

# Investigating Gestural Electronic Music

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## ABSTRACT

The practice of gestural electronic music performance provides the background for an artistic, practice-based investigation. To this end, the material and conceptual conditions for the development of performance pieces using gestural actions need to be explored. Digital musical instruments and concepts for the expressive use of their affordances lead to questions of the perception, by the musician and by the audience, of movements and actions, body and instrument. The practice of developing pieces and performing them exposes the issue of tacit knowledge that remains embedded within the subjective experiences of the artist. Means and ways are sought to establish – if not knowledge from within – then at least a meaningfully contextualised web of relationships that is drawing on terminologies and concepts from relevant neighbouring fields.

## Keywords

embodiment, gestural actions, performance, concepts, practise-based research, tacit knowledge

“The meaning in and of the music is not verbal or linguistic, but rather bodily and felt. We understand the meaning of longing, desire, expectation for better things to come [...] We cannot convey it verbally, but it is nonetheless meaningful, and it is enacted via our active engagement with the music.” *Marc Johnson* [4]

## 1. INTRODUCTION

How do artistic practices with new instruments generate insight and understanding that go beyond the discourse in HCI, computer music and digital arts, in particular in electronic music performance? Artistic advances are made not by posing questions about the technology and design paradigms, the techniques and metaphors for instrument development, but by exploring the potential for creation of novel musical situations and the types of musical and physical agency they afford. Even if developments of *Digital Musical Instruments* (DMI) and the skills for handling them are indispensable and an advanced conceptual grasp of the entire chain from gesture to sound, by mapping [15, 14] actions to software, and linking interface to digital process is necessary, the core questions for artistic research with these

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instruments deal with issues of imagination, creation and performance rather than engineering.

In the past fifteen years, I have gone from performing electronic music in traditional ways, using faders, knobs and screens, to a gesture-oriented and corporeal practice that consists of a balanced blend between exerting control, loosely steering (semi-)autonomous processes and creating intuitive spaces for expressive actions. By developing and refining techniques stemming from the context of the *New Interfaces for Musical Expression* (NIME) community I was able to reclaim some of the immediacy of traditional instrument playing and the intense feeling of engagement the stage can afford.

Gestural performance means exactly that, using gestures, i.e. expressive movements to control, shape, modulate musical and performative aspects of a piece [12]. Of course this entails having a gesture acquisition system, and this is what the NIME context provides. But more importantly it requires an awareness and imagination for what being on stage with a body and sensing devices means for playing electronic sounds both for musician and audience.

Finally, no investigation into a creative practice could be complete without the establishment of a frame of reference that encompasses the social domain within which the practice is situated, the wider artistic discourse and contexts, and the philosophical and psychological foundations of artistic agency and perception.

## 2. EMBODIED PRESENCE AND ENACTION

Live performance of electronic music poses a number of questions regarding the physical presence and actions of the musician. Contrary to traditional instrumental playing, the technological instruments do not provide a definitive shape and character that would allow an intuitive and direct understanding of the musician's actions and expressions. Physical presence, awareness and embodiment of the performance is mitigated by the broken, sometimes hidden, and heavily mediated relationship between the musician's listening and imagination, the perceptions in the physical domain of action and the feedback enabling the musician to continuously adapt and shape the music.

My central research question is derived from the experience as a performer on stage. In particular, I'm interested in the state of mind and the awareness of the body in exploratory music situations. I'm inquiring into what the inner and outer aspects are, which constitute a fully present, aware and embodied music performance in a technologically mediated yet exploratory music practice.

A concrete starting point is the view on movement and gesture, and how these outward physical elements can be composed and modified in the creation of new pieces for physical performance. By using sensing technologies, which

capture bodily movement either physically or visually, a rudimentary link is created that provides the ability to tie actions of the musician to musical elements. The establishment of rules and qualities between the corporeal domain and the musical processes is a key compositional challenge. The difficulty of finding artistically satisfying connections makes evident some of the fundamental question about how movement is perceived and the complexity of perceptual processes that allow us to interpret expressive movements and actions as meaningful gestures.

A complementary point of the view on the performance on stage addresses the self-awareness and inner perception of the body (and the instrument) by the musician, and in extension, by the audience. This leads into the fields of physiology and psychology, where processes of sensing and self-perception are described in sensory-motor models related directly to the body, but also in terms of body-images and -schemata. In addition, the discourse in philosophy of mind, in particular the contemporary view on ‘Enaction’ provides important cues regarding the state of body/mind that a fully engaged musical performer can attain.

The questions about agency, intentionality and perceptual attitudes provide a further direction to the practice, specifically by addressing the musical creation strategies that form part of exploratory, improvised yet structured compositional concepts. The key elements of stage-presence and concentration affect the origination of musical ideas from the associative flow of music, which is subjected to a variety of constraints that form and delimit the field of musical possibilities. Discovering and describing some of the non-reflective and pre-conscious elements that influence musical creation impulses can shed light onto the more ineffable knowledge of this performance practice.

### 3. RESEARCH THROUGH PRACTICE

There are different concepts and views on what this kind of research can and should bring forth. Depending on the cultural and academic context, the focus of such an inquiry emphasises different aspects of the practice. Contrary to the British context, where the term ‘Practice-based’ implies a methodology almost exclusively focused on art-work, in continental definitions of ‘artistic research’ or ‘Art as Research’, aspects of reflection, communication, contextualisation and verbalisation are much more prominent. Without wanting to unroll the entire debate, which for some might seem redundant and already solved, and for others still represents a wide and important area of debate, I’d like to firmly stake the claim that the fields of NIMes, of electronic music practices, and digital instrument building, need to deliberately establish a standard of practice-based or artistic research that is neither exclusively mimicking scientific and scholarly methods by solely adhering to ‘hard facts’ and generalised knowledge, nor is subscribing to the notion that the artistic practice by itself always already constitutes research and therefore needs no additional discourse and contextualisation. What this means in terms of the ‘theory versus practice’ balance is open, needs to be defined by every artist him- and herself, and is probably always contingent on the type of questioning and constellation of elements the individual practice consists of.

In the above marking of territory there is one aspect, which I particularly would like to elaborate on. How can a practice that is built to such a large extent on systematic technological developments succeed in addressing precisely those issues that arise beyond the concrete instrumental, material developments? How can a point of view be established that deals with the specificities of an artistic

endeavour rather than the conditions needed to set these tools into action? What differentiates the ‘practice-based’ investigation from one that develops concepts, models and techniques that extend and refine those tools?



**Figure 1: Gestural electronic music performance.** Note the spatial extension of the body that is being captured in a camera’s field of view as well as the wearable sensors on the hands. These two systems provide both allocentric and body-centric information about movement. The author on stage at the Internationale Ferienkurse für Neue Musik, Darmstadt, in July 2012.

### 3.1 Investigating gestural performance using NIMes

In the following sections I’d like to present examples that I believe attempt to address if not answer these concerns.

Coming from a background of traditional instrumental, improvisational and composition training, I am always searching for ways to bridge the gap between the sound world of electronic music and the performance experiences of experimental and exploratory music. Like so many of us in the field of NIMes I have learned to use the current sensor and interfacing technologies, sometimes adapting existing interfaces, sometimes attempting to build my own devices. This has led to a set of stable tools, that hardly changes and enables the exploration of their affordances in a series of ever evolving pieces.

The discourse within the last decade in design in general and digital instrument development [9] in particular has incorporated the term ‘affordance’ that Gibson [3] defined in terms of ecological potential, as that which an object or environment is offering as potential for actions or resources. “The affordance of something does not change as the need of the observer changes. The observer may or may not perceive or attend to the affordance, according to his needs, but the affordance, being invariant, is always there to be perceived.” [3, pp. 138–139] Gibson derives his concept from ‘Gestalt’ psychology’s terms of valence, invitation and demand, but criticises that in the original context they were used in a value-free manner. He emphasises the inherent meaning that arises out of an ecological embedding. “An affordance points two ways, to the environment and to the observer. So does the information to specify an affordance. [...] this is only to reemphasize that exteroception is accompanied by proprioception – that to perceive the world is to coperceive oneself. [...] The awareness of the world and of one’s complementary relations to the world are not separable” [3, p. 141]

With the concept of affordances as underpinning, my stable toolset is aiming at three different modes of engagement and environmental connection. It consists a pair of wireless

sensor gloves [12], a wireless sensor-carrying staff [13] and a depth camera, which has taken the place of a number of different kinds of optical sensing devices I have used over the years. In addition to these interfaces, I am using a wireless headset microphone and a high quality condenser-type microphone for capturing breath, pre-voice sounds and object noises, and recently I have started exploring wireless speakers useful for carrying the source of sounds with me onto the stage.

Using this equipment to explore the meanings and possibilities of gesture for electronic music performance has led to a number of performances that specifically address ‘gesturality’ and physical presence. The style or tradition of this music can be traced back to Michel Waisvisz’s ‘Hands’ [17]<sup>1</sup>, Atau Tanaka’s work with the Biomuse [16] or to Laetitia Sonami’s [10] performances with the ‘Lady’s Glove’, all three founding members of the NIME community.

What intrigues me in this practice is the detachment from the cockpit-like control mentality of earlier electronic music performers. This attitude was particularly striking in the ‘GRM-Acoustonium’-style mixing-desk interpretations from the era of ‘Musique Concrète’ and even traditional electro-acoustic work, but is still present in the guitarist’s typical array of floor effects and stomp boxes, to be operated by the feet. As a consequence of this detachment, my intention is to get away from the visual representations of electronic music processes on a screen as well. In these performances I attempt to reach a level of familiarity with the interfaces, structures, mappings and sound-process that make a screen superfluous.

These choices are informed by an aesthetic attitude, where complete control is less important than the tension and surprise an unexpected configuration and constellation might produce. The exact sonic contents of the pieces are improvised and unpredictable and vary from performance to performance. Apart from the solo-pieces where a traditional position standing in front of the audience is chosen (see Figure 1), I explore some of the same processes and tools in other collaborative improvised and interdisciplinary projects. Since my investigation takes a keen interest in embodiment, corporeality and awareness, I have been fortunate to establish an ongoing working relationship with an improvising dancer. In this dance-and-music collaboration, which is based on instant-composition and intuition-based exploratory forms, I’m applying some of the same tools and sound-processes (see Figure 2). This allows me to experience and to learn more about their effectiveness and perceptual impact, musical value and their overall power to carry sounding and musical expression against bodies and concrete instruments and materials.<sup>2</sup>

#### 4. EXTRACTING KNOWLEDGE

Earlier I postulated that ‘practice-led’ or ‘artistic research’ needs to generate a contextualised, communicative, and reflexive discourse, which goes beyond the practice itself. The questions for this additional domain are then: How can I convey the practical insights, the experiences, instrumental reflexes and reflections that I have built up in the course of these performances and works? Is what I’m developing not utterly subjective and tied to the specific musical, performative, and social moment where these pieces come into existence? What would a transferable knowledge be, that

<sup>1</sup>Video can be found online on STEIM’s page <http://www.steim.org/michel/media.html> and youtube <http://www.youtube.com/watch?v=SifumZa2TKY>

<sup>2</sup>For videos of these and other performances, go to <http://www.vimeo.com/jasch>. URI valid in May 2014.



**Figure 2: Movement-based explorations with a dancer and electronic sounds. The ‘quarterstaff’ DMI enables object-based actions using postural, kinetic, and discrete actions. The author rehearses with dancer Angela Stoecklin in May 2014.**

I could extract from this practice? Without being able to give a concrete answer to this problem, I can nevertheless express *some* aspects of what I’m learning and put into perspective *a few* of the elements that make up these ineffable resources I have gained by exploring these kinds of performances.

The primary element that I find essential to assert is a position or point of view that is based on the performance practice with NIMEs. When I manage to root the thoughts and argumentation in the actual performance experience as opposed to the mere reflections about it, then I feel justified to bring in a number of elements from other, sometimes neighbouring domains, in order to help me build my case.

#### 4.1 DMIs, Perception and Expressivity

As outlined above, a communicative solution might be to focus on the perceptual and physical conditions and affordances of the instruments, their performance modalities and the expressive impact on the audience. By drawing from psychology, systematic musicology and linguistics, models may be brought together that shed some light on the specific situation at hand.

A *Digital Musical Instrument* exists on the one hand in an abstract, symbolic domain but on the other hand needs to provide the musician with a tangible surface or interface suitable for ‘interaction’ [7]. By itself, the interface has no intrinsically compelling connection to the modes of sound generation apart from the necessity to provide a gestural and metaphorical action space. This connection needs to be ‘composed’ and reflects the affordances but also the conflict between the tangible artefact and the control requirements of the sound process. This contradiction exposes the question about non-reflective instrumental and corporeal awareness during performance, both for musician and audience. Previously, the physical actions and adaptations that made up traditional instrumental playing were imprinted into the musician’s body-schemata and corresponded closely with the instrument’s physical, sonic, i.e. objective affordances as well as its perceptual affordances in terms of cognitive and pre-cognitive processes.

Considering a musical performance as being shaped by the relationship between the DMI, the body and the musically expressive actions can be understood as an abstract form of communication. As an utterance [6] or language [11] construct it becomes charged with additional emotional meaning. Whether this occurs intentionally or not, there is no communicative action and therefore no performance

mode that does not exhibit this fact. This is also effective on the bodily level: “Musical expressiveness has a strong appeal to corporeal articulations, in the sense that the human body can be said to resonate, attune and even imitate parts of the expressive forms contained in music.” [8] This holds true for the auditory as well as for the kinaesthetic domains of musical actions. Music psychology in recent years has investigated the question of musical emotions and expressivity, with a focus on the listener, on the auditory, as well as the symbolic musical domains. The framework developed by Juslin [5] about musical emotions and their originating mechanisms, even though it reflects this perspective, provides useful indications for the analysis of performance movements as opposed to perceptual results of playing.

Gestural actions in the performance of electronic sounds can be considered to occur in a sort of expressive and perceptual void. The gap presented by the unknown must then be bridged by the perceiver, who can only extrapolate on the basis of prior experience. Thanks to the performer’s the shared corporeal presence with the audience through the bodily actions, however, the corporeality persists and permits to project musical intentions, if not expressions.

For the performer, the intentionality [2, p.238] that is necessary to play a traditional instrument remains unchanged, but the sense of agency [2] that the feedback through a non-reflective body perception of sound production enables, can be diminished or disappear all together. As Gallagher states: “the sense of ownership for actions depends on sensory feedback for proprioceptive, visual tactile sources. It is generated as action takes place. The sense of agency, however, is based, in part, on pre-motor processes that happen just prior to the action.” [2] This is particularly relevant for the performer. For the audience, recognition of instrumental actions in DMIs may be inhibited, and other culturally guided or previous individual experiences may come to substitute the missing schema.

Both the performer and the audience remain exposed to perception on the bodily level and thus have the opportunity to share the experience. The instrumental gestures and actions occur within the ‘real world’ through a body and in relation to an object or tool or instrument. And even if their targeted effect should manifest itself through abstract digital processes, they are still informed by our innate and acquired capabilities of acting through tools and instruments.

## 5. IN CLOSING

The British improvising guitarist Derek Bailey, although active in a different style and aesthetic than that of computer music and digital sound processes, formulated the importance of the instrument in a relevant manner when he said: “It is the attitude of the player to this tactile element, to the physical experience of playing the instrument, to the ‘instrumental impulse’ which establishes much of the way he plays. One of the basic characteristics of his improvising, detectable in everything he plays, will be how he harnesses the instrumental impulse. Or how he reacts against it. And this makes the stimulus and the recipient of this impulse, the instrument, the most important aspect of his musical resources. [...] The instrument is not just a tool but an ally. It is not only a means to an end, it is a source of material, and technique for the improviser is often an exploitation of the natural resources of the instrument.” [1, pp. 97–99] What he describes is a relationship with the instrument that is dialogic, ecological, and embodied, much in the way we have seen exposed in Gibson’s concept of affordances.

When looking at these aspects in their multiple linkages,

it might be difficult to connect to the original situation of a performance practice with DMIs. And the reflections and knowledge gathered here represent only a small selection of possible links and connections. Yet, the richness of this network of relationships that radiates from the actual practice into fields that primarily theorise about the experiences, is one of the gains of ‘practice-led’ or ‘artistic’ inquiries. The unfortunate fact is, however, that the essence of these experiences remains private and the accumulated knowledge and understanding is locked into an ineffable state. This forces us to draw out meaning, to construct a narrative, and to establish a context by borrowing and re-arranging terms and concepts that not our own, at least not yet.

## 6. REFERENCES

- [1] D. Bailey. *Improvisation - Its Nature and Practice in Music*. Moorland Pub, Ashbourne, Da Capo Press, 1992.
- [2] S. Gallagher. *How the Body Shapes the Mind*. Clarendon Press, Oxford, 2005.
- [3] J. J. Gibson. *The Ecological Approach to Visual Perception*. Lawrence Erlbaum, 1986.
- [4] M. Johnson. *The Meaning of the Body, Aesthetics of Human Understanding*. The University of Chicago Press, Chicago, 2007.
- [5] P. N. Juslin. From everyday emotions to aesthetic emotions: Towards a unified theory of musical emotions. *Physics of Life Reviews*, (10):235–265, 2013.
- [6] A. Kendon. *Visible Action as Utterance*. Cambridge Univ. Press, 2004.
- [7] S. Kozel. *Closer, Performance, Technology, Phenomenology*. The MIT Press, Cambridge, Massachusetts, London, England, 2007.
- [8] M. Leman and A. Camurri. Understanding musical expressiveness using interactive multimedia platforms. *Musicae Scientiae*, 10(1 suppl):209–233, 2006.
- [9] T. Magnusson. An Epistemic Dimension Space for Musical Devices. In *Proceedings of the 2010 Conference on New Interfaces for Musical Expression (NIME 2010), Sydney, Australia*, 2010.
- [10] B. M. Mathews, J.-C. Risset, L. Sonami, and M. Waisvisz. Trends in gestural control of music. 2000.
- [11] D. McNeill. *Language and Gesture*. Cambridge University Press, 2000.
- [12] J. C. Schacher. Gesture Control of Sounds in 3D Space. In *Proceedings of the 2007 Conference on New Interfaces for Musical Expression (NIME07), New York, NY, USA*, 2007.
- [13] J. C. Schacher. The Quarterstaff, a Gestural Sensor Instrument. In *Proceedings of the Conference on New Interfaces for Musical Expression (NIME 2013), Daejeon & Seoul, Korea Republic*, 2013.
- [14] J. C. Schacher, P. Kocher, and D. Bisig. The Map and the Flock – Emergence in Mapping with Swarm Algorithms. *Computer Music Journal*, 38(3), 2014.
- [15] J. C. Schacher and A. Stoecklin. Motion To Gesture To Sound: Mapping For Interactive Dance. In *Proceedings of the Conference on New Interfaces for Musical Expression, Sydney, Australia*, 2010.
- [16] A. Tanaka. Musical performance practice on sensor-based instruments. *Trends in Gestural Control of Music*, 13:389–405, 2000.
- [17] M. Waisvisz. The Hands, a Set of Remote Midi-Controllers. In *Proceedings of the International Computer Music Conference*, pages 313–318, 1985.