new paradigms have made me question whether a music performance system was the correct term to be using for this evolving practice.

I have previously referred to Essl, Wang and Rohs assertion that it is the autonomous nature of a mobile device that makes it feel more like a musical instrument (Essl et al., 2008). Tanaka expanded on this, by suggesting the notion of the mobile musical instrument is metaphorical, rather than a strict definition. The word 'instrument' helps us to link the device to an artistic tradition of musical technique and creative practice' (2009). Perhaps the use of metaphors was confusing the issue? These early experiences appeared to confer existing research into mobile music and the difficulties in a public's perception of ubiquitous technology as a musical instrument, or the culturally understood gestures associated with music making (Bowen, 2013). Mobile musician Martin Koszolkó cites my own research when he describes the challenge to artists using iOS devices such as an iPad, that forces the artist to redefine assumptions of what constitutes a musical instrument as well as perceptions of music practice (2019, p.199). Touching, holding and walking (embodiment), and signal processing the localised soundscape as a basis for electronic sound (emplacement) were each presenting new creative paradigms.

Chapter 4. Headphonics and Portable Loudspeakers

Imagine an electronic musician in the process of creating sound. With forefinger and thumb, the musician moves four circular icons across the x and y axis of a screen. There is a process of listening intently as each movement adds or subtracts to a variety of time delay and reverberation effects. The sound being created is a mosaic of rhythmic textures, sine tones and loops of human voices. Our musician has to make constant adjustments to the sound being created, taking spontaneous decisions about numerous variables; dynamics, textures and frequencies are in a continual state of flux. Each sequence of events will never be repeated.

If we step back from this scene, we can see our musician's surroundings are not a recording studio or a programming suite. There is no mixing desk, no racks of electronic equipment, keyboards, or near-field monitors. Instead it is a carriage on the Paris metro. The musician is holding an iPad, yet to all outward appearances is simply another passenger wearing earbuds, staring at their mobile device. The physical gestures are the same as everyone else's: tapping, pinching and scrolling down a screen. No one is aware the electronic musician is inscribing this improvised event as a fixed recording; it is a private, internalised experience of mobile music. To describe this process I am using the term *headphonics*.

Picture now an art student in the process of creating sound. The student is listening to sonorities emanating from her smartphone. Tapping an icon on the screen allows her to record a brief snatch of a passerby's conversation. With another tap the recorded audio plays back, its pitch climbing and falling with the roll and yaw of her phone. Taking a mini-jack cable, the student connects the device to a small battery-powered amplifier and loudspeaker she has built from electronic components. With slight re-adjustments to the loudspeaker's volume, the student is developing her own novel two-handed technique to record and playback, guiding and bending the sonic material.

The art student is not alone; three other players circle around her carrying iPads and loudspeakers housed in an assortment of cardboard boxes. Each member of the group is running a different mobile signal-processing application, multiple sonic events are firing off from all directions and the results are often cacophonous. There appears to be an incongruity between their sleek, mass manufactured devices and the cardboard boxes suspended with coarse wrapping string. In contrast to our first example, this is a public, externalised experience of mobile music, and to describe this process I am using the term *portable loudspeaker performance*.

4.1 Two Axes of Mobile-Mediated Performance

In fact I am the electronic musician in the first example as I rode the metro developing my performance system, while the art student in the second scene was Aurore Senave, a participant in a mobile ‘marching band’ during the festival *Audio Mobile Fest* (2015). The crucial point in these examples is they distinguish mobile-mediated performance from other more conventional kinds of electronic music performativity, and do so in opposing ways. In both cases mobile mediated performance allows an individual or groups of players to create electronic sound, superimposed onto their own subjective experiences of public and private spaces. But both examples describe almost diametrically opposed phenomenological experiences of mobile mediated music. Differing means of auditory reception appear to produce different models for mobile music performance. This chapter interrogates these two axes of mobile mediated performance.

The chapter is divided into two parts; the first section examines a series of autoethnographic soundwalks I undertook with the reduced performance system discussed in the previous chapter, using earbuds for monitoring sound. The remainder of the chapter is devoted to examples of group performances where small, portable loudspeakers or a device’s own inbuilt speakers are the source of audition. I will attempt to determine to what extent different means of audition creates different experiences and creative outcomes. In each of these cases I will attempt to interpret the various works that emerged, and analyse their implications for the practitioner model of mobile music performance.

4.2 Headphones and Auditory Systems: Existing Literature

Before continuing I believe it is important to put these studies and artworks in context, so there will be a brief account of the various theoretical references that I am grounding these investigations. Firstly, I am taking Keith Swanwick's definition of *audition* as that of being 'an engaged listener, a listener attending to music as an audience...to the virtual exclusion of all else' (1979, p.43). Swanwick argues that audition is the central reason for the existence of music, with performance acting as a means of communicating music as a presence. Secondly, my use of the term *headphonics* as a key conceptual term borrows from Brandon LaBelle's description of headphonic space as one that forces the headphone listener out-of-sync with the exterior world. Wearing headphones 'define[s] a very different acoustic reality to that of our physical position' (LaBelle, 2015, p.225). Wearing headphones creates an internal performance space in the listener's head. My aim is to build on the disorienting experience of occupying two zones of audition at the same time, situating the performer/listener in both real and unreal soundworlds. Headphonic performance creates a private, almost secretive experience of mobile-mediated music.

This approach is grounded in existing cultural and social theories on mediated listening in urban environments (Chambers, 1994, Thibaud, 2003; Arquette, 2004; Bull, 2000, 2007, 2008; Weber, 2009). Previous research into the impact of personal stereos and MP3 players was concerned that portable audio devices isolated their users in 'audio bubbles', preventing them from engaging with people around them and their surroundings (Bull, 2008, p.29). As we saw in chapter 2, Michael Bull's in-depth interviews with Walkman users found that personal stereos often gave rise to a user's feeling of being 'somewhere else'. Users became indifferent to the presence of others achieving a subjective sense of public invisibility: 'in which they do not speak, but listen, silenced and unsilenced through the spaces of the city...shielded cognitively from the contingency of the world' (2007, p.68). Sophie Arquette warned this form of behaviour afforded by 'gadgets' has increased our general sense of isolation and displacement from the acoustic environment (Arquette, 2004, p.163).

Yet in many cases, Bull found that headphones had become an integral tool in people's managing their everyday lives, helping control their mood against the 'oppressive nature of routine' (2007, p.69). Mediation – that through which

experience occurs – has many disguises both cultural, intellectual, historical and technological. Bull tells us: ‘Embodied knowledge is filtered through our very senses – what we hear, see, touch, smell and taste. The practices of ‘looking’ and ‘hearing’ are in themselves mediated cultural practices’ (ibid., pp.158-159). And this mediated experience appears more immediate to the mobile listener as the technology becomes increasingly invisible.

Rather than disconnecting listeners in a hermetically sealed audio bubble, theorist Elena Biserna suggests that mediated experience sets up a process of ‘multiple dwelling in which mediated and contextual experience interfere and hybridise’ (2014, p.28). The mobile-mediated listener is situated within multiple sonic worlds, in what Jean-Paul Thibaud calls an ‘interphonic knot’ (2003 p.329). In other words, a place that brings together two sonic spaces of a different nature: the walking listener’s and that of the street. As we saw in chapter 2, these theoretical frameworks have informed mobile-mediated sound art works, from Lalya Gaye’s ‘Sonic City’ to Noah Vawter’s ‘Ambient Walkman’ to Janet Cardiff’s audio walks to name but a few.

Taking an opposing stance, Julien Henriques (2014) claims we are becoming overwhelmed by an ‘invasion’ of sound occurring all around us, from the high frequencies leaking from other people’s earbuds, to ‘sodcasting’ – playing music through the inbuilt speakers of a smartphone on public transport. Henriques argues that listening is a receptive activity: ‘a reciprocal relationship with active, kinetic expression’ (p.100). He contrasts the auditory saturation of headphones with the sonic physicality of Jamaican sound systems: ‘With the sound system, bodies are placed inside sound, whereas with earphone listening it’s the opposite, sound is placed inside bodies.’ (ibid., p.xvi). When sound is projected outward, it gains a new capacity to transform and control space, territorialising it (Gopinath and Stanyek, 2014).

Samuel Bordreuil suggests that there is a territorial component at play with sound systems and the festive traditions of carnival floats and street parties. The function of the mobile sound system is not that people should stay away, but rather they should enter into the sonic bubble the music carries with it: ‘It has an enticing function. Be a part, at least for a while, of the transient sphere that emerges’ (2015, p.5). Bordreuil argues that to tackle the question of community, we should widen our approach beyond the technical component of soundworks. It is useful to introduce this open

sounding context to the design of sonic performances, not only as musical content but also as actual context to the extent that the works will be played in.

This notion of exploring the social context of the performances is one of the theoretical underpinnings of Nicolas Bourriaud's *relational aesthetics* (1998, 2002), a desire not just to erode distinctions between institutional and social space, but between artist and viewer. Claire Bishop emphasises that Bourriaud does not regard relational aesthetics to be simply a theory of interactive art; he considers it to be a means of locating contemporary practice within culture at large:

It is often hard to identify who has made a particular piece of 'relational' art, since it tends to make use of existing cultural forms—including other works of art—and remixes them in the manner of a DJ or programmer (2004, p.54).

Bishop paraphrases Bourriaud by stating that relational aesthetics is not about the artist 'arriving like the god and saying ok, this is the meaning of the artwork'. It is about creating open structures, which allows room to the beholder or visitor of the exhibition. However Bishop's discussion is predominately focused within the field of visual and installation art in exhibitions.

Much of the critical theory on mediated listening is tied to older audio technologies, the Walkman and mp3 players. Previous research into the social affordance and commonality of mobile devices (Bryan-Kinns and Healey, 2004; Parkinson et al. 2012; Yang and Essl, 2015; Bowers and Shaw, 2014) is still predominately focused on the technical aspects of designing audio performances. There is an absence of sustained research regarding the use of mobile devices such as iPads in urban environments, and there remains a gap in knowledge on the perspectives and praxis that arise from being mobile. It is therefore appropriate that I consolidate these theoretical ideas of cultural practices when considering the following examples of this research's model of mobile mediated music.

4.3 The Secret Theatre of Headphonics

While staying in the 10th district of Paris over the summer of 2014, I would often explore my local neighbourhood while the same time continuing to develop techniques to capture and manipulate sound while walking. What was the most

efficient way to playing while moving, how best to carry an iPad? How could I blend in with other pedestrians while remaining alert to traffic? The multi-effects app Turnado had now become integral to my performance system, as its four XY pads allowed various parameters to be changed without looking down at the iPad's screen, and could be operated effectively with either fingers or thumbs. Listening back to audio with a pair of earbud headphones provided the right balance between the real and processed soundworlds – essential when navigating busy roads.

Pieter Verstraete argues a fundamental aspect of headphone mediated listening is its affordance of a secret theatrical experience. The user experiences listening and moving as a 'secret theatre', an experience that forges new relationships between a user, inconspicuous by-passers and their surroundings (2017, p.2). The question was whether this approach might help me renegotiate the phenomena of an unknown space into something that feels like a place? With no preconception of what might happen, or what I would encounter, I would leave my apartment and walk the nearby streets in the spirit of Walter Benjamin's flâneur and Eric Satie's habitual walks across Paris.

4.3.1 The SoundWalker

SoundWalker Mixtape (2014) is a short compilation of some of the audiovisual documents I made over that summer⁵⁸. It marks the beginning of a period of sustained investigations to develop a workable and repeatable technique for headphonic performance. Paris at the best of times is a noisy, sometimes chaotic place, and this video captures some of the sense of bewilderment felt as I gave myself up to the movement of the streets. I was now employing a GoPro 3+ camera for post-performance analysis, as I felt the next step was to document the processes involved in these walking experiments. Sergi Jordà and his team describe the importance of video documentation in the evaluation of music interaction phenomena, and its close links to social sciences disciplines such as ethnomusicology and visual anthropology (Jordà et al., 2013, p.245). Reflecting on the recorded material I was generating, it became apparent that the least interesting aspect was the iPad screen interaction material. What was more fascinating was observing people in the streets, how they

⁵⁸ Media file: 15_SoundWalkerMixtape.mov
<https://steranko.tumblr.com/post/179583722338/soundwalking-mixtape-a-mixtape-of-mobile-media>

negotiate shared spaces, sitting, standing, moving and talking. Here were scenes of the neighbourhood that I was gradually becoming acquainted with, yet although it portrayed real life, the super-wide angle perspective of the GoPro lens elevated it to a cinematic dimension. The assemblage of the iPad's audio and GoPro video files heightened the disjuncture between image and reality: both sound and visual were rooted in the everyday but transformed into something unreal. It was at once familiar, yet unknown.



Figure 4.1: SoundWalker Mixtape, Paris (2014). Source: Author

Having the camera positioned on my hip not only hid it from the gaze of bystanders, it lent a new perspective to an observer's point of view. The motion and sway of my walking are captured, occasionally the stride falls into synch when snatches of sirens or car horns are looped into repetitive rhythms, or voices of passersby transposed and warped into fleeting melodies. Occasionally my left hand swings into view – is this self-propulsion, or is it an attempt to appear nonchalant? Additionally, no one gives a second glance at the camera, a fact that provoked questions regarding observing and being observed, the state of watching and being watched.

Thibaud tells us that walking 'geared with headphones' is an urban tactic that creates an auditory relationship, or 'tuning', between the ear and the step (2003, p.329). Listening on headphones while walking 'musicalises' the walker's step. The walking listener reveals the hidden sides of a city according to three movements; firstly establishing a disjunction between the visible and the audible affirms the importance of sound as a way of 'decoding the urban environment'. The listener uses their device not only to protect themselves from the sometimes aggressive din of the city, but also to filter and enhance the events that give the place its meaning. Secondly the movement from perception to action reveals everyday sounds as closely related to social practices, music mobilises the step as much as the ear. And thirdly

the shift from private listening to a public secret can reveal things that we often take for granted in everyday life.

While Thibaud was referring to the use of the Walkman, his findings seem relevant to the headphonic pieces I recorded during that summer. Headphonic performance is situated within two sonic worlds, navigating simultaneously the one in which I hear and the one in which I walk. Thibaud attempted to synthesise the different walking patterns of the Walkman user into a ‘typology of strolls’. The *stride* emerges from synchronising one’s steps to musical rhythms, while a walker’s *gait* consists in establishing variations of walking speeds, modulating the step according to the pace of the music. Variations are set off either by particularly intense sonic occurrences happening in the street or changes in musical tempos. ‘

Transferring Thibaud’s observations of the Walkman to that of an iPad, I would argue that the movement, stride and gait of the walking mobile musician shape the urban space. Thibaud cites Merleau-Ponty (1991) in his claim that the disjunction between the visible and the audible creates a disturbance of the human senses, a form of strangeness in everyday life that in turn questions the evidence of perception: ‘...listening to headphones establishes strange connections between the visual and the musical landscapes’ (2003, p.40). By keeping the content of the headphone auditioning a secret, it hides elements of the context that might enable an outside observer to give meaning to the behaviour of the performer. Passersby were unaware there was a ‘performance’ going on.

4.3.2 On the Metro

Headphonics: Metro #02 (2014) is another example of headphonic performance⁵⁹. I was continuing to use an iPad with Audiobus, Turnado and TWRecorder apps, while monitoring on earbud headphones. I was also including a GoPro camera to document the onscreen interactions, now the performance system combines real-time signal processing with audio and visual data capture. From a practical point, a sound environment like a metro train can provide rich material to excite Turnado’s processing parameters. In the video we can observe my attempting to balance the indeterminacy of the situation – what sounds are available for processing, which

⁵⁹ Media file: 16_Headphonic_Metro#02.mov <https://www.youtube.com/watch?v=BRk8JE0hMCU>

person might enter or exit the train – while trying to consider the overall compositional process. Magnetic tape cut-up pioneers Louis and Bebe Baron employed a working methodology they described as ‘curating serendipity’ – activating a set of electronic circuits, recording whatever happened and editing the results into a composition (Brandt, 2013, p.76). The fieldwork I undertook on public transport is similar to curating serendipity, selecting which sonic events to develop, which to omit and embracing any chance proceedings as they happen.

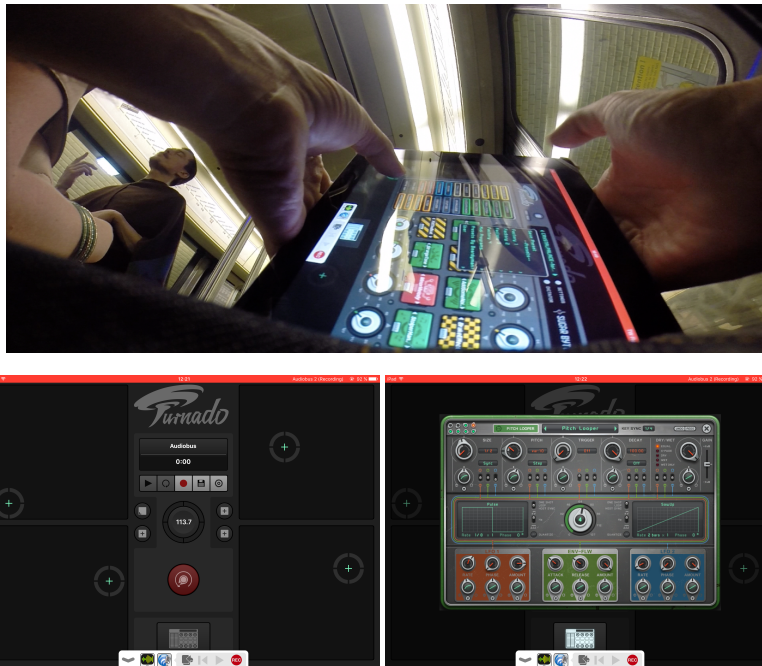


Figure 4.2: On the Metro: Turnado's operating GUIs. Screen grabs.

The images in Figure 4.2 show Turnado's various operating GUIs for controlling signal processing. The circular BPM counter allows the overall tempo to be set by tapping or touching the surrounding edges while red knob is a reset button for the four circular icons that are mapped to separate processing options. The overall GUI design is clean and simple, Turnado can be played almost without any visual references. In the video you might note how efficient my thumbs are for making rapid movements across the screen's x and y axis, it demonstrates how the app responds instantaneously, a single gesture instantly altering a processing effect.

By contrast, the image on the lower right side of Figure 4.2 reveals the individual parameter controls for each of the eight effects units. The controls are much smaller, more detailed and somewhat complicated. In the video, for example at 01:24s, we can see my struggling to change the parameters, pinching and tapping at the screen. This

is most likely because Turnado was originally a desktop plug-in, and suggests the problems in porting established DAW designs over to iOS touchscreens. It's designer Sugar Bytes states 'Turnado's primary focus is on beat manipulation'; the app was originally intended as a VST plug-in for pre-existing audio files, rather than an autonomous, standalone DSP unit.

More importantly, notice in the video how none of the other passengers appear to be aware of my actions. Through listening to the sound on my earbuds, I am sharing the same space as everyone while at the same time occupying another reality to the rest of my fellow passengers. To all outward appearances, there is little to distinguish headphones as an identifiable form of music performance. The earbuds I wore were identical to those used by most of the other passengers in the carriage⁶⁰. The set of physical gestures I employed to control the sound processing – tap, swipe and scroll – were also similar to those of my immediate neighbours as they scroll through their messages and social media. This lack of obvious outward visual signs throws up a conundrum: if no one is aware a performance is taking place, does it count as a performance in its traditional sense?

When performer and spectator are one and the same person, it starts to deconstruct the hypothetical 'stage'. If there are no identifiable elements to mark out headphones as a performance; no culturally understood gestures associated with music making, no traditional performance venue, no one can hear the work except the performer. It begins to raise questions about the status of performativity itself. This chimes with Brandon LaBelle's assertion that wearing headphones defines a very different acoustic reality to our physical position (2015, p.223). Both LaBelle and Verstraete (2017) reference Janet Cardiff's audio walks as exemplary examples of how artists have responded to the potential for secret theatrical experiences.

Cardiff and George Burges Miller's *Alter Bahnhof Video Walk* (2012), set in Kassel's main train station, depicts an iPod Touch held up in front of an identical view of the station. Participants are guided by Cardiff's off-screen voice instructing them to keep holding the iPod in horizontal mode so as to match the given visual perspective of the video. From her introductory statement – 'It is very intimate to

⁶⁰ This was before Apple's Bluetooth air pods became available, and I will return to discussing how Bluetooth audio does not allow DSP apps to use the internal microphone in the concluding chapter.

watch people’ – the work promises to disclose a deeper reality that only the bearer of the iPod has access to. The participant becomes a detective in an imagined war history as various actors, ballet dancers and musicians playing brass instrument unexpectedly traverse across the screen. The listener-spectator is drawn into an imaginative space through both the screen and earbuds of the iPod. Holding the device while looking at the same location enhances the sense of a double frame – both virtual/inside and physical/outside space – creating an augmented vision that also enhances sounds that are either not there or not normally perceived. According to Verstraete, it is in this ‘in-between’ space that turns headphones and device into a secretive theatre with their ability to aestheticise the urban practices of walking and transporting oneself (2017, p.10). The case studies presented here build on Cardiff’s exploration of the in-between space afforded by wearing headphones. They demonstrate this research’s objectives to question the spaces associated with electronic music, to interrogate a new model of mobile music from which a new performer identity is emerging.

4.4 Portable Amplifiers and Loudspeakers

For the next section of this chapter I will focus on my enquiries with portable loudspeakers, as I hoped to expand the idea of mobile mediated performance to accommodate multiple players and listener-spectators. How might the same model of headphonic performance turn out in a larger group setting? The opportunity to interrogate this question was during a visit to Locus Sonus’s *Audio Mobility Symposium* (2014) in Aix-en-Provence, France⁶¹. While developing a site-specific piece for the symposium, I had intended to use a wireless headphone system using the Bluetooth protocol commonly found with ‘silent discos’⁶². During testing however, I discovered that iOS sound processing apps like Turnado were unable to use the mic input when streamed over Bluetooth. Audiobus’s developers confirmed this on their discussion board; the problem with Bluetooth is it ‘...simply does not work with apps that can record from the microphone, iOS does not allow it’⁶³.

When an iOS app enables Bluetooth audio, both input and output are routed through it. The system disables the internal mic and speakers to prevent feedback.

⁶¹ <http://locusonus.org/>

⁶² <http://www.silentdisco.fr/index.php>

⁶³ <http://www.forum.audiob.us/discussion/201/audiobus-bluetooth/p1>

Other companies such as RØDE microphones confirm this: ‘Unfortunately due to issues with multiple sampling rates, both RØDE Rec and RØDE Rec LE are currently unable to support Airplay or Bluetooth output’⁶⁴. Whether it is issues with sampling rates or the need to protect listener and equipment from accidental feedback loops, this is a basic limitation of the iOS operating system. Although this might appear an unimportant point it has profound implications for real-time signal processing, and I will return to this issue in the concluding chapter. As it was, the installation was locked to a static position and felt unsatisfactory as a mobile performance.

Conversely at the same event, I discovered walking around the School of Art facility with an iPad and a Dirty Electronics mini-cardboard box amp (Richards, 2013) provoked an enthusiastic response from the students. They instantly reacted to the contradiction of high and low technology, the slight ridiculousness of objects at the opposing ends of the technological scale. Passing the loudspeaker and iPad around transformed the performance into a creative and playful process, especially when squeals of feedback ricocheted around the building. It suggested how a portable loudspeaker might allow my performance system to accommodate groups of players.

4.4.1 Bradford Street Festival

The video *Bradford Street Festival* (2014) demonstrates a performance using this system with my work partner Sally Rodger, taken from her point of view with a head-mounted GoPro camera⁶⁵. Under the project title ‘Discrete Machines’, we were billed by the festival organisers as ‘Street Theatre’, although it felt more like guerrilla sonic interventions. Walking up and down Bradford’s city centre, each with an iPad running Samplr app, we would sample the sounds of market stalls, a funfair, generators, passing traffic or the voices of festival goers. The close proximity between the audience and us appeared to go against conventional listening practices in a shared public space.

Amplified music in public spaces is most likely registered as background music, or ‘programmed’ music as a means of engineering mood and behaviour in public spaces, shops and working environments. It can also come from passing cars, and Sophie Arkete tells us the stereo system of a passing car played at high volume

⁶⁴ <http://en.ode.com/faq/compatibility-of-roderec-with-airplay-bluetooth-audio>

⁶⁵ Media file: 17_BradfordStreetFestival.mp4 <https://www.youtube.com/watch?v=G4bFwFhSsWw>

encroaches into an environment far more than the car itself; the acoustic space may extend to a 40-metre radius around the vehicle. Or we might come across music performed by buskers, although buskers tend to take a static position, playing recognisable songs with traditional instrumentation. A passing listener can choose to either engage with this form of music or not, they have control over the level of sound through physical proximity. With *Discrete Machines*, being situated in the middle of a crowd projecting sound outwards with our cardboard box amps went against these cultural expectations.



Figure 4.3: Bradford Street Festival (2014). Image courtesy of Sally Rodgers.

As a result, no one quite knew what to make of us. Immersed among a crowd making abstract sound collages provoked looks of surprise, bemusement and even annoyance. It was reassuring we were assigned an accompanying security guard. Although Rodgers and I guessed in advance the crowd would be predominately afternoon shoppers and families rather than an audience with specialist knowledge of electronic music, our performance genuinely seemed to confound the usual expectations associated with music production. Were we a marching band, buskers or simply a public nuisance? With what criteria could it be judged to be successful or not?

Perhaps it would have been preferable to make something less disruptive and more understandable as music? Claire Bishop argues that any ‘unease, discomfort... fear and absurdity - can be crucial to any work’s artistic impact... however eccentric, extreme or irrational this might be’ (2012, p.26). According to Bishop it is better to focus on ideas and affects generated by a project, rather than erring on caution or

being self-censoring. In written correspondence with Rodgers afterwards she remarked: ‘mobility was the most significant digression from conventional electronic music-making practice here’. Transforming the sounds of the environment and transmitting them back out into the space had created a feedback, almost an echo of reality. In contrast to the secret theatre of headphones, using loudspeakers while operating outside the cultural expectations of music performance had forced the issue into the public arena.

4.4.2 SoundWalking at the Mobile Audio Fest

Returning to the example described in this chapter’s introduction, I would now like to discuss and evaluate my experiences with a mobile marching band at the *Mobile Audio Fest* (2015)⁶⁶. Invited back by Locus Sonus for a research residency at the École d’Art d’Aix-en-Provence (ESAAix), I was asked to run a series of workshops and develop a group performance with students at the school. There, I hoped to explore the social structures that shape the individual and group experience of mobile-mediated performance.

The first week was dedicated to building the Dirty Electronics mini-cardboard box amps from scratch. John Richards describes them as an economic portable battery-powered (2 x 9v) amp with a 3.5 mm jack socket, a full range 5 cm speaker and low voltage power amplifier housed in a three inch cubed box (2013). The cost of making ten kits managed to fall within a budget of €150 (before TTC, or French VAT). Locus Sonus provided six soldering irons and a box of assorted loudspeakers, from which various 8-Ohm full-range speakers were salvaged. Meanwhile, ESAAix provided solder and equipment wire while students sourced their own cardboard boxes. Although the school had its own fab/lab workshop, only a few students had previous experience of electronics and soldering. Fortunately the school’s technicians Frances and Laurent were on hand to demonstrate good soldering practice and explain technicalities such as the flow of electricity as it travelled across the board. It helped having the schematic on an iPad that everyone could pass around, and I deconstructed and opened out my box amp as a 3D maquette.

⁶⁶ <http://maf.locusonus.org/>

Particularly impressive was Aurora Senave who took an empty cardboard box as a template over to the school's woodwork studio, returning several hours later with a speaker made out of high-density wood (see Figure 4.4, right). Painted crimson and decorated with drilled indents and circular motifs, her portable loudspeaker was not only durable but also elegant. The material absorbed the reflective sound vibrations giving it a richer tone than cardboard.

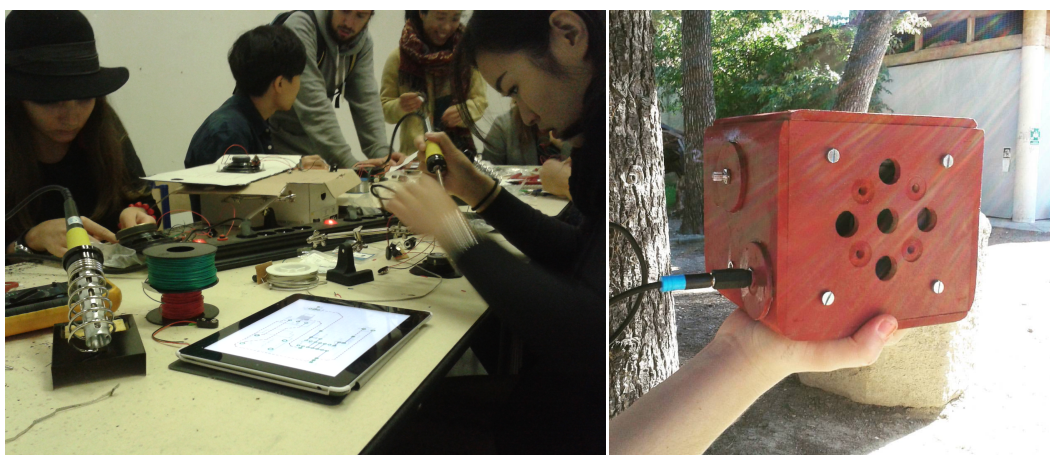


Figure 4.4: Building the Dirty Electronics box amp, and Aurora Senave's version. Source: Author.

Aurore was one of four student volunteers, including Tiphaine Durbesson, Valentine Aubert and Kevin Niemeskern, who I was to collaborate with in developing a mobile assisted soundwalk for the three-day festival. While all four were greatly interested in music, no one had played a musical instrument before or considered their smartphones as capable of generating sound. We looked at the three iPads I had brought loaded with a selection of sound and music apps. The intention was for the group to discover for themselves the apps they wanted to play and what sounds they enjoyed making.

4.4.3 Experimentation and Collective Composition

The difficulty of using technology to mediate collective behaviour meant each volunteer reacted very differently; one gravitated instantly to an app while others wanted to try out every possibility unable to settle on a single one. Aurore almost immediately decided *sfCapture* (2014) by GRAME was perfect for her, downloading it to her Android phone. Meanwhile Tiphane enjoyed altering her voice with the audio effect unit *ADelay2* (2013) commenting how we often hide behind technology to mask our true selves. Kevin was a fan of Hip Hop and enjoyed creating rhythmic

beatbox loops with *Loopy HD* (2015). Valentine, on the other hand, wanted to make subtler, more melodic sounds with *Jam Synth* (2013) a monophonic guitar synthesizer and multiple effects unit. I was concerned how such strong individuals were going to agree on a collective composition.

I decided there and then I would not join in their experimentation, preferring instead to facilitate the group and observe and document the group dynamic taking shape. Rehearsals were held in a rarely used space in the faculty; room 64, or more commonly known as the ‘black room’. Inside was total darkness except where light penetrated from a broken blacked out window; it seemed an effective place to begin rehearsing. Immediately everyone began making random noises but the sound was fractious and abrasive, no one was working together. Could they direct themselves in a collective composition, or did they need a conductor?

Taking the initiative, I decided to guide the group through various improvisation exercises I had learnt at St Merry. I would argue this fits within Small’s definition of *Musicking*, as taking part in any capacity in a performance whether by listening, rehearsing, or providing material: ‘Unity of performance, a group of fully realised musicians working together in a state of social harmony is a terribly difficult balancing trick to bring off’ (1998, p.81). I began by directing each member of the group to play individually, joining in one after another and then dropping out on my instruction. Although still chaotic, the exercise encouraged everyone to listen to each other and not simply focus on their own sounds. When one person stopped playing, it left a wide-open space in the sonic texture. Everyone’s attention became instantly focused.

Next I proposed they decide between each other, using visual cues, as to who should begin to play, who should drop out. Like this, players began looking at each other and not their devices. Having established there were two ‘generating’ voices and two ‘sampling’ voices, each member’s roles became delineated. Often Tiphane would open so many apps at the same time that she was constantly shifting between them, getting confused and not knowing which app was generating a particular sound. Meanwhile Aurore gradually began to master controlling the accelerometer of the phone, particularly as the tilt function is sensitive to movement.

After one session I commented that the sounds they were making spontaneously would have taken a much longer time in a recording studio. Instantly I heard my voice repeating back, looping and disintegrating. It was now my turn to be covertly recorded and transformed. Through experimentation and openness, the team were becoming increasingly co-ordinated and it seemed an appropriate time to move out of the rehearsal room. Outside the school building, friends and strangers stopped and listened. They began asking questions, some posting photographs on social media. It was this moment I began to realise the manner in which sonic material is auditioned is related to the experience of mobile performance. Although the group were using the same performance system used in my headphonic walks, the portable box amps had transformed the experience into a shared, social activity.

In the video document *Mobile Audio Fest (2015)* we can see the group as they develop and expand their own individual playing methods through a process of experimentation, exploration and improvisation⁶⁷. Tiphane drums on her iPad with her fingers, treating the device almost as a contact mic, while Aurore works on her playing technique with sfCapture, attenuating the volume control of her box amp. Moving in ever increasing circles, heads bobbing and bodies swaying, the group's body language had changed as if the physical act of being outdoors encouraged openness.

4.4.4 Make Way for the Mobile Marching Band!

“The group are in full swing; rhythmic loops, insistent melodic phrases, buzzing chordal tones and swooping pitches are all firing off. As they file down the street Tiphane shouts “Make way for the marching band!”⁶⁸ Although I am concentrating on documenting their walk with my iPad and Zoom recorder, I worry about passing cars. But their confidence is building and they seem unafraid of the encroaching outside world. These streets are their streets.”

⁶⁷ Media file: 18_MobileAudioFest_01.mov

<https://steranko.tumblr.com/post/141142753803/soundwalking-documentary>

⁶⁸ When Tiphane shouted to make way, she would have been most likely unaware of mobile marching bands in the context of NIME research: Dan Trueman, Perry Cook and Princeton University's Laptop Orchestra *PLOrk* (2005), Ge Wang and Stanford University's *Mobile Phone Orchestra* (2008), the Michigan *Mobile Phone Ensemble* (2010), Jeff Snyder and Avneesh Sarwate's *Mobile Device Marching Bands* (2014). Much of the research concluded players struggled to adapt to the physical act of carrying equipment, with Snyder and Sarwate (2014) suggesting specially adapted vests and utility belts should be employed, or in more extreme cases transporting equipment on a cart.

The group performed over three days during the Audio Mobile Fest in Aix-en-Provence and Marseille, between November 19 - 21, 2015. Although a group of us followed the band around taking photographs and making audio recordings, I eventually only used the sound recorded on my Zoom for my own documentation. Standing ahead of them, the sound of massed portable speakers produced a Doppler effect as they swept past. I recorded images using *Hyperlapse*, (2014) a time-lapse video app that incorporates Instagram's in-house stabilisation allowing one to 'Shoot handheld time lapse videos in motion – while you're walking, running.' *Hyperlapse*'s focus setting also produces unexpected glitches when shot in real-time, tapping anywhere on the screen pushes the app to overcompensate as it recalibrates its focusing.

As the marching band roamed around the town centre, they created an itinerant fanfare as they passed through different economic and social spaces. They felt it was important to walk through very different sound environments to highlight how places that are close to each other sound different, based on the activities taking place within them. As the band moved along the narrow streets, visiting sound artist Andrew Brown commented that the drone from Valentine's Jam Synth sounded like a modern hurdy-gurdy. He thought the group were sympathetic to the medieval design of the streets; they resembled a band of electronic jongleurs.

With their loudspeakers slung around their necks or worn like backpacks, the Dirty Electronics box amps came into their own in the narrow streets. The speakers were clear and directional without being overwhelming, the volume level similar to that of a normal speaking voice. When the group headed back towards the old part of town, Kevin delighted in sampling random conversations and playing them back with a mischievous delight. During the walks, I witnessed passers-by stop and turn, searching for the source of the words. Kevin's role had become a digital ventriloquist (Katz, 2000), a prankster revelling in the confusion left in his wake.

As we saw at the Bradford festival, carrying portable loudspeakers can demand a strong social commitment from players and audience alike, one that sometimes confounds the cultural expectations associated with music production. Hearing the sound made it difficult to ignore, it becomes harder to blend in with the crowd. Arquette explains the growing schism between the space that physical objects occupy,

and the acoustic space that is taken up with a sounding object: ‘Sonic space does not follow the same rules as physical space’ (2004, p.116). Collectively, the band occupied a far bigger sonic space than if they were four individuals (Figure 4.5).



Figure 4.5: The Mobile Marching Band. Images by Elena Biserna, Hugues Martin and Author.

In his essay *Between The Marching Band and The Sound Walk* (2015), Samuel Bordreuil suggests the ‘agonistic’ component of nomadic music can be transposed into a more amenable guise. The mobile marching band’s purpose is more than just opening the way; the function of is not that people should stay away but that they should enter into the sonic bubble that the band carries with along. It can be an enticing function. ‘Be a part, at least for a while, of the transient sphere that emerges’. Bordreuil argues the critical point is that the eventfulness and playfulness of sonic and musical performances should be the central criterion in its aesthetic assessment.

The elements of playfulness seem to bolster the group’s confidence and strengthen their sense of solidarity. At times they prompted spontaneous interactions from passing spectators, for example when an enthusiastic member of the public joined in with an improvised rap. The nature of embodied listening practices afforded by the portable loudspeakers presented something of a paradoxical scenario for the spectator,

insofar as the mobile performer re-integrates and reclaims the immediacy of embodied relationships rather than neglects them. There was no secret to this theatre.

4.4.5 This is an app. This is another...

During the first day's SoundWalk performances, I retweeted an image posted by Elena Biserna on twitter, commenting, "This is an app. This is another. This is a third. Now form a band". This was a passing reference to the punk aesthetics of Mark Perry's seminal fanzine 'Sniffing Glue'⁶⁹. Almost instantly came a response, "you mean now form a *brand*". The implication was that by using iPads and smartphones, the group were simply conforming to a consumerist ideal of creativity. Rejecting this criticism as technological determinism, I defend my comment by restating the group were embracing punk aesthetics and DIY culture⁷⁰. It was significant that the group had never made music before, or co-developed a sound-based performance. Also the students had built and customised their own battery-powered amplifier speakers out of electronic components, boxes and scavenged loudspeakers. This integration of low and high technologies touches on Henry Jenkins' notion of convergence culture, where 'knowledge culture meets commodity culture' (Jenkins 2006, p.1). In such an assemblage of DIY technologies, which can be said to be high or low tech?

Claire Bishop states this microtopian DIY ethos is what Bourriaud perceives to be the core political significance of relational aesthetics (2004, p.78). Bourriaud had argued the criteria we should use to 'evaluate open-ended, participatory art works are not just aesthetic, but political... we must judge the "relations" that are produced by relational art works' (2002, p.64). The act of collective co-operation offers another route for navigating the tendency of mobile apps to operate as 'prescriptive technologies', technologies in which a user's decision-making is minimal. Ge Wang and Stanford University's *Mobile Phone Orchestra* similarly proposed that research on mobile marching bands should focus on the social and geographical elements of performance, rather concentrating on technical details (Wang et al., 2010). Three main elements of the SoundWalking group could be set out as distinguishing them

⁶⁹ Apparently Sniffin' Glue never actually printed the legendary instructions, it has been ascribed to Sideburns, another punk 'zine from 1977: <https://www.theguardian.com/music/2011/jun/14/mark-perry-fanzine-culture> accessed 10 December, 2019.

⁷⁰ 'It was very basic... I was just doing the best I could, with whatever was available' (Perry, 2019) https://www.theguardian.com/music/2019/dec/10/how-we-made-sniffin-glue-punk-fanzine?CMP=Share_iOSApp_Other accessed 12 December, 2019.

from previous models; the non-musical, the relational and the geographical elements of their performances.

As a guest speaker for the Mobilise symposium (2017), Locus Sonus' Peter Sinclair offered his thoughts on the unique qualities of the group's practice:

I found it totally fascinating to see the orchestra coming towards me along the street carrying with them the ambiances of a neighbourhood they had previously sampled, the sounds blended in them with the atmosphere of the moment, they resurfaced or were replaced in a stream of mixed temporalities.⁷¹

Sinclair refers to the use of rapid, shared and selective memory as 'timewarping' when occasionally a sound would acquire a particular persistence, hang around as it shifted from one device to another, spreading both sensorially and temporally. Sinclair mused that this activity of sampling the sounds, borrowing moments that had recently passed and were already being reinterpreted was akin to the way human memory works. Behrendt speaks, also in this context, of walking as remixing where the experience of space and the distribution of sound are 'pre-curated', but the participants can 'create their own version or remix of the service by choosing their path through the sounds' (2012, p.268). Walking with the box amps created an evolving and mutating environment that helped foster a relational situation between performer and the listener-spectator.

4.5 Participative Performance

As I have mentioned in this thesis' introduction, Mobilise was a symposium where I invited researchers, developers and writers to De Montfort University to discuss their practices in the field of mobile music and sound. The two-day event featured an open call for an IRCAM Hackathon to design and program web audio performance apps using CoSiMa, including first year Music, Technology and Performance (MTP) students at DMU, foundation collage students from Leicester and Dudley, several Philharmonia Composers' Academy musicians as well as the general public. The event concluded with an evening's concert featuring a range of works by DMU's

⁷¹ Quoted from Sinclair's conference keynote speech.

music and technology students, and selected commissioned pieces from the IRCAM team⁷².

Two student works, by Emma Sykes and David Tucker, employed the *CoSiMa* (2014) web audio app using their own interaction designs developed during the previous day's Hackathon⁷³. The audience were encouraged to participate by playing the pieces through their own individual smartphones. It allowed everyone to interact with the material using their device's motion and orientation. The phone's inbuilt speakers amplified and diffused the sound around the concert hall, depending on where they were positioned in the space. This approach to collaborative performance through a shared rendering system transformed the evening into a relational and social activity instead of a passive form of entertainment.

Included on the USB portfolio are two audio recordings from that evening. The first is a collective piece devised by first year MTP students for their MUST1008 mobile music module⁷⁴. The audience were invited to choose an audio file from a playlist uploaded to SoundCloud, while the group handed out plastic transparent cups with instructions to place them over the loudspeaker of everyone's phones. These playful strategies were an ingenious workaround for both the lack of a dedicated sound app and the perceived weakness of mobile amplification. The randomness of the audience's actions resulted in a slightly wayward and chaotic audio collage, but there were often moments when rhythmic and melodic elements would lock together over the sound of shuffling footsteps.

The second recording is perhaps more recognisable as a musical composition, taking the notation and melodic phrasing of Steve Reich's 'Piano Phase' as its basis⁷⁵. It was the UK premier of Piano Phase II, developed by Norbert Schnell and Benjamin Matuszewski of the *Sound Music Movement Interaction* team at IRCAM. Each member of the audience was assigned a single key of Reich's piano phase, which they then self-regulate on how and when the phrase is to be played. Schnell

⁷² Participating speakers included Frauke Behrendt, Elena Biserna, Jakob Haq, Norbert Schnell, Benjamin Matuszewski, ex-DMU student Aneek Thapar from Ninja Tunes, as well as myself. A WordPress blog documenting Mobilise is available here: <https://carryprinciple.wordpress.com/>

⁷³ <https://bit.ly/2VQo636>

⁷⁴ Media file: 19_Mobilise_collectiveImprovisation.wav <https://bit.ly/2RVLDgk>

⁷⁵ Media file: 20_Mobilise_pianoPhase_excerpt.wav <https://bit.ly/2ymP7jG>

points out the resulting music often tend to shift between cacophony, quiet, noise, boredom and moments of transcendence.

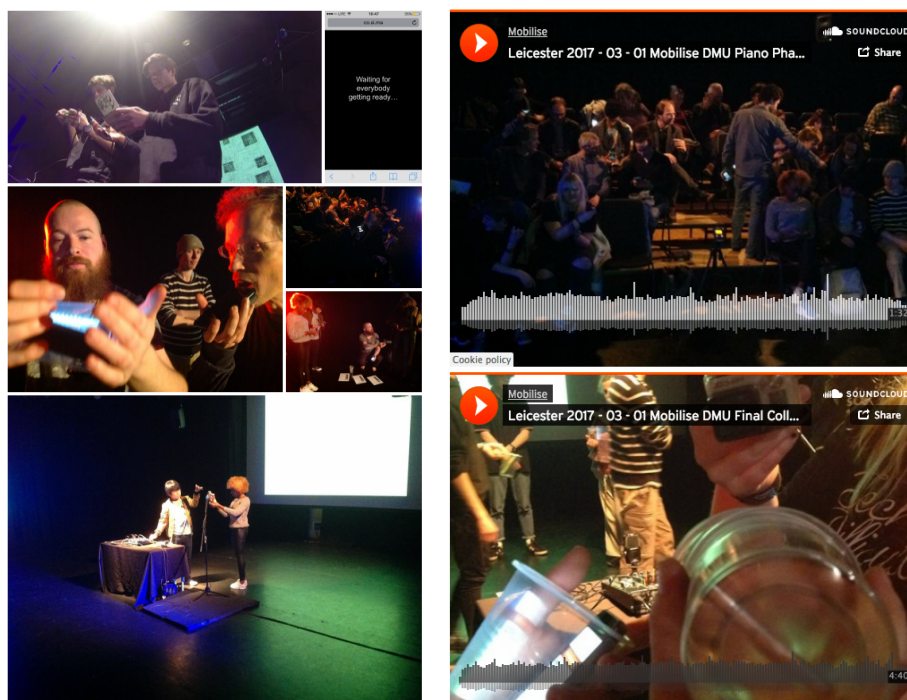


Figure 4.6: Mobilise Performance, DMU Pace (2017). Images courtesy of James Andean.

The audience were invested in the proceedings; they were allowed to control the various compositions' structure and duration, to improvise with the sound materials and to freely move around the hall. This form of collaborative performance blurs the distinction between performer and audience, when both can directly and indirectly participate in the music making process (Figure 4.6). It also aligns with Georg Essl and Sang Won Lee distinction between audience involvement, in which the audience can respond to musical performances but are not participating in the music-making activities, and audience participation where the audience is part of the musical performance (Essle and Lee, 2017). The distinctions between stage and seating had become blurred, so too the fixed demarcation between who is the audience and who is the performer.

The DMU group's ingenious approach to the apparent sonic limitations of a smartphone's inbuilt loudspeakers was impressive; it was another iteration of the resourceful and reciprocal nature of mobile practice. I would suggest the Mobilise concert might be situated within the continuum of mobile music, from Golan Levin's *Dialtones: A Telesymphony* to GRAME's *Battle de Smartphones*. Mobile-mediated

performance promotes collaboration, collective interaction and participation. In addition, the introduction of the MUST1008 mobile module as part of DMU's curriculum between 2013-18 consolidates this research's contribution to the field of mobile studies.

4.6 Bringing Mobile Practice into Schools

I want to take a brief detour now and recount my time working with the British Council and the French Ministry of National Education for their cross-cultural project, *Science in Schools*. Over a period of 2015-17, I ran a series of workshops for school students ranging between Year 3 to Year 11. Travelling with an adapted suitcase holding 20 iPad minis, I visited over 70 schools and colleges in cities, towns and villages across France, including a short tour of its overseas territory, French Guyana. The intention was to develop cultural relations and promote educational opportunities between the two countries as pupils got to practice their English language skills in specific, real world contexts.

The workshop 'Coding for Kids' was aimed at younger students, teaching them how to make games, animations and stories by dragging and dropping colourful blocks of code with Hopscotch (2014), a simple but powerful visual programming app. During one activity coding a 'spiralling emoji pen', I realised that the children were using emojis as a form of self-expression. Julia Deathridge has reflected on the new visual and textural lexicon of emojis, asking 'Are Emojis the Hieroglyphics of the 21st Century?' (Deathridge, 2017). Although the school children all shared the same ubiquitous tools, they were able to convey their own individuality through their choice of emojis.

On the other hand 'Music, Sound and Mobiles' explored sound – how we register it, how we measure its properties and how it is recorded⁷⁶. Using MobMuPlat with Pure Data as an audio engine, I was able to demonstrate audibly and visually the processes involved in manipulating and shaping waveforms as 'representations of sound'. I was able to describe concepts such as frequency and amplitude, how numbers are used to generate electronic sound – ideas that might appear opaque written on a blackboard or in a book.

⁷⁶ <https://steranko.tumblr.com/post/145248674623/atelier-scientifique-en-anglais-2-retour>



Figure 4.7: Mobile practice workshops (2015-17). Images courtesy of the British Council.

The participants built a simple sine wave generating app that they were able to port to their iPads, even their own phones (see Figure 4.7). They were free to explore other Pd patches on MobMuPla, as well as the range of SmartFaust apps and CoSiMa web audio apps (see passim). The workshops would usually end with everyone performing as a self-directed mobile ‘orchestra’. Sometimes chaotic, often noisy, the musical output was perhaps not the most interesting aspect; it was as much about group participation, about creating an experience based on sound and mobile technology. While engagement, collaboration and participation were key take away points, a more salient observation to make was the iPads acted as a shared agency, crossing differences in culture, age and language. There was a shared understanding between the students and me through the cultural ‘adhesive’ of mobile media.

At one particular school a teacher commented on how students would often pass the iPads between themselves, offering advice, swapping tips and helping those that had fallen behind. We agreed that this might be theorised as ‘nomadic learning’. A local television item on France 3 covering the workshops even defined my role as a ‘specialist in nomadic technologies’⁷⁷. A future implication of this research might be

⁷⁷ Media file: 21_Atelier_codage.mp4 <https://france3-regions.francetvinfo.fr/normandie/orne/orne-cours-codage-informatique-in-english-1138773.html>

to explore the phenomenon of nomadic learning, and its practical application for media literacy in schools by considering mobile media as a creative resource.

4.7 Conclusions

In this chapter I have attempted to analyse the two axes of mobile mediated performance. This research's findings suggest that differing means of audition produces almost diametrically opposed experiences of making mobile music. Both strategies allow both individuals or larger groups of players to create electronic sound – sound that is superimposed onto a user's subjective experience of public and private spaces. On the one hand, auditioning sound through headphones can produce a private, internalised experience of mobile music, a process I have chosen to term headphonic performance. By contrast, auditioning sound through loudspeakers creates an externalised experience, and to describe this process I have chosen the term portable loudspeaker performance. Both cases can be said to be two sides of the same coin, they are both examples of the practitioner model of mobile music. The glue that binds them together is the ubiquitous mobile media device.

Furthermore, the examples discussed in this chapter suggests that there are new avenues to explore that entail the use of mobiles and signal processing apps to transform and remix the urban soundscape. With both headphonic and portable loudspeaker performances, there are the same elements of sonic improvisation, environmental context and temporal dislocation – sound and location are thoroughly entangled. Yet while they might have a musical focus, they are not solely about music activities. Mobile mediated performance can be as much about creating an individual or collective experience, extend the boundaries of musical agency between a performer and audience.

At the end of my residency with Locus Sonus, one of the participants Kevin Niemeskern remarked 'In the end, it's not so much about the sounds we're making, but the social act itself!' Frauke Behrendt concurs that the quality of the music is not what makes mobile performance interesting: 'it is the mobility of the device that opens up new social and physical realms of collaborative music making' (2012, p.293). My work with the art students, the school children with the British Council

and music technology students at DMU may similarly be considered as attempting to open up new social and physical realms of collaborative music making.

In my analysis of the different models of portable loudspeaker performance, I suggested they echoed the principles of Nicolas Bourriaud's relational aesthetics in – judging artworks on the basis of the inter-human relations they represent, produce or prompt. Bourriaud argues that the criteria we should use to evaluate participatory art works as not just aesthetic, but political: we must judge the 'relations' that are produced. An important consideration of the mobile marching band was that the participants were all non-musicians; the performances they devised collectively took a social form that was capable of producing positive human relationships. As young artists, the group considered electronics and sound as valid media for creative self-expression, in the same way as paint, sculpture or photography. The combination of DIY aesthetics and consumer technology's total access made music improvisation and mediated sound practice inclusive, as opposed to exclusive. By highlighting its democratising effects, this thesis aims to build upon the existing resources available to other electronic musicians and offer a different model of mobile performer.

I have expanded on Pieter Verstraete's discussion on the 'secret' theatrical experience afforded by mobile devices, by suggesting more explicitly that headphonic performance has no identifiable elements to demarcate the hypothetical 'stage', the audience or the presence of any kind of production of electronic sound. It raises more questions about the status of performativity itself. My SoundWalker pieces in Paris may similarly be positioned with artistic works by Lalya Gaye's *Sonic City*, Noah Vawter's *Ambient Walkman* and Janet Cardiff's audio walks to name but a few. Furthermore, within the context of Jean Paul Thibaud's 'interphonic knot' between two sonic spaces of a different nature, the use of signal processing apps with iPads in urban environments has been explored with any kind of vigour, hence I believe this is a contribution that I am making to the field of knowledge.

I must now shift the focus of this discussion from the auditory to the visual conditions of mobile mediated performance, as this practice-based research appears to be crossing disciplinary trajectories. The following chapter will illuminate how the increasing use of visual images has become an unexpected aspect to this research.

Chapter 5. Becoming a Camera: Documentation, Artwork or Self- Historicisation?

We want to record our entire life by video... Developing wearable devices and huge storage devices will make it possible to keep entire life by video. (Kiyoharu Aizawa et al. 2001)⁷⁸

In this chapter I will interrogate how the increasing use of video images has emerged through the ongoing research process, and how the mobile media camera has introduced new paradigms to this research project. Originally I began using a camera as a way of gathering evidence of my enquiries, to capture images continuously from a first-person perspective. I found video to be an effective method of conveying the sense of movement, place and situation central to the experience of mobile soundwalking. Over time, the visual aesthetics of the GoPro camera and its associations with extreme sports and self-documentation became folded into the sound interventions, shifting the emphasis from auditory to the visual conditions of mobile mediated performance. As a result I began to question the status of documentation. I used video to record everyday events as a form of self-monitoring, or what Sarah Cook defines as ‘self-historicisation’; artworks presented online in the form of online posts or ‘Tumblr-ing’ (2014, p.213). But can a performance posted on YouTube, or a video recorded on a mobile phone be considered an artwork?

During this research I have been forced to consider the camera as a means for capturing data, for documentation, and ultimately as a performance object in its own right. However, wearing a hands-free camera in public raises ethical, if not legal questions. Wearing a camera in such a covert fashion appears to cross the line regarding what is ethically and socially acceptable, and I needed to carefully consider these issues. Rose Wiles and her team argue that ethical research demands that researchers are explicit about the methods and contexts in which visual images are created. It is crucial that researchers are able to understand, articulate and argue the

⁷⁸ Aizawa, K. Ishijima, K. Shiina, M (2001). ‘Summarising Wearable Video’, in Proceedings 2001 International Conference on Image Processing (Cat. No.01CH37205) accessed 18 November, 2019.

ethical or moral case for the decisions they make about the design of their research, and the ethical issues that emerge throughout the research process (Wiles et al., 2008). The following chapter will attempt to illuminate how the increasing use of video images has introduced an unexpected aspect to this research project, one that appears to be crossing disciplinary trajectories.

5.1 Walking Across Disciplines

The boundary between visual and aural modes of creative practice is porous. Since the beginning of the last century, artists and musicians have crossed over into one another's domains in order to extend their field of competence, to collaborate or cooperate in the interstice of their disciplines (Harvey, 2013). In an interview with contemporary art magazine 'This is Tomorrow' (2013), land artist Jan Dibbets outlined how his practice as a painter shifted when he began to document his work in the landscape. While photographing his experiments with sculptural forms outside his studio in various locations he came to regard the photographs themselves as the artworks:

'I picked up a camera and all these ideas about what is real / not real, abstract / not abstract came together in one machine... I had to throw everything I learnt out the window'⁷⁹.

This chapter draws from Dibbets' repositioning of artistic practice through documentation, as a way of framing this research project. Although I have no formal training in video, it has not prevented me from experimenting, collaborating and developing a personal approach to using a camera in this practice-based research.

Visual methods of documentation share close links to social science disciplines, such as ethnomusicology and anthropology, as well music interaction research for understanding interaction between people and technology. The integration of 'visual methods' comprises a vast array of different types of approaches and data (Prosser, 2007; Prosser and Loxley, 2008). Social researchers use video documentation because the visual image is often able to reveal more about phenomena than text alone (Sweetman, 2008). Visual data can also act as a catalyst for creating ethnographic

⁷⁹ <http://thisistomorrow.info/articles/an-interview-with-jan-dibbets> accessed 22 July 2014.

understandings of other people's experiences, and represent these experiences to a wider audience (Pink, 2003).

Sarah Pink is widely credited for her instigation of the use of visual material in digital ethnography. Pink's concept of 'walking with video' has become a respected method of phenomenological research that addresses the sensorial elements of human experience and place-making (2007, p.99). She describes employing video as a means of creating new embodied ways of knowing, while still providing an academically rigorous, scholarly narrative. The use of video led Pink to cross over from visual ethnography to the development of a new arts practice, or as she eloquently describes the process – to walk across disciplines.

This approach complements Sergi Jordà description of the importance of video documentation in the development of *Reactable* (2013), a tabletop electronic music interface controlled by tangible objects. With a team of developers, musicians and technologists Günter Geiger, Martin Kaltenbrunner and Marcos Alonso (Jordà et al., 2013), Jordà emphasises the use of video as an informal and exploratory approach to understanding user collaboration in new situations. The team employed video as a participatory approach for improving *Reactable*'s interface design through user feedback; they found video recordings shed light on how *Reactable* functioned in the wider context of group creativity and multi-player interaction.

Another important aspect of video is its use in documenting sound art. A crucial characteristic of sound works is their ephemerality; site-specific, technology-based artworks are perceived as temporal and contain a degree of obsolescence. Christiane Paul refers to time-based sound works as 'unstable, fluctuating endangered media that will eventually become obsolete' (2008, p.25). Therefore appropriate documentation and recordings are crucial to keep such works accessible in later discourse. Ina Čiumakova (2018, p.11) asks how we are to document soundworks when audio recordings are not sufficient? When sound works disrupt traditional behaviour patterns of artwork and audience, they require different presentation modes (ibid. p.46). Harold Schellinx, coordinator of the European Sound Art Network Resonance, goes even further; claiming that in some cases documentation will eventually substitute the original artwork (2013, para. 6).

There is a considerable body of sound-based works that will be only possible to ‘know’ (or experience) through available documentation. In such cases, as Schellinx and Čiumakova argue, it is the documentation that *becomes* the artwork (2018, p.57). It could be ‘official and intentional’ via catalogues, textbooks or authorised audio and video recordings, or ‘unofficial and accidental’, through hearsay, web blogs or YouTube clips.

5.1.2 Democratising, Destabilising and Re-Framing

The process of documenting time-based and transitory events using audio-visual media can be traced back to the Happenings and Fluxus movements of the mid 1960s and early 1970s. As mentioned in this chapter’s introduction, the artist Jan Dibbets practice altered from painter to sculptor to photographer during the late 1960s, it was a period that breached the barriers separating mediums, styles and art forms. With an emphasis on plurality and ‘transgressive’ thinking (across the boundaries of subject fields), affiliations were encouraged through the growth of interdisciplinary, intermedial and transmedial art-works.

The photographer Mike Leggett describes collaborating with Ian Breakwell on his *Unword* series (1969-70), a succession of Fluxus-like ‘event-performances’. The fleeting nature of these often-chaotic productions, in a space capable of accommodating no more than ten people, required photographic records of the events; visual records were the ‘objectification of the process, a need to leave a trace, largely through documentation’ (2012, p.105). He describes how his role shifted from documentation to becoming included in subsequent performances as ‘The Photographer’, thus generating a link as documenter and named performer. Leggett’s photographs extended the performances into objects of study.

When affordable video technology first appeared during the mid-1960s, it opened up new social horizons for art production. Most narratives on the origins of video art link the musician and sound artist Nam June Paik acquiring one of the first commercially available portable video cameras, the Sony CV-2400 Portapak. Paik tested the video camera by recording shots of New York’s traffic as it snarled to a halt during a visit by Pope Paul VI. Paik generated a tremendous reaction when he showed the tape that evening, hooking up his camera directly to a television monitor at the Café-au-Go-Go, a popular meeting place for Greenwich Village’s artists and

musicians. In Chris Kraus's examination of artistic enterprises that reclaim the use of 'lived time as a material in the creation of visual art', she asserts:

In 1965 Nam June Paik pointed a new Sony Portapak camera out of a New York taxicab window... Suddenly everyone could make movies... Within a few years, thousands of hours of videotape had been shot by new, self-trained documentarians. The equipment was awkward and heavy but the process was instant. (Kraus, 2011, p.127)⁸⁰.

Not only did a V-30H tape reel allow an entire thirty minutes of continuous recording (compared to the three minute runs of Super 8), the Portapak was handheld in contrast to the floor-bound video cameras in television studios. Yet video was not a stand-alone genre. Holly Rogers develops this claim that at its most basic level, videotape was an audio technology that could record and project sound and images simultaneously. On a more complex and performative level, 'it can synergistically unite many other disciplines such as music, painting, sculpture, poetry, dance and other forms of performance' (Rogers, 2013, p.76). Video acted as intermedial glue that brought together a convergence of action, sound and performance practices.

The burgeoning video art scene in North America coincided with emergence of body art, process and time-based work. In Nick Kaye's review of multi-media installation and performance practices, he states that early video artists' used videotape as a method of reflexivity, a way of engaging with live performance (2007, p.67). Many of these artists' interweaving of live, mediated and recorded performance repositioning video and photographic documentation as the main, or even the only means of accessing ephemeral art-events.

For instance one of the most celebrated early single-channel video works, Joan Jonas' *Vertical Roll* (1972), was itself a by-product of the multi-media work 'Organic Honey's Vertical Roll' (1972). Denis Oppenheim's action and earth works were presented as video, film and photographic documentation; they acted as a trace or index of a performance's ephemerality. Similarly the poet-turned-performance artist Vito Acconci's work intrinsically links video with live action and performance, while Bruce Nauman's early works blurs the distinctions between performance, time-based art and video work. This form of self-reflexive practice in video art provoked the

⁸⁰ Kraus, C. (2011). *Where Art Belongs*. Los Angeles: Semiotext(e) Interventio Series 8.

reframing of an original event into a new presence, a new ‘object’. Ina Blom argues video presents itself as a perfect autobiographical medium, it is a technology that allows continuous self-monitoring on digital devices that can be ‘big and small, cheap and expensive, stationary and mobile’ (2016, p.31).

In this current smartphone era, the idea of video can include practically any kind of combination of pictures and sound. As the tube, tape and disc are replaced by file, pixel and cloud, video has come to be an adaptable and enduring term that bridges all of these past technologies and the practices they afford. Michael Z. Newman argues that video has meant different things for different people at different times: ‘it is a history of ideas about technology and culture, of relations and distinctions among various types of media and the social needs giving rise to their uses’ (2014, p.1). Mobile phones are not the first precedent of the democratisation of visual culture; self-reflexivity has shifted from what was once an arts practice into a widely used form of expression. I am thinking of the self-monitoring practices such as Lynn Hershman Leeson’s *Self Portrait as Another Person* (1972), which could be said to prehend the term ‘Selfie’ before it become absorbed into common everyday language.

When the Nokia 70 mobile phone was released in 2006 it came pre-loaded with its own software *Movie Director* that allowed images, sound and text to be assembled into opening and closing title sequences. These could then be sent as multimedia messages. Kim Louis Walden puts forward the claim that Nokia’s *Movie Director* challenged the generally accepted concept of making ‘movies’; it heralded the beginning of users developing their own short form visual and textural practices (Walden, 2017). Writer and new media researcher Edgar Gómez Cruz contends that mobile photography apps have destabilised traditional notions of what a visual image means: ‘When users post a photo to Snapchat, and the image disappears after a period of time, it makes it increasingly difficult to say exactly what a photograph is, what a video is’ (Gómez and Lehmuskallion, 2016).

There an estimated 95 million images uploaded each day to Instagram⁸¹, the mobile social network that allows users to edit and share photos and videos. It is also estimated that more than 500 hours of video are uploaded to YouTube every minute, roughly equating to 30,000 hours of newly uploaded content per hour (Clement,

⁸¹ <https://www.statista.com/statistics/253577/number-of-monthly-active-instagram-users/>

2019)⁸². Viewed through the lens of mobile media practice, self-reflexive user-created content is forming new aesthetic and linguistic traditions that overturn and reframe the notion of video culture.

5.2 Capturing Mobile Mediated Experiences



Figure 5.1: A bicycle as a two-wheeled performance system. Source: Author.

Returning again to this research, I wish to recount how I began incorporating visual material as a method of capturing mobile mediated experiences. While investigating walking with my mobile-mediated system, I was also exploring the idea of cycling as a way of merging embodied and mediated modes of performance; the bicycle as an instrument in terms of energy and vibration. This notion was partly in response to seeing the Canadian conceptual artist Jean-Marie Delavalle's *Une demi heure* (1973), an installation comprising of photographs and a vinyl recording of a bicycle ride in the countryside⁸³.

Spending time on the Île de Ré off the west coast of France, I would explore the stretches of dedicated cycle lanes that weave between seawater salt flats and a wildlife nature reserve. I would attempt processing audio on my Android smartphone while

⁸² <https://www.statista.com/statistics/259477/hours-of-video-uploaded-to-youtube-every-minute/>

⁸³ <http://ccca.concordia.ca/traffic/artists/pages/delavalle.html>

riding a bike using Peter Sinclair's *RoadMusic* app (2014)⁸⁴, or with my iPad loaded with various iOS apps linked in Audiobus. Although it was a rudimentary set-up – holding up the phone in one hand or resting the iPad in the bicycle's front basket (see Figure 5.1) – it proved a thrilling experience.

Hearing the electronically processed sounds of the bike's gears and chain, my breathing and the wheels across different road surfaces, in combination with the smells coming from the salt beds, the sun's heat, the physical exertion and the passing landscape can only be described as truly immersive. As a last minute hack, I strapped my phone onto the bike's pannier to video these experiments and *Improvisation with a two-wheeled performance system* (2014) shows a typical example of these sessions⁸⁵. Watching the video we see the image jerk and bounce as the bike navigates its winding path across the wetlands, pausing every so often as if to catch breath. There is never a clear viewpoint; the viewpoint is broken up into zones by the hexagonal lines caused by the basket. As the camera shake degrades the image to the point of being a blur, the audio similarly seems to collapse in on itself. The footage has a rough reportage feel, it gives the impression of forward movement as well a sense of the location. In contrast to audio files made on a Zoom recorder, the video seemed to demonstrate some of the technical difficulty of combining several activities at once, keeping balance, forward propulsion, digital signal processing and recording.

Nevertheless, it was a hit-and-miss approach – the Android phone would record in short bursts before locking up creating large unwieldy files causing it to crash. It was often impossible to view the screen in direct sunlight, and on several occasions I discovered the record function was still in pause after a long ride. I needed a more reliable means of visual documentation and began to investigate various standalone video recorders.

5.2.1 Introducing the GoPro

Reviewing the options of commercially available mobile media HD cameras at the time, there were many relatively cheap off-the-shelf devices that let one continuously capture visual images. Options were the Narrative Clip, a small, wearable camera that includes location sensing, weighs approximately 0.7 ounces and takes a five-

⁸⁴ https://soundcloud.com/steve_jones/iledere-marais-android-02

⁸⁵ Media file: 22_TwoWheeledSystem.mov <https://www.youtube.com/watch?v=jIrqKCw3USE>

megapixel photo every 30 seconds⁸⁶, or the Autographer with its slightly larger form factor and extra sensors⁸⁷. After examining and deliberating the various options, I chose a GoPro Hero 3+ (2014), a lightweight wearable camera aimed at the adventure sports market.

Matchbox sized, battery-powered and encased in rubber, the GoPro 3+ is small, resilient and relatively inexpensive for all its technical capabilities. The camera records full high definition video (MP4 format, H.264 codec), has a 3-megapixel camera lens with video resolution settings that range from standard 720p to near broadcast quality 4K. It shoots at different speed settings, from 15 to 100 frames per second, and has the ability to extract individual images. Screen aspect ranges from close-up to super wide angle⁸⁸. The bulk of the operation systems are managed through a standalone mobile app and accessed through a localised Wi-Fi network.

5.2.2 How to Wear a Camera?

GoPro's manufacturer provides various accessories so that the camera can be mounted to a range of surfaces and objects. This allows the user to position the camera in different ways – such as creating a first-person view or selfie perspective, to capture oneself when driving, skating or surfing. Known among the GoPro community for his tutorials and product reviews, YouTube contributor MicBergsma suggests an alternative range of options from extended 'selfie' poles to drones, to even a mouth mount⁸⁹. But how could I wear a camera?

In their *investigation Lifelogging: You're Wearing a Camera?*, Katrin Wolf, Albrecht Schmidt and their team found the choice of where the camera is worn is significant in terms of social acceptance, usability, and the resulting images (Wolf et al. 2014, p.9). Different camera positions produce specific image characteristics. For example, the most natural seeming images are achieved when a camera is close to the user's eyes, capturing what the user sees. Yet mounting the camera on the body avoids head movement and thus produces more stable images.

⁸⁶ <http://getnarrative.com/>

⁸⁷ www.autographer.com

⁸⁸ There has since been a range of additional versions released, currently at HERO8, including an Omni-directional camera and a short-lived Drone edition.

⁸⁹ <https://www.micbergsma.tv/>

On the media file *Improvisation with Dom* (2014) we are able to see the head-mount point-of-view⁹⁰. The camera has a clear view of the iPad screen; the wide-angle aspect gives the sense of the rehearsal space, bare except for guitar amplifiers and a scattering of chairs. I am positioned close to Dom, we both acknowledge and respond to the sounds each other is generating. There is a sense of our engagement in an improvised and spontaneous exchange of ideas. However, the motion of my unconscious bobbing head very quickly becomes distracting.

One of the central motivations to record these improvisations was to help me to remember the situations during self-reflection, to capture the situations in real time and in some detail. Yet Wolf and her team suggest that self-documentation can also reveal more about personal patterns and activities, providing the potential to gain entirely new insights into processes (ibid. p.10). As an object of study into how a GoPro might offer an intuitive way of extending documentation, I now want to consider *Light & Feathers*, devised by John Richards and performed by Max Wainwright with the Dirty Electronics Ensemble. Wainwright's head-mounted GoPro offers a clue to what he experienced that night⁹¹.

Recorded in October 2014 at the KTH Reaktorhallen – a decommissioned nuclear reactor turned experimental performance space, 25m under the centre of Stockholm – the audio soundtrack originates from the camera's inbuilt microphone's proximity to the different sounding objects in the space. We can hear and see in close detail the buzzing, rattling of Richards' tin-can instruments, and the almost imperceptible electrical discharge from mechanical motors contrasting with the reverberating cavernous space of the Reaktorhallen. Being light activated, the mechanical motors spin faster the closer Max approached the bulbous light fitting. The interference between the light and camera created additional artefacts of horizontal lines scrolling across the screen, adding to the utilitarian aesthetic of the light fitting and the tin cans like a badly tuned signal broadcast from some distant analogue past. But is this simply a recording of an event-performance or is there something more going on here?

⁹⁰ Media file: 23_ImprovisationDom.mp4 n/a online.

⁹¹ Media file: 24_Light_Feathers.mov <https://steranko.tumblr.com/post/100083888093/dirty-electronics-light-feathers-dirty>

I would argue there are other complex layers that go beyond the simple act of documentation. In the video, the accidental strobing and Wainwright's movements through space are captured in a way a static camera could never do. Although Max was wearing the GoPro, he had no viewpoint and was unaware of the images the camera was capturing. The device has its own point of view; it does all the work — the heavy lifting, so to speak. Considered this way, the camera is transformed into a performer too. It also reverses the roles in Breakwell and Leggett's *Unword*. Now the 'Performer' becomes the 'Photographer'. The act of recording and performing is inscribed in the work, allowing the event-performance to be retrieved, relived and reframed. The resulting video is the remaining trace of an event that an audio recording or a tripod-mounted camera would have been unable to capture. As Mike Leggett affirmed to his audiences during the 1970s:

The performance is but one stage in the event-process, a process encompassing gradual conception of idea/format, realisation of that conception through performance, and progression from there through documentation⁹².

I would argue the video documentation extends the performance into an object of study, it provides some of the contextual contingencies of the performance. A viewer is invited to reflect on the physicality of Max Wainwright as a performer, by entering the performer's space of the frame. The video describes a reconfiguration of the traditional relationship between a musician, instrument, body and technology.

5.3 The GoPro as a Performance System

In the field of experimental film, Michael Snow, Tony Conrad and Stan Brakhage understood that it was through pushing the limitations of a medium that an artist might find its potential for creation. Taken from this perspective, I hoped to develop a more expansive notion of a performance system. In order to do this I needed to forge working relationships with artists outside my immediate field of knowledge. I embarked on a series of audiovisual 'duets' with videographer Prisca Lobjoy, and *Above/Below* (2014) is an example of the work we created together. The video

⁹² Leggett, M. 2012. Liveness, Performance and the Permanent Frame. in Cubitt, S. Partridge, S. (eds.) *Rewind|British Artists' Video in the 1970s & 1980s*, pp.105-119.

demonstrates Prisca operating the GoPro while I improvise with the iPad⁹³. The GoPro's waterproof protective casing allows the camera to be used in water – and it was this aspect that Prisca was interested to exploit visually.

Above/Below begins with the camera plunging into a swimming pool. As it submerges the sun can be seen overhead, along with the vapour trails of a passing jet plane. The soundtrack picks out the Doppler effect of an unseen light aircraft above the gurgling of the pool's cleaning system. Stood at the pool's edge, I was using a performance system of Echo Pad (2013), TWRRecorder and Audiobus, while the sound was amplified through a small portable loudspeaker. In this single moment there are different levels of observing, multiple levels of existing happening all at once: underwater, on land, in the air.

The video captures the rhythm of Prisca's physical motion as the sound and image combine above and below water, cutting through the surface, exploring the physicality of sound through a direct involvement with the water. Swimming becomes a means of embodied experience of movement in an environment. The constellation of body-imagination-world is an experiential, first-person relationship to environment generated by walking (or swimming) through it (Solnit, 2001, p.291). The further the abstraction of sound, the further the image breaks down. As the soundworld becomes unrecognisable, the view from the GoPro mirrors this disintegration. The video portrays multiple states each existing simultaneously, it converges the notions of what is real/unreal, what is above/below.

Another example of our collaboration is *Washing Up # 1-3* (2014), taken from a series of 'kitchen sink studies' recorded at the Performing Arts Foundation (PAF), St Ermé⁹⁴. The kitchen studies expand on the ludic approach to a GoPro, situating it in a domestic setting as another way of challenging its extreme sports aesthetic⁹⁵. We decided to work to a set of pre-agreed rules; each improvisation was to be a continuous shot and held within a time limit. Prisca would wash dishes holding or wearing the GoPro, while I would manipulate the sounds she made through my iPad, which she in turn would listen to on her headphones.

⁹³ Media file: 25_above_below.mov <https://bit.ly/2PFQvoj>

⁹⁴ Media file: 26_washingUp_02.mov <https://bit.ly/2CQh4oa>

⁹⁵ Examples of GoPro's aesthetic associations can be seen here: <https://youtu.be/SN25SD6Kw2s>

With the GoPro 3+ having no physical viewfinder, it presented a real challenge that called on Prisca's experience of shooting with film and video: she had to imagine what the resulting images would look like. I encouraged her to think of it almost as *playing* the camera like an instrument. As she responded to the sounds of my signal processing in her headphones, the camera captures her movements, her physical gestures through space and water.

The act of washing up might be considered an everyday chore, an enterprise most people might identify with. Sarah Pink proposes that domestic activities can often reveal hidden routines, skills and pleasures that demand as much intelligence and imagination as music and weaving (2009). From a theoretical aspect, formalising domestic activities transforms them into events. From a semiotic point of view, the camera's eye gives an altered perspective of an ordinary situation; we are not usually accustomed to seeing washing up from the crockery's perspective. It presents an alternative look at reality. This chimes with Bob Ostertag's description of creative practice with technology as an opportunity to see life '...as if from a new angle... at least for a moment... and see things from a new perspective' (2009, p.8). From a technical aspect, the GoPro's waterproof protective casing creates analogue, in-camera effects such as the visual distortions caused by water on the lens. The waterproof housing also allows its internal microphone to register sound waves moving through water with unusual clarity. Now the camera is employed not only for capturing visual images, but also a hydrophone.

Through collaborating with an artist like Lobjoy, I discovered the GoPro was able to capture audio and visual data in an innovative way. Worn or held in the hand, it could be a means of capturing the embodied experience of movement. GoPro's distinct visual aesthetic had also become rolled into the artistic interventions; the associations made with GoPro videos repositioned into the context of experimental mobile performance. From this perspective, a more expansive notion of a mobile performance system is starting to emerge.

5.3.1 Visual Modality in a Performance Environment

This research is not the first to claim that visual modality can be an accessible part of mobile music performance. Patrick O'Keefe and Georg Essl have suggested the use of cameras, projectors and camera flashes can lead to visually intriguing performance

possibilities (2011). Using pico-projectors to project images on arbitrary surfaces and objects while moving or considering the camera flash to create stroboscopic effects, O’Keefe and Essl developed their own ‘mobile performance meta-environment’ – *urMus* – similar to painting with Processing and OpenGL textures on a computer screen. Their attempts to extend the visual output capabilities of a mobile device in performance situations can be put in context of other studies using portable projectors (Cao, 2006, 2007; Park and Kim, 2010; Wilson et al., 2010; Boring et al. 2010), particularly the works of Michigan Mobile Phone Ensemble. But while these studies suggest a device’s built-in camera can act as a sensor input while its screen and projected images act as output, O’Keefe and Essl argue that visual integration in mobile music performance is an area that remains to be thoroughly explored.

I mention these examples of related works to position the next study I wish to discuss, recorded during a collaboration between the Culture Lab, Newcastle University, Music, Technology and Innovation Centre at De Montfort University, and the Centre for Digital Innovation, Tongji University, China. Although *One Knob To Rule Them All: Reductionist Interfaces for Expansionist Research* focused on design issues in building and coding instruments within the framework of NIME research (Bowers, Richards et al., 2016), it was also an opportunity for me to expand on the idea of the visual in a performance environment.

At first, my contribution to the project was to theorise the notion of a reduced performance system of one device, one lead and one sound source. During the concert program my role shifted to considering the iPad as a performance *facilitating* system. Connecting to a large projector screen, the iPad provided text information about the research collaboration, suggested hashtags for tweeting about the event, and invited the audience to keep their phones on during the concert. At the same time I was documenting the proceedings with the GoPro, moving around the space while projecting a live feed onto the screen using the GoPro app in record mode. This afforded a roving-eye view from both the performers and the audience’s perspective, although it was often difficult to determine where it was coming from.

The video *One Knob Extracts* (2015) features footage from two separate GoPro cameras, one shot by performer Jim Frize, the other shot by myself⁹⁶. It offers a stereoscopic view, presenting two slightly different views of the same concert and layers them to produce the impression of a multilayered scene. Sometimes my GoPro was passed around the ensemble players, for instance to highlight a recorded roadside performance from a smartphone's screen. At other times it was used show a broadcast direct from Tongji University in Shanghai, pointed at a laptop screen that created serendipitous video feedback loops when both images were onscreen. Like this, the GoPro was introducing different performance spaces from alternate time events into the venue. Max Neuhaus tells us, 'When you change scale, you start to look at things differently' (1993, p.2). Magnifying and transposing scale and placement brought new elements to the performance, and although I was not contributing to the audible aspect of the concert the camera was still a crucial member of the ensemble.

It was only as the concert approached its finale, and all the musicians began to play louder and louder to reach a crescendo, that I realised my performance system was comparatively silent. How could I make my voice heard with essentially a soundless medium? Being forced to improvise with the limitations at my disposal, I decided to leave the concert hall and head out towards the street. I was aware that the camera's images would continue to be projected onscreen – GoPro has the capacity to stream images up to 250 metres – and mentally gauged how far I had gone. As the event's theme was investigating minimalist interfaces, I thought about the GoPro's single operating button on the front was a simple binary function that turned the camera on or off. I pressed the button.

Inside the concert hall, the musicians had finished playing. The projected camera image from outside stuttered and hung as it reached its streaming limits. At the same time the roadside performance movie on the mobile phone could still be faintly heard, by chance suggesting the sound was emanating from outside the building. Finally the screen went blank, leaving a message requesting the GoPro to reconnect to the wifi.

⁹⁶ Media file: 27_OneKnobExcerpts.mov <https://vimeo.com/176276937>

The audience, laughing and applauding, accepted this as a form of musical coda and so the performance was brought to its conclusion ⁹⁷.

Mobile mediated performance suggests that roles and media can be expanded on, interchangeable. In this case study the iPad had been repositioned as a performance facilitating system while the GoPro camera was now considered as a performance system in its own right. The traditionally intimate relationship between body, instrument, and sound production is turned inside out. The camera is an extension of the performer - in effect a silent instrument - and the performance combines the ability to control this instrument with complex, unpredictable, and ever-changing environmental factors. To reiterate Ina Čiumakova's claim (2018), when action-based soundworks disrupt traditional patterns of artwork and audience, they require different presentation modes.

The questions that mobile mediated practice provoked and the kind of creative outcomes it was producing appeared to be taking me beyond the borders of music making. However the above example was held in a concert environment. What are the implications for using a camera as a performance system in an open, public space, in everyday scenarios? How can mobile camera technologies expand, complement, and question such experiential relationships to the environment rather than alienate them?

5.4 I Am The Passenger

The Passenger (2015) is another autoethnographic series recorded in Paris, as I spent a lot of time commuting across the city while renovating an apartment. I was routinely making recordings as a form of self-monitoring practice, for managing time spent in transit as well as enquiries for this practice-based research. *Slowlapse walk* (2015) shows my daily walking route to the metro station, signal-processing sound on my iPad while wearing the GoPro on my belt ⁹⁸. Often I would inadvertently change the camera speed settings by accident – shooting in time-lapse, photo burst or slow motion. By chance, I discovered that altering the speed of visual captation on the camera introduced a perceptual disjunction between image and sound.

⁹⁷ It was only later that I discovered this information; at the time I had no idea of how my role had been received.

⁹⁸ Media file: 28_Slowlapse.mp4 <https://steranko.tumblr.com/post/148470441888/slowlapsewalk>

While assembling the audio and video files in GoPro's editing software GoPro Studio, I discovered its FLUX feature, that analyses footage frame by frame and inserts new frames based on the original ones. FLUX appears to struggle with blending the frames together in time lapse or slow motion, as it attempts to smooth out the transitions (see Figure 5.2). I continued experimenting with the limitations of FLUX, and the serendipitous results from pushing it to its extremes.

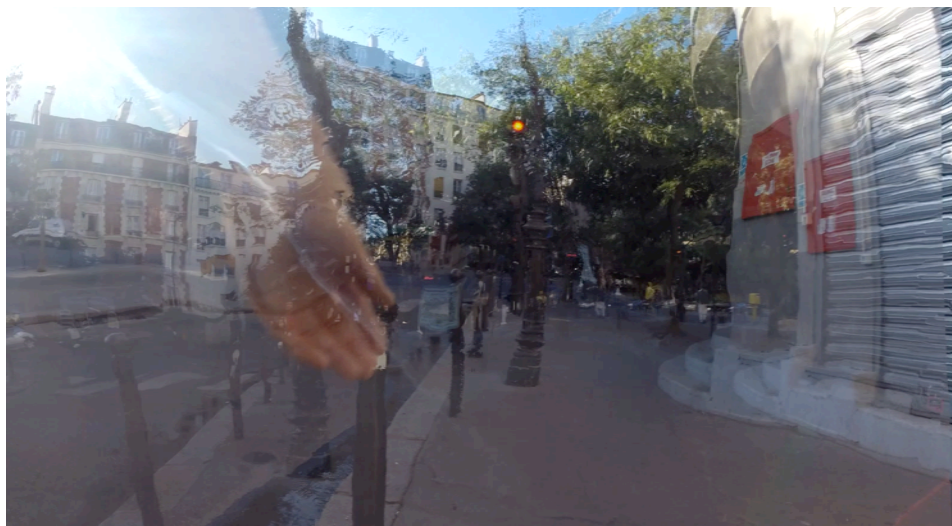


Figure 5.2: Slowlapse walk (2015). Screen grab.

For instance, the video *Sidewalking* (2015) is shot from a bus window⁹⁹. In contrast to the hectic pacing of the earlier SoundWalking works, the camera gaze is directed outwards and shot in slow motion. It observes the regular passing of familiar landmarks, people and objects found in the city from the point of view of 'The Passenger'. The audio runs in real-time, contrasting with the frozen world of the pedestrians outside. The vehicle's halting at a bus stop becomes elongated into a seemingly endless wait, perhaps stretching the viewer's patience as well.

I became fascinated by the effect of slow motion, slowing down and stretching familiar and habitual journeys. It seemed to reveal hidden patterns and unconscious gestures of passersby that I did not initially register. Although slow motion scenes are the simplest of all special effects, film theorists have contended that 'slo-mo' has the potential to enhance sensory experiences (Bel. 2013, p.156). Mieke Bel quotes Fillerman-Lewis to argue that slo-mo in film promotes a subjective involvement; slow

⁹⁹ Media file: 29_SideWalking.mp4 <https://steranko.tumblr.com/post/151141399108/thepassenger-sidewalking>

motion tends to ‘ritualise and solemnise movement’ (1993, p. 181). Conceptually the Passenger videos draw from this notion, employing slow motion to generate a disjunction between sound and image that sits somewhere between memory and dream, but hopefully exalts and celebrates the practise of commuting.

Commuting is often thought of as a passive or repetitive routine. It is a feature of what Henri Lefebvre called *le quotidien*, meaning the mundane, the everyday (2004, p.ix). Yet commuting can reveal hidden aspects to public places, of synchronised social rhythms and colliding, multiple time scales. Tim Edensor (2011) tells us that Lefebvre’s *Rhythmanalysis* (2004) offers a starting point for investigating the complex temporal rhythms of the multiple mobilities that course through space. Rhythmanalysis is a way of addressing the rhythms that circulate through life. Rhythms that can be registered as either macro or micro, linear or cyclical, operating on circadian, weekly, monthly, seasonal, annual, lifetime, millennial, even geological scales (2011, p.189) ¹⁰⁰. The synchronisation of thousands of rhythms shape routine urban experience, they reiterate social practices ranging from work and leisure rituals, the ‘repetitions and regularities that become the tracks to negotiate urban life’ (Amin and Thrift, 2002, p.17). Contemporary everyday life conforms to the clock; from rush hour, the school run, lunchtime or lively evenings out, spaces in the city are under perpetual change. Edensor offers that the rhythms of commuting add to this social mosaic.

Although represented as dreary and alienating, the very consistency of the repetitive rhythms of daily travel can also permit a diverse range of pleasurable effects. Looking out the window of a bus gave me a sense of comforting reliability. I was moving yet stationary. Scenes, landmarks and passersby appeared as a moving tableau, drifting into view and then moving on. Sitting on the metro carriage, the view would shift from light to dark, to light again. The scenery swished by and the carriage engine would vibrate with a murmur lulling me into a state of relaxation by the gentle rhythms of mobility. *Commuter with a tape delay* (2015) reflects this state of mind as I set off each day ¹⁰¹. It also demonstrates how listening intensely to the sound though

¹⁰⁰ Many residents depart from Paris during the summer, leaving only workers, tourists or those who cannot afford to go on holiday. This year also saw the beginning of influxes of refugees arriving from Syria and Africa, with a gradual build up of tented settlements along the river or any small green spaces.

¹⁰¹ Media file: 30_Commuter_TapeDelay.mp4 <https://www.youtube.com/watch?v=E-kWflXXOjY>

Dahlia Delay (2015), a simple tape style delay effect with filtered feedback, heightened the experience of commuting.

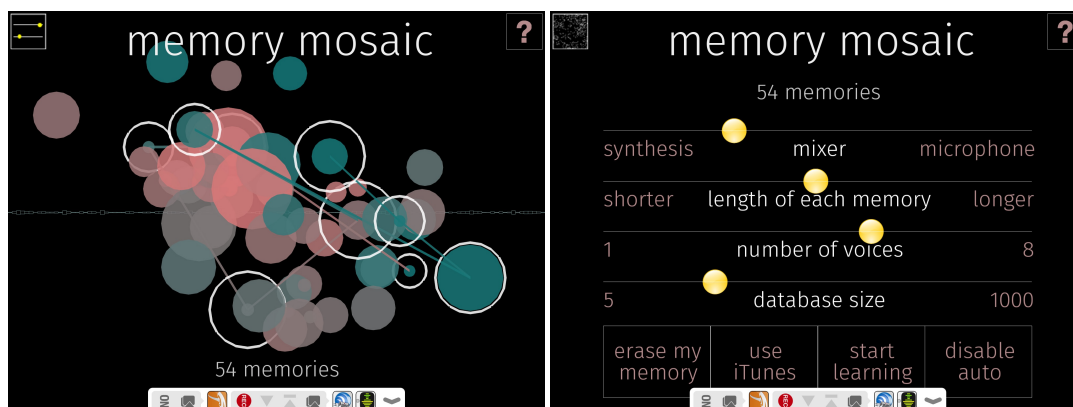


Figure 5.3: Using Memory Mosaic in Audiobus. Screen grabs.

This perceptual disjunction between image and sound is expanded on in the following case study; *Commuter: Rhythm Mosaic* (2015)¹⁰². Adding Parag Mital's *Memory Mosaic* (2015) into the Audiobus chain produced a far richer sonic texture. Rather than a straightforward delay effect, the Memory Mosaic app synthesised the opening/closing doors, alarms and station announcements ricochet and repeat into a kaleidoscope of sound. In comparison to *Dahlia Delay*, Memory Mosaic is a generative app that records, organises and plays back audio from a database based on similarities in timbre¹⁰³. Sound samples, or what Mital refers to as 'memories', last either a fraction of a second or continue up to a few seconds in length. These are gathered in clusters and played back by the app's own learning algorithm, or through physical screen interactions (Figure 5.3 left). Playback control can be balanced between the microphone input or the automatically created synthesis (Figure 5.3 right), while the introduction of Turnado into the mix allowed for a further level of effects processing.

It is striking how the video's slow motion reveals the hidden patterns and unconscious choreographed movements of the passengers on the opposite side of the platform. Film theorist Ina Blom writes that once the synchronisation of video image and sound slips, the presence of a deeper media layer of micro temporal speeds is felt (2016, p.199). Gazing out of the windows in such close detail, the Passenger videos

¹⁰² Media file: 31_RhythmMosaic.mp4 https://www.youtube.com/watch?v=kjSX_jWmxUQ

¹⁰³ There is an option to use music in an iTunes collection too, but these experiments are focused on real-time signal processing.

also stood somewhere between distancing and interrogation. They also provoked questions regarding observing and being observed, on the state of watching and being watched. But one of the ethical issues confronting a researcher is how to manage the convention of anonymity and confidentiality in relation to visual material. These works mark a significant difference between using the GoPro for documentation, which demanded some careful thought and perhaps some methodological adjustments.

5.5 Covert Recording

Is it acceptable to take images of people without them knowing about it, is it surveillance or voyeurism? Small, commercially available HD cameras like the GoPro have the potential to disrupt our current understanding of what is ‘socially acceptable’. Katrin Wolf and her team argue this new generation of cameras are disturbing social boundaries in much the same way the Kodak camera did over a century ago, prompting society to reflect on an individual's ‘right to privacy’ (Wolf et al. 2014, p.8). However our right to privacy is compromised each day, as the number of surveillance cameras a person encounters on a daily basis rises steadily. Most people do not consciously think about surveillance cameras or change their behaviour because of them. It seems that society is becoming accustomed to cameras everywhere.

Again, are the videos under discussion surveillance or voyeurism? Kevin Macnish’s investigation into Surveillance Ethics defines surveillance as paying close and sustained attention to another person: ‘...distinct from casual yet focused people watching, such as might occur at a pavement café’ (2017). With surveillance, the surveillant gains power over the surveilled through the gathering of information or through distancing a person and judging them as acceptable or unacceptable (Boyd, 2010). Voyeurism, on the other hand, is defined in the Cambridge dictionary as ‘the activity of getting pleasure from secretly watching other people in sexual situations or, more generally, from watching other people's private lives’¹⁰⁴. Tony Doyle (2009) argues that voyeurism is simply wrong, and can cause grave harm if detected or publicised. I would argue the videos made during this research are neither surveillant

¹⁰⁴ <https://dictionary.cambridge.org/dictionary/english/voyeurism> accessed 17 November, 2019.

nor are they voyeuristic. But clearly it must make a difference if a camera is worn on the body or operated hands-free (and thus covertly).

While making these videos, I attempted to draw on historical and contemporary parallels of artists using a camera in a public arena to generate their work. Covert photography has been a method of avoiding the artifice of conventional studio portraiture, most famously Walker Evans and Helen Levitt's hidden camera portraits on New York's subway (1938-41, 1978). Other influences are Mike Goldwater's London Underground (1970-1980), Marc Augé's 'In the Metro' (1986, 2002) and Stefan Rousseau's 'Riding the Tube' (2019). Walker Evans claimed photographing his fellow passengers surreptitiously and at close range allowed him to capture his subjects unposed, lost in their own thoughts: 'Stare. It is the way to educate your eye, and more. Stare, pry, listen, eavesdrop' (1960, cited 2004, p.197).

Taken from this stance, is there is a difference between eavesdropping through covert photography or field recording? Because recording devices are much easier to hide than camera devices, covert audio recordings are illegal in most jurisdictions (Wolf, et al. 2014, p.11). Eavesdropping aurally is much more regulated because audio recordings are often intimate in nature and do not qualify as 'public'.

5.5.1 Ethical and Legal Issues

Wearing a camera in public raises ethical, if not legal, questions. Laws vary widely, even within EU member states, and Wikimedia.org provides a comprehensive overview of consent requirements worldwide for photography¹⁰⁵. FOCI practical guidance states neither members of the media nor the general public need permits to film or photograph in public places, and Chief Police Officers have made it clear that only highly unusual circumstances should prevent the taking of pictures in a public place¹⁰⁶. In France, photographing and filming in public places may take place without prior approval for minor operations such as handheld or tripod camera reports, architectural or fashion photographs with or without a tripod stand, and training school exercises¹⁰⁷.

¹⁰⁵ https://commons.wikimedia.org/wiki/Commons:Country_specific_consent_requirements

¹⁰⁶ <https://www.theiac.org.uk/resourcesnew/filming-in-public/filming-in-public.html>

¹⁰⁷ <https://www.diplomatie.gouv.fr/en/press-room/terms-and-conditions-for-filming-in-france/>

The organisation *filmlondon* advises filmmakers there are several rights that apply to the use of a person's image that needs consideration when filming in a street in London or the UK ¹⁰⁸. They warn not to use images of an individual in a manner that could be defamatory or lower a person's reputation, and to avoid any manipulation of an image that suggests a context or meaning that was not part of the original image. UK's Ofcom Code states that it is acceptable for broadcast television programmes to film in a general manner in a public place, providing the footage is brief, incidental and an individual is not engaged in a personal or private activity: 'If an individual is the focus of a particular shot or video then consent is essential.' The European Convention on Human Rights and the Human Rights Act 1998 states that everybody has a right to a respect for their private and family life, their home and their correspondence. Where possible, it is wise to obtain written consent from anyone shown on camera.

Visual images of young people and children pose particular difficulties. The law around the process of consent for children to participate in all types of research is complex, and relates to the notion of capacity or competence (see Masson, 2004; Alderson & Morrow, 2004; Heath et al, 2007). There is no law against photographing or filming children provided the images are decent in nature. Children can be filmed in public places but parental consent is needed at all times ¹⁰⁹. Rose Wiles and Jon Prosser argue that informed consent is a central principle in ethical research and researcher-generated images (2008). Researchers can easily hide from public view when taking photographs or use strategies that conceal the subject of the photograph or devices, such as a telephoto lens, that enable photographs to be taken from a distance (Prosser, 2000).

Yet it has been argued that much visual material makes the anonymisation of individuals or locations problematic, if not impossible (Clark, 2006). While many visual researchers may not condone covert strategies, they might question whether it is necessary to always obtain consent from individuals who are the subject of photographs, sometimes when taking images of groups of people in public spaces or at events it is not always practical, or indeed necessary, to obtain consent from people

¹⁰⁸ <http://filmlondon.org.uk/filming-people>

¹⁰⁹ <https://www.theiac.org.uk/resourcesnew/filming-in-public/filming-in-public.html>

present (Wiles et al. 2008). Particularly in major European capital cities like London and Paris where the tourist's gaze is omnipresent.

5.5.2 Obscuring Facial Features

One of the ethical issues confronting a researcher is how to manage the convention of anonymity and confidentiality in relation to visual material. *Waiting for La Joconda* (2014) captures a visit to the Louvre museum, and my attempting to move through the crowds to see its most famous exhibit, Leonardo da Vinci's Mona Lisa (or La Joconde)¹¹⁰. Posting the video on YouTube, I was concerned that I had no consent from any of the visitors included in the video. YouTube was prototyping its own face blurring software, warning it was at a beta testing stage and as the video shows, the algorithm had a scattergun approach to obscuring multiple faces, introducing artificial artefacts that sometimes hover in space.

An alternative method of obscuring people's identity is the pixilation of facial features in order to blur them. There is also anonymisation software that converts visual images into cartoons or drawn images for blocking out eyes, faces or other distinguishing features¹¹¹. Blurring or obscuring facial features is a contentious practice and has been subject to criticism by social researchers (Williams et al, p.7; Sweetman, 2008). Some researchers criticise obscuring faces in that it objectifies people, and removes their identity.

Without faces people appear not as individuals but as objects. It does not accord with the duty to treat people with respect; indeed one might argue that it becomes too easy to fail to treat people with respect when we cannot see their faces (Prosser, 2000; Rose, 2007). Furthermore the way that images are consumed may be different to that which the researcher intended (Gold, 1989; Pink, 2007). This indicates the need to carefully consider the implications of using images of groups or individuals. Wiles and Prosser conclude it is crucial that a researcher is able to understand, articulate and argue why they have the ethical or moral case for the decisions they make about the design of their research. Therefore as a practice-based researcher, justification must be provided for these research-generated images that have emerged through the

¹¹⁰ Media file 32: LaJoconda.mov <https://steranko.tumblr.com/post/96259264868/waiting-to-see-la-joconde-aka-mona-lisa-one>

¹¹¹ <http://www.virtualdub.org/> http://compression.ru/video/cartoonizer/index_en.html

research process. With the following two examples I will attempt to present my case for employing the visual parameters of mobile mediated performance.

5.6 Je Suis Charlie. Place No. 3 (2015)



Figure 5.4: Place No.3 (2015). Source: Author.

Place No.3 comes from a group of videos that capture a huge public rally held in the Place de la République in Paris ¹¹². It was one of a series of demonstrations that took place in cities across France on 10 and 11 January 2015 to honour the victims of the Charlie Hebdo shooting, the Montrouge shooting and the Porte de Vincennes siege, as well as voicing support for freedom of speech. It was estimated that more than 1.5 million people were assembled there that Sunday ¹¹³. As the *attentats* impacted on my neighbourhood, I went to the rally in support and stood there listening to the crowd singing and chanting, sometimes bursting into spontaneous applause at the sight of the police in acknowledgement of their response to the attacks. As the rally began to slowly head south of the city, I took my iPad to record the sounds using my performance system of Audiobus, Turnado and TWRecorder, holding the GoPro aloft as I walked around the square.

Like everyone else with their cameras and phones, I was caught up in the outpouring of collective shock and defiance, and wanted to capture this momentous

¹¹² Media file: 33_PlaceNo.1.mp4 <https://bit.ly/2XS6iYa>

¹¹³ <http://www.leparisien.fr/societe/en-direct-marche-republicaine-la-place-de-la-republique-noire-de-monde-11-01-2015-4437327.php> accessed 24 November, 2019.

event. I admired the French culture of public demonstration as a civic right, the realisation the figure of Marianne served as a historical symbol of a nation and its people. And now I was employing my mobile performance system as a way of engaging with the society I had found myself in, as an expression of my experience of being there.

Robert Arnes quotes Susan Sontag to argue that video recording extends from serving power to expressing private experience, from surveillance to self-observation (1978, pp.1-24). Jacques Attali tells us: 'Recording has always been a means of social control, a stake in politics, regardless of the available equipment (1985, p.85). Now video recording had shifted far from performance documentation; it was as much about creating a sense of identity. Place de la République is now a site of regular demonstrations and video images streamed from participants' mobile phones on platforms such as Twitter's Periscope during 2019 portray a very different landscape. Now there are live images of running battles between demonstrators, anarchist factions and riot police, often swathed on clouds of teargas ¹¹⁴. In hindsight, the Je Suis Charlie videos are a first-person account of my experiences that day. They are an evocation of a memory.

5.7 Walking/eating/driving (2016)

Recorded during the summer of 2016 at Redcar, Teesside, *Walking/eating/ driving* is similar as a remembering of a cultural and social event ¹¹⁵. The video comes from a period when I was organising my mobile mediated walks using a set of Fluxus-like rules:

1. *Walk one direction while recording.*
2. *Return by a different agency and means of recording.*
3. *Assemble the two recordings.*

With my iPhone 05 I walked along Redcar's seafront, recording with a mobile performance system of Audiobus, Samvada, Deregulator (2015) and TWRecorder

¹¹⁴ 'En direct de la manifestation du 5 décembre' via @ybouziar:
<https://www.pscp.tv/w/1MYGNPyYezNxw> accessed 5 December, 2019.

¹¹⁵ Media file: 34_WalkingEatingDriving.mov
<https://www.youtube.com/watch?v=GV4fStiS8Xo&t=5s>

directly to the phone. The audio was processed through Samvada's comb filters, lending a solemn church organ-like element to the sound of passing conversations and traffic. The sustained chords are jolted into a rhythmic pulse whenever I tapped on Deregulator, chopping and changing between subdivisions of the tempo by selecting its random generator setting ¹¹⁶. Every now and then I would accidentally brush Samvada's 'sitar strings', but these errors are absorbed into the looping swirl of voices and blocks of chords. The resulting sounds are recorded in stereo directly to TWRRecorder.



Figure 5.5: Walking/eating/ driving (2016). Source: Author.

The journey then proceeded in the opposite direction, this time as a passenger in a car. Propping the iPhone against the car window I shot the video in slow motion mode (Figure 5.5). What had taken eighteen minutes to walk in one direction took only several minutes by car, despite stopping at pedestrian crossings.

As context behind this piece, it was made the morning after the UK referendum on whether to leave or remain in Europe. Redcar had voted overwhelmingly to leave, and as I headed along the seafront I felt hostile to the people walking past me. As mentioned in this thesis introduction, I have been based in two countries, the UK and France, and the referendum result seemed to herald a momentous occasion: one that would have a direct impact on my life, my family and my work.

¹¹⁶ Note: Deregulator is no longer available on the App Store; instead its developer Savelii Kaliupanov has released Lalalab (2019), based on Deregulator's processing engine.

Roughly playing back the files together on my phone, I found both audio and video neatly fitted together – the walk in real-time and the drive-by in slow motion. Assembling the files in GoPro Studio, keeping the gaps and interstices, the static shots are deliberately slowed to the point of stillness. Slow motion gave a sense of suspended animation that forced me to contemplate to people I had recorded. Despite our political and cultural differences, I realised we still enjoyed the same simple pleasures – walking, eating and sitting in the sunshine. Now mobile mediated experience was becoming a way to help me try to understand the cultural and political situation I was facing. This, then, is my attempt to reconcile with the country where I was born.

But where is this work to be placed, how do I set about defining it? Is it social documentation or is it self-historicisation? Is it multimedia, or intermedial? It uses site-specific sound, but it is not sound art. It uses video, but it is not video art¹¹⁷. I would contest walking/eating/ driving is probably the final expression of the research enquiries described in this thesis. The work draws from everything I have learnt over the duration of this practice-based research; capturing sounds picked up by the iPhone's mic, improvising with the material, the situation it is held in. It demonstrates my becoming familiar with the limitations and workarounds of the various apps chained together.

It is the final and probably the most successful of the entire portfolio as a complete artwork. The sharpness of the lighting, the horizontal framing elements split the screen into three zones of activity. The lengthening of time allows the viewer the space to look at the scenarios, the people that glide in and out of shot. The camera investigates and interrogates the objects before it, searching almost for access to their essence. They are everyday objects of material culture and humans bodies enacting the rituals of holiday. And through practice-based research, experimenting with a mobile video camera in a wide range of situations and contexts, and through collaborating with other performers, musicians and artists, everything converged in a single artwork made on a single device. An artwork that is unique to mobile media.

¹¹⁷ Although the work was selected for SEGNALI 2017: Audiovisual, Performance & Arts International Festival, Perugia, Italy.

5.8 Concluding Remarks

To summarise the ground covered in this chapter, I have suggested my decision to investigate the multifunctional nature of mobile media has brought me to a position where I now consider the camera as a primary source of media captation. I am interested in how is video asserting itself in relation to mobile performance, and how the resulting works might be interpreted as a trace of embodied presence. A camera lens is simply one of a mobile device's input modalities, like its inbuilt microphone, touchscreen or accelerometers. As most mobile phones and tablets have at least two camera lenses, rhetorically, it is impossible not to consider the camera.

The studies and works submitted here follow on from historical and contemporary precedents of artists documenting their practice with visual media, and those who explicitly linked video to their engagements with live performance. Hence, these artists provide the contextual grounding for this research's generated images, as they have shifted from research documents to become an approach to self-documentation, self-monitoring or 'lifelogging' everyday situations. As Sarah Cook states, in this process artists are the ones placing their works or their practice in the art historical context: 'In fact, this self-awareness around the historicisation process is even manifest in new media art itself '(Cook, 2014, p.213). The work undertaken in this chapter act as a record of personal, societal and cultural change. They are about constructing identity, forming relations and managing memory.

To help position my argument that these works demonstrate how the mobile media camera offers a phenomenological investigation of the world, I draw on Gabrielle A. Hezekiah's *Phenomenology's Material Presence* (2010). Hezekiah recognises videos' ability to offer up a suspended animation from which our habitual mode of looking at the world is bracketed and a new vision emerges. In her examination of the work of Robert Yao Ramesar, the author argues video techniques that lengthen and distort time, what is often regarded as an artistic object, creates a gap in vision; something essential is revealed in the seeing and video offers a way to contact with that experience, to contemplate the image 'as a repository of unfolding presence' (2010, p.3). According to Hezekiah, phenomenology can be taken as a framework for understanding an artistic intention, where experience, subjectivity and presence are combined in a profound and palpable investigation of the world. She

contends that video performance mirrors the investigations of phenomenological philosophers – to ‘see phenomenologically’. For a phenomenologist like Merleau-Ponty, vision is enabled by having a certain distance between the seer and the ‘thing’:

‘Thus when the seer is caught up in what he sees, it is still himself he sees: there is a fundamental narcissism of all vision...the seer and the visible reciprocate one another and we no longer know which sees and which is seen’ (1968, p.139).

We gaze at the screen and the objects gaze back out at us. This distance constitutes the medium of access to vision, the screen through which vision becomes possible – an apt metaphor for the ways we experience vision on our mobile screens. From this perspective, I have taken the notion of wearing a camera as an instrument of mediation, as an interface between the body of artist and viewer that brings an embodied perception of the world. Musicologist Nicholas Cook proposes the combination of sound, music and video is transforming into new forms of audiovisual experience. One that Cook argues goes beyond music when: ‘The burgeoning of new forms of music production and consumption in which the auditory and visual parameters are treated as effectively continuous’ (2013, p.55). As a reflection on the experience of perception, phenomenology or the sense of being-in-the-world offers a valid framework for describing mobile mediated experience.

Meanwhile future iterations of mobile phones suggest they will possess multiple camera lenses for 3D depth imaging, Augmented Reality and Artificial Intelligence (Gibbs, 2018). The P30 Pro Huawei’s Leica quad-camera system, or the Xiaomi Mi Note 10 with its 108MP main sensor, 2 telephoto lenses, ultra-wide lens and macro camera (Bedford, 2019). Cameras on mobile devices are set to extend our way of engaging with the world visually, and in doing so bring changes to how we understand ourselves and that world. In this chapter, I have argued it is important to examine this visual modality; it is an area of research that is under-investigated in mobile music studies. Examining the mobile camera has led me to consider myself almost as becoming a camera. And as part of my contribution to the field of knowledge, I have developed a wholly mobile-based body of work that is visual as well as auditory.

Chapter 6. Conclusions

This thesis has investigated the mobile paradigm in the context of electronic music, sound and performance, and the various strategies and perspectives from which a practioner model of mobile music might emerge. It has related the practical and theoretical research that has been undertaken in conjunction with the creation of a portfolio of original work. Through a discussion of my own creative practice and the work of other artists and theoreticians, this thesis claims that a practioner model of mobile music has the potential to change the methods and experiences of making electronic music, and as a consequence generate a new kind of performer identity.

I have positioned this research within the field of existing mobile music studies, contributing an expanded view on how being mobile puts into question the spaces commonly associated with electronic music – where it is situated, where it is listened to and experienced. In this concluding chapter I will briefly summarise the case studies covered in this thesis, to categorise the breadth of this practice-based research. From devising an self-contained performance system for free music improvisation to using digital signal processing apps as an approach to situated composition, from considering the urban environment as a site for musical performance to introducing music activities in schools through the cultural agency of iPads, these studies offer a range of creative possibilities for mobile music making. They demonstrate what a practioner model of mobile music could be.

I will recap the ideas and insights that have emerged during my time as a reflective practice-based researcher, devising and evaluating an autonomous performance system using generic mobile devices and apps. I will address the anxieties that remain regarding the authenticity and legitimacy of employing generic devices and commercially available apps, and the challenges in which expertise and formal roles are perceived. I will also speak more broadly on the ethical issues raised during this research, for instance using a GoPro camera in public spaces. I will then outline various avenues of future investigation, while remarking on the shifting landscape of mobile technology. To end, I will argue that the work undertaken during this research leads us towards a practioner model of mobile music.

6.1 Reframing Mobile Performance Practice

This research project has been both a personal and physical journey. With the objective of developing a self-contained performance system, I began exploring iOS audio sampling and effects apps, discovering a nascent field of mobile music practitioners, one that although has a community of informally networked enthusiasts and developers, is in need of raising visibility and documentation. By engaging with this community I refined my own performance practice and, as a method for testing these apps, joined an improvisation group based at Èglise Saint Merry in Paris for ad hoc meetings and clandestine sessions. By scaling back my performance system to a single iPad with individual standalone apps, I discovered that I no longer needed the usual apparatus associated with electronic music production – a mixing desk, sound cards, controller hardware, cabling or power supplies.

Working either as a duo, a trio, or with larger groups of players, I discovered amplifying the iPad through a bass guitar amp produced a directional sound source that gave other musicians a clear sense of my performance gestures; they understood the system as a form of instrument. I developed a closer engagement with the other players compared to previously using a laptop. I was no longer sat at a table, but was able to get up, move about and interact. Analysing my performance system, I discussed having sensor input, signal processing, sound synthesis and audio output embodied in a single device set it apart from the laptop model for digital music performance. I have illustrated how monophonic sound, along with the physicality of screen-based interactions on the iPad, afforded the other players a cogent and familiar sense of engagement with the sounds I was making. From this reductionist approach I formalised a singular performance system, one that I have characterised under the rubric of: one device, one lead, one sound source.

The physical mobility, the embodied interactions of the iPad and the playing procedures I developed were informed by Parkinson and Tanaka's work '4 hands iPhone', and the considering a mobile device as something close to an expressive musical instrument (Tanaka, 2010). My emergent performance practice built on Tanaka's theories on exploiting a smartphone's sensor input modalities and its ability for signal processing and audio synthesis, and his encouragement to think of mobile music not as an act of consumption, but as a proactive participatory activity.

Furthermore, while many of the previous mobile studies have tended to focus upon the design and construction of new hardware and software systems, this research puts performance practice at the centre of analysis. I have argued this is an area of investigation that other research programmes have not addressed in any depth.

With the objective of considering mobile as a lens through which a new model of electronic music performance can be interrogated, I have explored natural and urban environments as sites for musical performance. I began to learn techniques to transform the sounds of my immediate surroundings by sending the audio signal from the iPad's inbuilt microphone to a series of digital signal processing (DSP) apps, improvising with the environment in a solitary context rather than with musicians. I termed this approach as 'Xtended' field recording, referencing electronic dance music and the extended 12" mix, while also drawing from the theoretical framework provided by Thibaud's notion of ambiances and everyday practices. Positioning this mediated technique of selecting, rearranging and extending elements of an ambiance to create a new experience of a space, I referred to as 'remixing' the environment.

Walking as a means of embodied experience of movement has featured prominently in this thesis. Listening to my surroundings through DSP apps also heightened and expanded my perception of my surroundings. It was not simply a question of perceiving a landscape or measuring an environment, but of experiencing the sensory contexture of everyday life. I have related the work of other artists such as soundscape composer Hildegard Westerkamp and field recordist Andrea McCartney, and electroacoustic composers Jean-Claude Risset and Paul Lansky to my own mobile soundworks. Similar to Westerkamp's Kits Beach Soundwalk, the iPad's inbuilt microphone became a 'moving ear', an observational relationship with the micro-details of environmental sound. Unlike the working methods of these artists of taking field recordings to the studio for processing on more powerful computer systems, the method of experimentation that I proposed took place on site, in situ, and in real-time. In attempting to reframe mobile performance, I have discovered the practioner model of mobile music is about where the work is situated.

6.2 The Visuality of Mobile Music

Turning to the visual conditions of mobile music, I have reflected on how the use of video images became an unexpected but integral aspect of this research. I have argued that a camera lens is intrinsic to a mobile device; it is simply another input modality like its microphone or touchscreen. Although video documentation was intended to capture the processes involved in performance, the GoPro camera also offered a radically different point-of-view of where the studies were situated. In chapter 5, I discussed the commuter series of videos, how altering the playback speed of the camera created a perceptual disjunction between image and sound. Transposing its associations with extreme sports and self-documentation, I explored the GoPro camera's potential for expanding visual modality in a performance environment. And in the context of NIME research I have contributed my findings towards the co-authored paper 'One Knob To Rule Them All' (Bowers et al. 2016)¹¹⁸, considering the GoPro as a performance system in its own right.

This approach resonates with Sarah Pink's call to using video to capture sensory embodied experiences that we might find difficult to describe in spoken words (2019). Pink maintains that by auto-ethnographically documenting one's own feelings and practices through writing, audio or video recording, artists can create an archive of sensory knowing. She claims that mobile phone images can be understood not as images of the world, 'but as images that are emergent from the world, in it and part of it' (see Pink 2011; Pink and Fors, 2017). As Pink and Hjorth suggest: 'In camera phone photography, the experience and representation of movement cohere' (2012, p. 46). A similar theme is taken by Gómez Cruz, who states that mobile-mediated photographic practice is no longer understood as a resemblance between an object and image, but is increasingly used as an 'interface' for shared agencies, embedded in 'sociotechnical practices in constant flux' (2016, p.240). Nevertheless there were problems when covertly wearing a GoPro in public, which raised issues of privacy, consent and the ethical implications of using mobile HD cameras.

In many countries, it is legal to take pictures and videos in public places for personal consumption, for posting online or for non-commercial purposes. As Katrin Wolf and co-authors (2014) remind us, the fact that something is legal does not make

¹¹⁸ The paper was awarded winner of NIME, 2016.

it socially acceptable. They argue that it is crucial for researchers to be able to understand, articulate and argue the ethical or moral case for the decisions made in the design of their practice-based research, and the ethical issues that emerge throughout the research process. Having considered their arguments, I have taken an auto-ethnographic stance that the visual aspect of a mobile performance system should be interpreted as much about constructing an identity, about self-historicisation. Again, I have asserted the visuality of mobile music is an area of research that is under-investigated in previous studies.

6.3 Key Contributions

I will now outline the key contributions of this research to the field of mobile music studies. This research's working methodology in using mobile audio production apps in soundscape composition has been identified and categorised as 'situated composition' by Samuel Thulin, and I myself was included as an exponent of this nascent practice. Situated composition is recognised as an approach to sound that entails multiple relationships between the practitioner and their surroundings; 'that purposefully blurs the lines between listening, performing and other sonic activities' (2007, p.81)¹¹⁹. The fieldworks and studies were carried out while travelling between France and the UK, existing somewhere in the middle, in the liminal spaces Marc Augé refers to as non-places. A station platform, a waiting room or the fold down shelf on the back of a train seat; these ambiguous, impermanent sites became my new working habitat to explore and experiment with.

Rather than using a mobile device for blocking out the surrounding environment through passive activities such as watching a movie or playing a video game, this research's model of performance aimed to reposition mobile music as proactive and participatory, a way of engaging with these transient non-spaces. Combining existing rhetoric on the practice of walking in everyday contexts with app interconnectivity as a method of reclaiming agency over seemingly closed, blackboxed apps, I have demonstrated a mobile performance system as a 'situated' mode of enquiry, exploring my local neighbourhood in Paris or traversing on public transport. I have given a summary of Michael Bull's discussion of the personal stereo, and how it resonates

¹¹⁹ Thulin also draws upon academic articles I have written: 'The Carry Principle in Mobile Music' in *Wi: Journal of Mobile Media*, and 'Mobile Devices: A New Folk Instrument?' in *Organised Sound* 18 (3).

with my enquiries into earbuds allowing real and transformed soundworlds to be heard simultaneously, augmenting and overlapping each other. The cultural ubiquity of earbud headphones meant that I could successfully blend with my surroundings; my public interventions went unnoticed and unheard. These works created a secret, internalised experience of mobile-mediated performance, comparable to Janet Cardiff's audio walks and Brandon LaBelle's notion of 'headscapes'. Thus, I termed this form of practice as headphonics.

Introducing portable, battery-powered Dirty Electronics amplifiers to the performance system increased the sonic presence of the performer, prompting an externalised experience of mobile-mediated music. At times the amplification of sound with portable loudspeakers challenged other peoples' expectations of where and how they might hear what could be considered as experimental music. Of the many awkward moments that have arisen during these enquiries, my experiences at the Bradford Festival as part of the duo Discrete Machines is cited here to illustrate the reaction of the general public to the sometimes confrontational nature of mobile performance. Evaluating our attempts to blend in amongst crowds of afternoon shoppers and families – establishing what we described as guerrilla interventions rather than any conventional model of performance – I realised the close proximity between us and our audience confounded conventional listening practice in shared public space. It was through experiences like this that I realised different modes of audition created almost diametrically opposed approaches to mobile music. I have labelled as these divergent experiences as the two axes of mobile-mediated performance.

In scaling up this system to incorporate multiple players, I have described collaborating with a group of participants as a 'mobile marching band' during Locus Sonus' Mobile Audio Fest. Mobile-mediated performance via self-directed sound improvisation became a playful, social and relational activity. While the group utilised DSP apps and the same singular system, they were endowed with a sense of ownership throughout; building their own amplifier speakers, developing bespoke playing techniques and interacting amongst each other. Collective, self-directed, a group dynamic developed between the ensemble, while retaining fidelity to the autonomous ethos I had earlier established.

This approach chimes with Philip Samartzis's argument that while established electronic music studios and their attendant research groups are well-documented, alternative organisations such as art schools and colleges hold an equally important role in promoting the sonic arts (Samartzis, 2019). The resourceful mobile marching band was using cheap electronic components, discarded speaker cones, cardboard boxes and portable hand-held devices to produce a vibrant and dynamic soundworld. This has been a major strand of this research project, to challenge the ways in which expertise, discipline and formal roles are perceived in innovative processes in the context of mobile music studies.

This thesis has attempted to show how mobile-mediated performance can promote collaboration, interaction and participation; a generic mobile device can accommodate all levels of creativity and promote inclusivity. As with Luc Ferrari's attempt to democratise experimental tape music into something that anyone could undertake, this research's model of mobile music can be both top down and bottom up. A mobile device can be simultaneously high-level while being universal.

During the concert for the Mobilise (2017) festival, the audience were encouraged to use their own phones to participate in a collective performance. I argued the concert could be comparable to any of the previous examples of networked distributed audience performances, from the ringtone compositions of Golan Levin's Dialtones, to Shaw and co-authors' Fields, to GRAME's Battle de Smartphones. Furthermore, Mobilise follows in the footsteps of previous mobile media conferences such as the Mobile Music Workshops (MMW).

In this thesis I have highlighted the creative paradigms that mobile devices offer regarding musicianship, soundworks and performance. Mihaly Csikszentmihalyi defines creativity as occurring when: 'a person, using the symbols of a given domain ... has a new idea or sees a new pattern, and when this novelty is selected by the appropriate field for inclusion into the relevant domain' (1996, p.28). According to this model, an act or idea is not deemed creative unless those in the relevant domain and field acknowledge it. Acknowledgement of this research's claim to new knowledge as a practitioner of mobile music came at *Sound & Mobiles: International Colloquium* (2015) at the Université Sorbonne Nouvelle in Paris, when Peter Sinclair of Locus Sonus included me as one of three artist practitioners working with new

forms of listening and mobile sound productions ¹²⁰. Sinclair described my attempts to ‘musicalise’ the sounds of the surrounding environment as I walked through urban space, employing a smartphone like a harmonica that is always in my pocket, ready to be played at any time. Although using readily available apps, Sinclair argued my artistic intervention is found in the transformation of ambient sounds captured by the smartphone’s inbuilt microphone, linking together apps to create a unique sound.

Locus Sonus recognised my primary interest in the practice that arises from being mobile, inviting me to their Audio Mobility program as an artist-in residence to develop a performance for a student mobile ‘orchestra’. Speaking at the Mobilise festival, Sinclair re-stated that there are three aspects to my work that are worth comment; firstly the social question – through the misuse and artistic reappropriation of the mobile phone I have turned the generally private and individualistic sound of the phone into a public and collective experience. Secondly, my residency at Locus Sonus working with the student marching band represented a strong social commitment, one that had a profound effect on the students as they developed their own performance systems allowing them to share their sounds with each other and the public. And thirdly the use of rapid, shared and selective memory as a form of ‘timewarping’, and how the cognitive effects of immersion in mobile performance and environments leads to fragmentation and layers of narration. I would argue these creative aspects point towards this research’s claim of a practioner model of mobile music.

6.4 Future Implications or Feature Creep?

Written texts on new technologies tend to date very quickly. Sarah Sloane’s *Digital Fictions* jokes that books on computer technologies tend to ‘have the shelf life of a carton of milk’ (2000, p.17). While I have attested that this research has a robust methodology that is accessible and repeatable for anyone with a mobile device, the landscape of mobile media is already shifting. Referring to The Carry Principle, Barbara Ballard states that the constant introduction of additional features, or ‘feature creep’, is an inherent part of the development process of mobile media (2007, p.77). Over the duration of this research the iPad 2 has gone from cutting edge technology,

¹²⁰ This Colloquium was an extension of the ‘Mobile Phone and Creation’ group at Sorbonne Nouvelle: <http://www.mobilecreation.fr/2015/11/08/colloque-international-sons-mobiles-34-decembre-2015-paris/> accessed 23 April, 2016.

to being unable to download many new apps – a symptom of its encroaching obsolescence. This is due to the iPad 2 being 32-bit, and will not run newer 64-bit apps and therefore unable to update to the current operating system iOS 13. The inherent feature creep of the app ecosystem means the iPad 2 can only access older iterations of apps, playing so called ‘ghost apps’ – apps that have been withdrawn or disappeared without trace from the App Store.

App developers are sometimes unable to continue updating their products, apps quickly have become increasingly conditional and inherently unstable on account of the constant upgrades to the operating systems and devices on which apps rely. Therefore, they require continuous maintenance and repair. Morris and Morris (2019) claim this is economically generative; consumers expect apps to fail and thus be regularly updated. Matthew Bellinger takes up a similar theme by arguing failure should be considered as a rhetorical strategy; failing is an essential and productive part of an app’s life as a cultural commodity (2016). App stores and developers rely on the logics of failure and obsolescence to entice consumers back to the app store, it becomes a strategy for maintaining visibility in algorithmic retail environments.

In 2016, Apple abandoned the standard mini-jack port on its iPhone 7, introducing its wireless EarPods and a free Lightning to headphone dongle adapter for users with regular earbuds. The reasoning went that company needed to ditch the 3.5mm headphone jack since it took up unnecessary space inside the phone’s housing. Apple wanted to be able to extend the screen downwards to create a full screen display design and thus eliminate the iPhone’s home button (Smith, 2016)¹²¹. Other reasons for removing the mini-jack was it allowed wireless charging, room for Taptic Engine, a haptic feedback function, and future iPhones would be easier to waterproof (Lamps, 2016)¹²². The mini-jack relies on the mechanical spring property of metal to hold the plug in place¹²³. With the most common mechanical failure on an iPhone, after the fracture of screen, was the headphone jack failure; the lightning jack is deemed to be mechanically more robust. Streaming sound from a mobile to EarPods

¹²¹ <https://bgr.com/2016/01/13/iphone-7-design-headphone-jack/>

¹²² <https://techcrunch.com/2016/09/07/headphone-jack-rip/>

¹²³ The mini-jack is a miniaturised version of the classic quarter-inch jack (6.35mm), it was originally invented in the 19th Century to make it easy for telephone operators to make connections on their switchboards. A perfectly round plug, it can only be plugged in one way (unlike an USB), which meant that operators could plug and unplug the telephone connections without really looking.

via Bluetooth has become a standard form of listening to audio (even the larger iPad Pro arrived without a 3.5mm port). Google swiftly followed suit on the Android platform, stripping the once ubiquitous port from its phones to make all-screen devices (Heater, 2017)¹²⁴. It seems likely that the near future generation of mobile devices will eliminate all its electronic ports.

Why is this important? We have seen in many of this research's case studies the mini-jack affords certain modularity to iOS devices, allowing them to be plugged into different types of amplification, from portable cardboard speakers to bass guitar amps. Under the headline 'Apple kills headphone jack (1878 – 2016)' Techcrunch reported: 'Many startups and tinkerers rely on the relative accessibility of the 3.5mm jack to hack and develop for smartphones'¹²⁵. Apple's jettisoning the mini-jack on its devices has real implications for using DSP apps in situated composition and headphonic works.

In chapter 4, I discussed iOS signal processing apps such as Turnado being unable to use a device's microphone input when streamed over Bluetooth. When an iOS app enables Bluetooth audio, both input and output are routed through the app. The internal mic and speakers are disabled to protect listener and their device from accidental feedback loops. Audiobus explained the Bluetooth protocol would not work with apps that record from the mic: 'iOS does not allow it'¹²⁶. RØDE confirmed that issues with multiple sampling rates meant none of their microphone apps are unable to support Airplay or Bluetooth output: 'We are hoping that future versions of iOS might allow this functionality'¹²⁷. Even with a specialised dongle for standard headphones with mini-jack, I am unable to use DSP apps on my current iPhone 7. Whether it is issues with sampling rates or the need to protect listener and equipment from accidental feedback loops, it appears this is a basic limitation of the iOS operating system.

Furthermore, the interactivity of Audibus' inter-app routing system might not be permanent. In a recent video post by Jakob Haq, he asks 'Is Apple killing off Inter

¹²⁴ <https://tcrn.ch/2PkwoOp>

¹²⁵ <https://techcrunch.com/2016/09/07/headphone-jack-rip/>

¹²⁶ <http://www.forum.audiob.us/discussion/201/audiobus-bluetooth/p1>

¹²⁷ <http://en.ode.com/faq/compatibility-of-roderec-with-airplay-bluetooth-audio>

App Audio’¹²⁸. Audiobus recently announced Apple’s release notes for its iOS 13 update stated that Inter-App Audio, the technology on which parts of the latest version of Audiobus are currently built, is going to be deprecated in favour of Apple’s own version, Audio Units (AUv3)¹²⁹. The term *deprecated* means that developers will be encouraged to use the replacement technology instead, but IAA will not disappear any time soon (Tyson, 2019)¹³⁰. It is possible that that older apps that have not been updated to AUv3 will cease to function with Audiobus. Haq concludes by advising his audience to keep hold of an iDevice running an older iOS operating system in order to play older apps.

Why not then focus more on apps on the Android platform? It seems there has been little progress in the area of Android music and sound apps (Caustic is perhaps the only exception, but that too is a standalone DAW system). Another prominent member of the online mobile music community @dischord recently posted on twitter he had decided to cease writing about Android apps: ‘I’ve tried hard to maintain Android app support on the site... Android really hasn’t gone anywhere. Would anyone care if I stopped [to] support it? (2020)¹³¹. Yet Android has more open source materials available, perhaps music and sound production development will begin to migrate there?

The question remains how to study apps that are purpose built for continual updates? Despite being ingrained in the everyday practices of billions of users around the globe, app studies, whether conceived as an approach, a practice-based research area, or a (sub)field are only just emerging (Morris and Morris, 2019). The growth in the everyday use of apps further reinforces Lev Manovich’s call for an established field of ‘software studies,’ offering key insights from work in the field on how software systems are shaping everyday experiences and of how the world is understood (2001). Manovitch argues it is important to have documentation of periods of technological change, before systems become absorbed into the fabric of other technological mediated practices. This research contributes to the field of mobile music and app studies by providing a snapshot of time between 2012-17, when a

¹²⁸ <https://www.youtube.com/watch?v=rSnKrOXVtl8>

¹²⁹ <https://apple.co/2PlsGE4>

¹³⁰ <https://audiob.us/futureofaudiobus>

¹³¹ <https://twitter.com/discchord>

profusion of audio production and music apps appeared on the iOS platform. The appendix at the end of this thesis contains an extensive catalogue of apps available for iOS, to complement and extend the last taxonomic review (Axford, 2015).

6.5 Final Comments

In this conclusion I have highlighted what a practioner model of mobile music can be. This research set out to advance previous studies into mobile music by focusing holistically on the practice itself. While many of the previous mobile studies have tended to focus upon the design and construction of new hardware and software systems, this research has put performance practice at the centre of its analysis. I have argued this is an area of investigation that other research programmes have not addressed in any depth, and perhaps this thesis might offer future researchers new methodological and theoretical questions.

Despite the continual changing nature of mobile technology, I have argued the practioner model must embrace this flux; it is an integral part of the practice. There will always be negotiations and workarounds. Media are not displaced; their functions and status are changed by the introduction of new technologies. Henry Jenkins tells us that old media never die, what dies are the tools we use to access media content (2006, p.13). Vinyl, cassettes, CDs – these are what media scholars call delivery technologies. Delivery technologies come and go, they fall obsolete and get replaced, while media continues to evolve. Lisa Gitelman reflects: ‘once a medium establishes itself as satisfying some core human demand, it continues to function within the larger system of communication’ (2006, p.17). A medium’s content might shift, its social status and audience might change, but existing medium are forced to adjust and coexist with emerging new media.

It is likely that mobile as a medium will continue to adapt and change, perhaps running parallel or becoming assimilated with new technologies. What remains is the practice at the heart of this research. In the end, this thesis is not about technology but the human interaction with technology. The experiments, studies and works presented here offer a range of creative possibilities that leads us towards a practitioner model of mobile music. And I will continue to walk.

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Content of Portfolio USB Key

The audio recordings and video files discussed in this thesis are available on the accompanying portfolio USB key. I hope the reader will find it useful, and possibly essential, to be pointed to the appropriate recordings while reading the thesis. The following is a list of what media is featured, including names and roles of the different participants and partners:

Chapter 3

GyrOSC test (2013)

Media file: 01_gyrOSC_test.dv

Author: iPad + GyrOSC controlling Max on a laptop, Mini DV camera.

soundstudy-ipads-orchestral (2014)

Media file: 02_soundstudy-ipads-orchestral

Amit Patel: iPad + *Samplr*, orchestral percussion.

Author: iPad + *Samplr*, orchestral percussion, Zoom recorder.

Mobilise: Jakob Haq (2017)

Media file: 03_Mobilise_JakobHaq_Intro.mp4

YouTuber Jakob Haq for the Mobilise festival.

Video courtesy of Jakob Haq.

Improvising Machine (2014)

Media file: 04_Hand_held_orchestra.mp4

Dominique Wisniewski: Electric Guitar.

Paula Velez: Alto Saxophone.

Author: iPad + *ADelay*.

Unknown: Camera

Royal College of Music, Stockholm (KMH) and Dirty Electronics Ensemble (2014)

Media file: 05_KMH_DMU.mov

Dirty Electronics Ensemble and KMH laptop ensemble.

Author: iPad + *AriVibes*, Dirty Electronics cardboard amp.

Neal Spowage: Camera.

audience feedback (2015)

Media file: 06_Audience_Feedback.mp4

Extract from LLEAP ensemble and Dirty Electronics at DMU, 2015.

Max Wainwright: Contact Mic System and Dirty Electronics cardboard amp

Author: iPad + *Modulator*, GoPro.

Xtended Field Recording: Saturday Night Fever (2013)

Media file: 07_SaturdayNightFever.wav

Author: iPad + *AriVibes*, Zoom recorder.

Xtended Field Recording: Corsica Soundscape (2013)

Media file: 08_CorsicaSoundscape.wav

Author: iPad + *Samvada*, Zoom recorder.

Non-Places (2014)

Media file: 9_NonPlaces_EastMidlands_01.wav

Media file: 10_NonPlaces_Train2Leicester.wav

Media file: 11_NonPlaces_GardDuNord.wav

Media file: 12_imonthetrain.wav

Author: iPad + *Audiobus*, *Turnado*, *Echpad*, *TWRecorder*.

SoundWalker (2014)

Media file: 13_SoundWalker.wav

Author: iPad + *Audiobus*, *Turnado*, *TWRecorder*.

Sounds of the Valley (2014)

Media file: 14_SoundsOfTheValley.wav

Author: iPad + *Audiobus*, *Echopad*, *TWRecorder*.

Chapter 4*SoundWalker Mixtape* (2014-15)

Media file: 15_SoundWalkerMixtape.mov

Author: iPad + *Audiobus*, *Turnado*, *TWRecorder* and GoPro.

Headphonics: Metro #02 (2014)

Media file: 16_Headphonic_Metro_02.mov

Author: iPad + *Audiobus*, *Turnado*, *TWRecorder* and GoPro.

Bradford Street Festival (2014)

Media file: 17_BradfordStreetFestival.mp4

Sally Rodgers: iPad + *Samplr*, Dirty Electronics cardboard amp, head-mounted GoPro.

Author: iPad + *Samplr*, Dirty Electronics cardboard amp.

Mobile Marching Band, Mobile Audio Fest (2015)

Media file: 18_MobileAudioFest_01.mov

Aurora Senave: Android phone + *sfCapture*, modified Dirty Electronics amp.

Tiphaine Durbesson: iPad + *ADelay2*, Dirty Electronics cardboard amp.

Valentine Aubert: iPad + *Jam Synth*, Dirty Electronics cardboard amp.

Kevin Niemeskern: iPad = *Loopy HD*, Dirty Electronics cardboard amp.

Author: iPad + *Hyperlapse* video, Zoom recorder.

Hugues Martin: Photographs and additional video.

Mobilise: Collective Improvisation Excerpt 1 (2017)

Media file: 19_Mobilise_collectiveImprovisation.wav

Devised by Music, Technology and Performance (MTP) students, performed by audience.

Author: Zoom recorder.

Mobilise: Piano Phase Excerpt (2017)

Media file: 20_Mobilise_pianoPhase_excerpt.wav

Devised by Norbert Schnell and Benjamin Matuszewski, based on a composition by Steve Reich, collectively performed by audience.

Author: Zoom recorder.

Science in Schools (2016)

Media file: 21_Atelier_codage.mp4

France 3 broadcast report on *Science in Schools* project, video courtesy of British Council in France.

Chapter 5

Improvisation with a two-wheeled performance system (2014)

Media file: 22_TwoWheeledSystem.mov

Author: iPad + *Audiobus*, *Samvada*, *Animoog*, *Echopad*, *TWRecorder*, Samsung phone.

Improvisation with Dom (2014)

Media file: 23_ImprovisationDom.mp4

Dominique Wisniewski: Electric Guitar, Zoom recorder.

Author: iPad + *Attractor*, head-mounted GoPro.

Light & Feathers (2014)

Media file: 24_Light_Feathers.mov

Max Wainwright: GoPro.

Other performers: Dirty Electronics Ensemble.

Above/Below (2014)

Media file: 25_above_below.mov

Prisca Lobjoy: GoPro.

Author: iPad + *Audiobus*, *Echopad*, *TWRecorder*.

Washing Up # 1-3 (2014)

Media file: 26_washingUp_02.mov

Prisca Lobjoy: GoPro.

Author: iPad + *Audiobus*, *ADelay*, *TWRecorder*.

One Knob To Rule Them All (2015)

Media file: 27_OneKnob_Excerpts.mov

Jim Frize: GoPro.

Author: GoPro.

Performers: John Bowers, John Richards, Tim Shaw, Jim Frieze, Sam Topley, Ben Freeth, Neal Spowage, Ami Patel, L. Rui and Steve Jones.

Slowlapse walk (2015)

Media file: 28_slowlapse.mp4

Author: iPad + *Audiobus*, *Turnado*, *Memory Mosaic*, *TWRecorder* and GoPro.

Sidewalking (2015)

Media file: 29_SideWalking.mp4

Author: iPad + *Audiobus*, *GrainProc*, *Frekvens*, *TWRecorder* and GoPro.

Commuter with a tape delay (2015)

Media file: 30_Commuter_TapeDelay.mp4

Author: iPad + *Audiobus*, *Dahlia Delay*, *TWRecorder* and GoPro.

Commuter: Rhythm Mosaic (2015)

Media file: 31_Commuter_RhythmMosaic.mp4

Author: iPad + *Audiobus*, *Turnado*, *Memory Mosaic*, *TWRecorder* and GoPro.

Waiting for La Joconda (2014)

Media file: 32_LaJoconda.mov

Author: iPad + *Audiobus*, *Turnado*, *TWRecorder* and GoPro.

Je Suis Charlie: Place No.3 (2015)

Media file: 33_PlaceNo.1.mp4

Author: iPad + *Audiobus*, *Turnado*, *TWRecorder* and GoPro.

Walking/Eating//Driving (2016)

Media file: 34_WalkingEatingDriving.mov

Author: iPhone + *Audiobus*, *Samvada*, *Deregulator*, *TWRecorder* and inbuilt camera.

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Appendix

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