# Enacting Musical Worlds: Common Approaches to using NIMEs within Performance and Person-Centred Arts Practices

Lauren Hayes
Arts, Media + Engineering
Arizona State University
Tempe, AZ 85287
laurensarahhayes@gmail.com

## ABSTRACT

Live music making can be understood as an enactive process, whereby musical experiences are created through human action. This suggests that musical worlds coevolve with their agents through repeated sensorimotor interactions with the environment (where the music is being created), and at the same time cannot be separated from their sociocultural contexts. This paper investigates this claim by exploring ways in which technology, physiology, and context are bound up within two different musical scenarios: live electronic musical performance; and person-centred arts applications of NIMEs.

In this paper I outline an ethnographic and phenomenological enquiry into my experiences as both a performer of live electronic and electro-instrumental music, as well as my extensive background in working with new technologies in various therapeutic and person-centred artistic situations. This is in order to explore the sociocultural and technological contexts in which these activities take place. I propose that by understanding creative musical participation as a highly contextualised practice, we may discover that the greatest impact of rapidly developing technological resources is their ability to afford richly diverse, personalised, and embodied forms of music making. I argue that this is applicable over a wide range of musical communities.

## Author Keywords

Enaction, person-centred arts practice, performance practice, sociocultural contexts.

## ACM Classification

H.5.5 [Information Interfaces and Presentation] Sound and Music Computing—Methodologies and techniques, J.5 [Arts and Humanities] Music

## 1. INTRODUCTION

Christopher Small's concept of musicking firmly places participation at the centre of what it is *to music*. To take part in a musical activity—which includes sweeping the stage before a concert, selling tickets, in addition to accepted musical practices such as composing or performing—entails

the forging of various relationships. Small argues that it is through these relationships, which may exist between people, sounds, and spaces, that meaning is constructed.

In what follows I provide two contrasting accounts of NIME development. Through these, I explore how the relationships that Small outlines are forged over time through the lens of practice-led and ethnographic research. I offer examples which lie within two often unrelated areas: the Western experimental and electronic music communities; and the world of person-centred arts practices for people with complex disabilities. This is in order to illustrate how such an understanding of NIME development within one context may inform work in another. This may also illuminate parallels between what could be perceived as unrelated musical practices.

By viewing musical engagement as an evolving and embodied process, which supports Small's definition of music as human action, it can be demonstrated that the relevance of technological developments in the field of live electronic and digital musical practice lies not necessarily within the material aspects per se. But rather, an important consequence is the potential for individualised practices to emerge, where each performer enacts a unique musical environment in coordination with their physiological, cultural, social, and musical histories. I will suggest that by viewing NIME-related practices in this way, we are afforded the opportunity to view musical activity *in general* as a "medium of social relation" [3] in various contexts.

### 1.1 Perceptually Guided Action

The idea of performance as perceptually guided action [8] suggests the importance of a multimodal approach to developing digital musical instruments (DMIs) or NIMEs. Moreover, this can inform our understanding of musical participation in general. Not only as listeners, but also as performers we are continuously making use of multiple streams of sensory feedback as we make our way through a performance: auditory, haptic, kinaesthetic, and visual.

This draws on Francisco Varela, Evan Thompson and Eleanor Rosch's theory of enaction [11] as a way of understanding the importance of the role of the body within—specifically—live electronic musical performance. An enactive understanding focuses on the idea of structural coupling between agent and environment through repeated sensorimotor interactions [11]. Both the perceptive capacities of various organisms as well as the environment itself emerge through reciprocal coordination and coevolution. In biological terms, for example, this phenomenon is "responsible for both the ultraviolet vision of bees and the ultraviolet reflectance patterns of flowers" [11]. Through phenomenological enquiry we start to see how musical worlds may evolve

in a similar manner.

The concept of enaction extends Maurice Merleau-Ponty's work on phenomenology, which posits the body as both the perceiving object, and at the same time, the subject of perception [9]. Merleau-Ponty illustrates the body's capacity for this duplicity of sensation through an example of the hands, which oscillate between touching and being touched.

The enactive approach emphasises the mutuality between agent and environment. Similarly, musical works can emerge out of the relationships that develop over time between a specific combination of people, instruments, and space. This does not apply only to the immediacy of musical performance. This framework can also be used to understand the durational development of NIMEs, where an instrument may be iterated through a series of incremental adjustments informed by the experience of their use within different scenarios.

Small suggests that when we rehearse and perform, we are exploring not only the sonic relationships that articulate how we ideally believe sounds should be organised, but also the relationships between sound and instruments; the relationship between the performers and the audience; the relationship between those taking part and the physical setting; and so on [1].

## 1.2 Ethnography and Creative Practice

There has been a growing number of calls from the NIME community to acknowledge the importance of both ethnographic (see [2]) and practice-led (see [5]) research. These methodologies allow for a discussion of the complex relationships between the sociocultural contexts in which technical developments in various NIME-related fields are being made. Both creative practice and ethnographic approaches provide space for exploring how NIME-related research unfolds over time in the real world. The two case studies that I describe each offer accounts of highly personalised NIME development. In exploring these situations, it will become apparent that any attempt to optimise the instruments discussed for the wider community would be largely redundant as they are evolved through the physiologies and aesthetic choices of the specific musicians involved. Evaluation of these practices through objective testing would be fruitless. The methodologies employed allow the experiences of the users to be shared through reflective observation and discussion. Nevertheless, by offering this insight, we can start to find implications for engagement with DMIs in general.

## 2. TWO CASE STUDIES

In this section I discuss two case studies where I have developed NIMEs in what initially appears to be unrelated contexts: my own live electronic performance practice; and person-centred collaborative arts practice. In each case I examine the role of the physiology of the musician, their musical aesthetics and histories, the contexts in which the musical engagement takes place, and how this is bound up with the various technologies employed.

## 2.1 Personal Performance Practice

### 2.1.1 Background

Over the last eight years, I have explored an approach to personal DMI design that focuses around the relationships between sound and touch. This explores the double aspects of Merleau-Ponty's notion of embodiment through, on one hand, themes of resistance and haptic technology [7], but also the perception of sound as vibration, through vibrotactile technology [6]. While the benefits of using haptic technology for improving certain aspects of instrumental skill

acquisition are well documented [10], research in this area tends to be focused around technical development. My own research has attempted to provide an in-depth, practice-based perspective in this field.

### 2.1.2 The Physiology of the Performer

It is perhaps not surprising that my training as a classical pianist, which began formally at the age of four, has led to an exploration of musical HCI that is largely focused around the expressive capacities of the fingers. While I may have been drawn to the piano simply due to its ubiquity as a traditional Western instrument, through repeated engagement with the instrument from this young age, by way of lessons, exercises, and the sort of experimentation that I much later learned was called improvisation, I enacted my musical environment based around a very specific type of tactility.

I learned to make use of both the vibrotactile feedback of the resonating body of the piano, as well as the particular resistances that it offered me as a physical instrument. When much later I started to perform with computers, the disconnect between sound and touch left me unfulfilled as a musician. Performance gestures contained none of the effort, struggle, or physicality that I was accustomed to making use of.

This led me to question what it was that I was missing in my experience as a performer now engaging with digital technology, in order to adequately communicate a musical idea. How could I translate an intention into an expressive and articulated sonic result? It has been through my own personal history of musical performance that I have been prompted to examine the relationship between sound and touch. Experiencing what Simon Emmerson describes as "increasingly alienated from purely physical sound production" [4], urged me to explore more deeply the links between action and perception, specifically for the performer.

This research has been extensively documented elsewhere, and has included incorporating haptic technologies [7, 8], and vibrotactile feedback [6] into my instrument design. Rather than reiterate the technicalities of this work, it is important to note that my evolved means of musical expression has been closely tied to my physiology over a long period of time. As I approached NIME development, this relationship between body and instrument was key to informing my design choices in that they were deeply rooted within an exploration of physicality and touch.

### 2.1.3 Sociocultural Context

My performance practice using NIMEs has been largely situated under the umbrella of Western art music. Being based within universities has provided me with access to expertise in both software and hardware development, situated me within a community of potential mentors and collaborators, and offered me many opportunities to present and discuss my work.

Working in and between genres such as contemporary classical, free improvisation, experimental beat-based music, and noise, has allowed my various performance environments to be explored within a broad range of scenarios. For example, at an academic conference, NIMEs used for performance must be extremely reliable and stable, with the ability to be set up quickly as there is often little time for this between performances. Within improvisation scenarios, the NIME must be flexible and adaptable. It must be able to give space to co-performers, yet possess a voice of its own. At a noise gig, my digital/laptop-based instruments must be able to hold their own in terms of sonic depth against analogue counterparts from myself or collaborators.

### 2.1.4 Objectives for NIME Development

While a large part of my practice has been based around the hybrid piano, formed around haptically and digitally augmented acoustic pianos [8], I have also performed extensively using a variety of hybrid (analogue and digital) electronic systems. These are assemblages of various components, including analogue synthesisers, hardware drum machines, various MIDI and game controllers, foot pedals, and bespoke software built using Max/MSP.
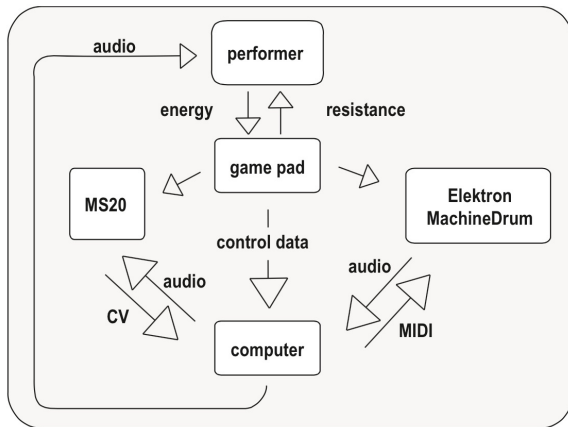


**Figure 1: Networked interactions.**

In working with hardware that does not offer the same rich physicality of the hybrid piano, I had to develop ways of introducing this tactile engagement to my performance environments. By interacting with all elements of a particular set up through a single game controller, I was able to simultaneously touch and engage with different parts of the instrument, bringing a sense of immediacy into my hands. For example, in one configuration, the game controller would trigger very short segments of sounds, which were in turn analysed by the software. This would send both MIDI information out via the sound card to trigger drum machine synthesis, as well as sending multiple control voltages out to an analogue synthesizer. At the same time, the audio output from these two external devices was sent back into the laptop. This would then be sampled and processed in Max/MSP, where several parameters were affected by my own interaction with the game controller. In this way I was able to access several parts of my performance system at once, bypassing some of the given—and to me, undesirable—control interfaces, such as the knobs of my Korg MS20 analogue synthesizer, or the buttons of the Elektron MachineDrum.

While this approach involves initial one-to-many mapping choices, the overall result is a network of interdependent processes, which feed into each other. The resistances in my performance environments often lie within the extreme potential for activity through interconnections within the audio signal path, which must be negotiated by the performer, often through holding a static position for extended periods of time. The game controller, for example, is so easy to manipulate, that the musicality comes from resisting this by holding both thumbs fixed on the joysticks, which requires a great deal of pressure from the hands, and creates a tension in the body: a movement of even one millimetre can drastically alter the sound.

## 2.2 Person-Centered Arts Practice

### 2.2.1 Background

Since 2006 I have worked in various music therapy-related and person-centred arts practice roles in the UK. These have included performing classical piano concerts in day care centres for adults with learning difficulties, as well as running several series of workshops for people with complex disabilities. In these workshops I employ a variety of traditional instruments along with numerous NIMEs, and I focus on the tangible experience of playing and perceiving sound.

In 2012 I was asked to be involved with the Artlink[1] Ideas Team, established by the Edinburgh-based arts charity in 2010. This team, consisting of various local and international artists and members of Artlink staff, works with an individual together with psychologists, care workers and family members. The goal is to establish new ways of thinking about and making artworks by exploring creative responses to the daily experiences of people with profound learning disabilities. I was asked to work alongside artist Steve Hollingsworth to develop an instrument for a young autistic man (M), who was intensely drawn to piano performance[2].

### 2.2.2 The Physiology of the Performer

"The nature from which man has selected his musical styles is not only external to him; it includes his own nature—his psychophysical capacities and the ways in which these have been structured by his experiences of interaction with people and things, which are part of the adaptive process of maturation in culture" [1].

Before any part of the design or build commenced, it was crucial to spend time with M at the piano to observe his engagement with the instrument. I visited him weekly to hear him play acoustic pianos as well as my digitally-augmented instrument, the hybrid piano [8]. Several important observations were made over the weeks that I visited him. Aside from a piano-based instrument being selected due to M's enthusiasm for it, his often overpowering strength meant that keyboards or MIDI instruments were ruled out as they were neither sturdy nor durable enough.

There was a marked difference in M's playing when sitting at the piano alone, compared to when we played together. When playing alone, M would hammer the keys for several minutes at a time with much force. When playing together, he would pause to make eye contact, to listen, and to respond. He would mimic patterns that my fingers made on the keys, often loosely, and sometimes with accuracy. This posed the first question as to how I could achieve this sense of engagement in M's new instrument without me, or another musician, being physically present.

Another important factor was the fact that M could get so enthralled in playing the piano that he would often become over-excited, and begin to sweat and hyperventilate. The posed a further problem as to how we could create something that could be enjoyable, without being over-stimulating.

### 2.2.3 Sociocultural Context

M's fondness for the piano did not stem from a particular interest in classical or romantic music, or from a childhood that involved taking piano lessons. The piano for M was a direct means of expression: tangible and immediate. This unique connection between player and instrument allowed an approach to developing the NIME that could view M's aesthetic choices as based around sounds that were enjoyed by him in his everyday life. Sound libraries were created

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[1] http://www.artlinkedinburgh.co.uk/
[2] http://issuu.com/artlinkedinburgh/docs/artlink201112

which contained samples of his mother's voice, the sound of his dog barking, as well as car sounds, and sounds from car racing television shows which he enjoyed. Additionally, I was able to observe during our time together in workshops which types of sounds from the hybrid piano seemed to engage M, and which he seemed to dislike. As M had been improvising with me over several months, I sampled some of my own piano playing as source material.

### 2.2.4 Objectives for NIME Development

There were several practical design choices that we had to consider from the outset. As mentioned above, the instrument had to be stable. Furthermore, M was attracted to wires, and would grab at any that were visible, so everything had to be hidden and enclosed. A button interface was proposed, where buttons would be secured onto the front of the piano. These were combined with LED lights and vibration motors which offered direct sensory feedback to M to confirm that he had pressed the buttons. The buttons would change the sample sets, and stop and start the sounds.



**Figure 2: Detail of M's Piano.**

One of the first goals that was discussed in a meeting by M's mother was the idea for M to put a "square peg in a square hole"[3]. That is to say that the instrument should be able to demonstrate some degree of agency and intentionality from M. Furthermore, we envisaged that this would develop over time as M grew familiar with the instrument. As such, I had to ensure that the software could be updated when necessary to ensure that it would remain challenging yet engaging for M. The buttons began as simple start/stop switches, but could be modified to react differently if M started to exhibit choice in his actions. The project is ongoing and the Ideas Team continues to learn from M.

## 3. CONCLUSION

I have described two examples of NIME development in differing contexts. Each situation uses musical performance as a means of enabling creativity, expression, communication, and also personal development. The commonalities between the two situations are clear. In each case, the development of NIMEs has evolved through close attention to the users' physiologies and sensorimotor capacities; their musical histories; and the sociocultural contexts in which the musical engagement takes place.

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[3]Personal email correspondence with Alison Stirling

It is evident that the type of physical, tactile engagement that I seek within live electronic musical performance has arisen out of my perceptive capacities and experience with the touch-based expressivity of the acoustic piano. However, there is now a generation of musicians who may not experience this loss of touch since their initial engagement with music may come through digital devices such as iPads, rather than acoustic instruments. The model of structural coupling between musician and instrument that I describe suggests a need for individualised systems that arise out of the specific interactions of each person in the world over time. For those with complex disabilities, an acknowledgement of the uniqueness of their experiences and responses is required before progress can be made.

If we view music as an enactive process, where new technologies lead to more engaging, embodied relationships between people and instruments, both the social as well as the sonic relationships that we wish to explore, affirm and celebrate [1] can be realised. The two examples in this paper serve to highlight the need for more in-depth collaborative research that will combine creative practice and ethnography with DMI design in order to provide a better understanding of the experiences and benefits of using new technologies within musical contexts.

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