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**The displacement of agency and sound source in electroacoustic music as compositional approach in works including live performers**

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**Abstract**

Music facilitated by technology has led to an unprecedented development in performance practice: the ability to generate sound without the physical gesture required when performing on an acoustic instrument. Response to this development has resulted in divergent performance aesthetic preferences, ranging from the emphasis of acoustically based listening practices to the development of electronic instruments that replicate the type of human gestural interaction present when using acoustic instruments. This paper examines the incorporation of both previously described aesthetics on a continuum as compositional devices that provide dramatic and narrative elements to electroacoustic works with live performers. Two recent electroacoustic works composed by the author are discussed: *Memento Mori* (2014) for saxophone and live electronics, and *Ecclesiastical Echoes* (2015) for piano trio. Analytical focus is placed on how the geographical displacement, or lack thereof, between the agent creating the sound and the sound itself affects the narrative of the composition. Future directions of these compositional methods and analysis strategies to examine them are explored.

**Introduction**

The discussion of embodied and anthropomorphic musical performance can be traced as early as ancient Greece. The creation of the aulos, an ancient Greek wind instrument, is described in Greek legend as arising from Athena's intent to replicate the beauty of the human voice. According to myth, Athena herself played the instrument until she was informed her face contorted while doing so. This myth can be related to modern musical instruments, many of which involve expressive and embodied performer engagement, just like the aulos. Acousmatic music could be considered the converse of embodied performance as the intent is to remove the visual body from performance. This concept was also addressed in ancient Greece; a separate Greek legend tells of Pythagoras choosing to lecture behind a screen, removing the embodiment of the sound altogether and encouraging the audience to listen deeper to obtain his message. Electroacoustic music in the present encompasses a large collection of musics of varying degrees of embodiment or acousmatic components. Electroacoustic music that involves live instruments, which I will refer to as mixed work, as

per Leigh Landy's definition,<sup>1</sup> frequently includes both embodied performance and sounds that are not attached to a visible agent. This creates a potential for extremely rich and diverse music, but it also makes writing meaningful and convincing music in the genre challenging.

## Background and early research

The elimination of the physical gesture and action correspondence that was made possible by technology inspired many composers, engineers, and interface designers to attempt to reincorporate the body into performance. Concurrently, researchers were attempting to extend the gestural responsiveness of the available instruments such as electronic keyboards. One of the most well-known of the early gestural controllers was Michel Waisvisz's *The Hands*, which were created at the Studio for Electro-Instrumental Music (STEIM) in the Netherlands, and presented at the 1985 International Computer Music Conference (ICMC). *The Hands* is a light-weight, multi-sensor set of MIDI controllers that is held in the hands of a performer.<sup>2</sup> The performer uses a range of motions to trigger and modify sounds via MIDI messages. Subsequent controller development followed, with many projects focused on building devices that had a strong visual gestural link between action and sound.

Traditional laptop orchestras also fueled the research into embodied performance and convincing gesture, as it generated a secondary discussion on the role of the performer in such music. Laptop orchestras, such as the Princeton Laptop Orchestra (PLOrk), although entertaining, have a performance aesthetic that involves little embodiment; PLOrk members sit on meditation pillows and press buttons on laptops.<sup>3</sup> This desire to re-incorporate traditional interaction with instruments has been described as effort nostalgia, with the explanation being that much of the intrigue of live performance arises from the physical tension the performer is under onstage.<sup>4</sup> This concept is not unique to electroacoustic music; composers as early as Stockhausen described that physical tension created performance intrigue.<sup>5</sup> Physical gesture in electroacoustic music was brought to the forefront of discussion as interfaces became more disassociated with physical motion. The creation of electronic and gesture-based instruments that nearly replicated live instruments became an important subject among the New Instruments for Musical Expression (NIME) community, and competitions such as the Margaret Guthman Musical Instrument Competition that award prizes for novel instrument design emerged. The attempt to replicate a live instrument reaches its pinnacle in developments such as the Viblotar and the Vibroslide, created at McGill by Mark T. Marshall and Marcelo Wanderley.<sup>6</sup> These instruments produce vibrotactile feedback when played, meaning that although they are electronic instruments whose sound is output through loudspeakers, they provide minute feedback through the instrument to the user. This is done

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<sup>1</sup> Leigh Landy, *Understanding the art of sound organization* (Cambridge, Mass, MIT Press, 2007).

<sup>2</sup> Michel Waisvisz, "The Hands: A set of remote MIDI-Controllers", in *Proceedings of the International Computer Music Conference*, International Computer Music Association, Vancouver, Canada, 1985.

<sup>3</sup> Dan Trueman, "Why a laptop orchestra?", *Organised Sound* 12 no. 2 (2007): 171-179.

<sup>4</sup> John Croft, "Theses on Liveness", *Organised Sound*, 12 no. 1 (2007): 63.

<sup>5</sup> Jonathan Cott and Karlheinz Stockhausen. *Stockhausen: conversations with the composer* (Pan, 1974).

<sup>6</sup> Mark T. Marshall and Marcelo M. Wanderley, "Vibrotactile Feedback in Digital Musical Instruments," in *Proceedings of the New Interfaces for Musical Expression Conference*, Paris, France, 2006.

by mounting a tiny speaker on the device which creates these vibrations. Vibrotactile feedback is intended to simulate the vibrations a performer would feel when touching and performing on an acoustic instrument whose sounding body vibrates to produce sound.

While it is undeniable that this movement has generated many useful expressive tools, and excellent research and development has emerged, it is also important to place these instruments in context of performance. They must be considered not only on their technical ability to provide a theoretically sound instrument, but also on their ability to exist on an aesthetic level. What do these instruments provide to the concert hall? What are we able to do with gestural controllers that we are not able to do with acoustic instruments? These questions are especially important given that set-up, rehearsal, and travelling with any sort of electronics can range from difficult to downright tedious. Therefore, it is pertinent that the artistic contribution of these instruments be carefully considered alongside their technical specifications.

## Discussion of Literature

There has been some discourse regarding performance aesthetics of electroacoustic music, often concerned specifically with the live elements of such music. Simon Emmerson describes in his 1994 paper "'Local/field:' towards a typology of live electroacoustic music" that there are three acousmatic dislocations that arose in the first half of the twentieth century: space, time, and mechanical causality.<sup>7</sup> The article focuses on the whole of live electroacoustic music, not embodied music and gestural controllers. However, the importance of these acousmatic dislocations is a crucial element in both instrument design and performance design. It is important that the composer consider precisely why they wish to compose using electronics or electronically-generated material, especially in mixed works. The discussion of why one may choose to write with a certain pitch set, or using certain orchestration is commonly exercised, yet, in mixed works, it is not often discussed why the composer specifically chose to use electronics at all. Frequently a technical objective or research goal is mentioned with regards to the live electronic sound, yet the aesthetic potential of the work is not. This lack of concern for aesthetic substance is described by John Croft in "Theses on Liveness", as he mentions that "There are now sophisticated modes of technical relation between performer and computer, both in terms of the live treatment of sound and of the collection of non-sonic information by means of sensors. But the poetic relation between the two too often tends either to the banal or the meaningless."<sup>8</sup> Our technology continues to develop rapidly but we have only just begun to tap the full musical potential of this technology.

The dislocations described by Emmerson provide an excellent starting point for considering the "why" behind electronics: these dislocations are elements that are only available to composers of electroacoustic music or those using electronics in some way. One cannot dislocate mechanical causality on an acoustic instrument, (although the notated de-coupling of pitch and gesture used by composers such as Aaron Cassidy comes arguably

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<sup>7</sup> Simon Emmerson, "Local/Field: Towards a typology of live electroacoustic music", in *Proceedings of the International Computer Music Conference*, International Computer Music Association, Hong Kong, 1996, 31.

<sup>8</sup> John Croft, "Theses on Liveness", 59.

close) as there will always be a physical reason for a sonic output. It is also more difficult, though not impossible, to dislocate space in purely acoustic works. An artist could get incredibly creative using natural reverberation and careful placement of performers, but the spatial dislocation would still adhere to the rules of the physics of sound. Electronics allow for these rules to be perceptually broken; sounds can be placed anywhere in a room with the nudge of a fader or click of a button. Dislocation of time is equally possible in electroacoustic music, and as computers now have virtually unlimited memory capabilities, sounds can be temporally displaced quite significantly.

These dislocations have an enormous impact on live performance; just as new orchestrational concepts and extended techniques supplied composers with a larger timbral palette, they provide additional compositional choices that can be made. Therefore, they should also be considered elements of composition that can be readily analyzed, and aesthetically assessed. There has been some discussion regarding liveness in electroacoustic music; one of the more recent papers, presented at ICMC in 2014 was written by Marko Ciciliani and titled "Towards an aesthetic of electronic-music performance practice." This paper discussed a means for analyzing specifically the performance aesthetics of electroacoustic works. Ciciliani coined two terms, *centrifugal*, and *centripetal*, to describe to opposing poles of performance practice in which centrifugal performance indicates the most disassociation between agent and sound, and centripetal indicates the most connection between agent and sound. The centripetal model includes such characteristics as "visibility of performer," "high transparency of bodily action and sonic reaction", and "sound source in the direction of the performer."<sup>9</sup> An example of the most extreme centripetal disposition would be an acoustic instrument. Ciciliani describes the centrifugal model as one in which the "performer is in a rather hidden position," there is "little or no correspondence between actions and sonic results," and the "sound sources are decentralized and/or spread out."<sup>10</sup> The clearest example of centrifugal performance would be acousmatic music, although Ciciliani also mentions that organ music could be interpreted as centrifugal. Ciciliani's descriptors address Emmerson's dislocations, most notably space and mechanical causality. Temporal dislocation is addressed but only as a result of these assessments, not as a primary consideration. Ciciliani's paper, however, also asserts the degree of embodiment as being an integral component in the assessment of performance aesthetic.

## Performance Aesthetics as Compositional Approach

I composed, as a result of reading some of the aforementioned literature, a series of pieces that used performance aesthetics as a compositional consideration. *Memento Mori* (2014), for baritone saxophone and electronics, incorporated Ciciliani's concepts of centrifugal and centripetal performance aesthetics into the dramatic and musical narrative of the piece. The work derived its programmatic material from the ancient Roman practice of emperors having the words "*memento mori*" ("remember death") whispered in their ears during a triumph. This

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<sup>9</sup> Marko Ciciliani, "Towards an Aesthetic of Electronic-Music Performance Practice", in *Proceedings of the International Computer Music Conference-Sound and Music Computing Conference*, International Computer Music Association, Athens, Greece, 2014, 263.

<sup>10</sup> Ibid.

was practiced so that emperors would not elevate themselves to the status of gods; they were instructed to remember that they were only human. *Memento Mori* incorporates a motion-tracking system that determines the performer's location onstage. Based on the performer's position, the performance aesthetic model becomes either more centrifugal or more centripetal. However, as the performer is always present and is playing the saxophone which is a particularly loud and penetrating instrument, a complete centrifugal perspective can never be achieved. Ciciliani described centrifugal performance as having been historically associated with the divine, and more recently with the removal of human presence.<sup>11</sup> Therefore, this attempt at a centrifugal model, and a subsequent failure, is a programmatic and dramatic element composed into the work. Just as the Roman emperors were told that they were only human, the performer can never musically elevate themselves to godlike status. *Memento Mori* thus provides an example of integrating performance aesthetics in the compositional process for purely aesthetic reasons; there is no technological or scientific justification for this use.

A subsequent composition, entitled *Ecclesiastical Echoes*, for piano trio and electronics (2015), also uses performance aesthetics as a part of the compositional material. This piece, however, takes a different approach, with more emphasis placed on the temporal and spatial displacement. The motion of the violinist and cellist is tracked throughout with a camera, and their visual gestures are translated into data that affects delay lines and spatialization. The piano does not involve the tracking of visible gestures; instead a camera is placed inside of the piano, capturing the mechanical movement and translating this movement into data that is realized sonically. This mechanical movement is invisible to the audience, and even though it does somewhat correspond to the physical motions made by the pianist, it is considerably more linked to the mechanics of the instrument. Tracking the hammers also removes the inadvertent, extra-musical movements a performer makes, such as breathing, adjusting position, and even expressive hand and body movements.

These two works provided an important step in my research towards performance aesthetics as compositional approach, but with regards to the evaluation of the performance practice and the actual realization of these works in a concert hall, the element of the space was lacking. Both incorporated the use of spacial dislocation theoretically, but do not address the performance-specific or actual realization of the spatial dislocation. Additionally, descriptors such as those Ciciliani provided, while getting close to measuring Emerson's dislocations, provide a more general criteria for analysis. Therefore, I developed a different means of both evaluation and composition, which also involves spatial noise and other sonic elements introduced as a result of the performance. These elements may not be predictable or perceptible by studying the score and performance instructions, and will change from performance to performance.

To reconcile the compositional elements with the realized while preserving the concept of performance aesthetics as evaluative method, I propose the **Agential Displacement Measurement** (ADM), or the degree of perceived geographical and temporal displacement between the agent and the sound source. The ADM examines the embodiment

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<sup>11</sup>Ciciliani, "Towards an Aesthetic of Electronic-Music Performance Practice", 263.

(mechanical causality, space), proximity (mechanical causality, space, time), and spatial noise (space, time).

This is useful to all types of electroacoustic music, but is especially useful to those works that involve live instruments. These works generally have a score and performance instructions, which are often used as a starting point for both performance interpretation and theoretical analysis. Using the ADM allows an interpreter or musicologist to consider that music is both a spatial and temporal art form, and that both duration and spatial distribution will differ from performance to performance. The ADM is also useful for composers when considering the "orchestration" of an electroacoustic work. While it may seem clinical and almost appears to be removing the aesthetic considerations from the compositional process in place of calculated ones, the result is actually the opposite. Being aware of both the elements of dislocation and the performance-specific elements allows a composer to approach orchestration, drama, narrative, and many other components of composition in a new way.

## Conclusion

Electroacoustic music is the most recent type of music to enter the concert hall (preceeded by choral and then instrumental music). Composers and performers are always bound by their technology when it comes to creating and realizing pieces of music, whether that is the human voice, the harpsichord, or a computer. Computer technology has contributed to an enormous increase in possibility for composers, as the limitations are not bound to the mechanical elements of the instrument. Therefore, it is understandable that there is a significant body of discourse surrounding music facilitated by technology. The importance of musical substance, however, must always be at the forefront, regardless of the technological device used. And while it is appropriate to question whether the "answer" to liveness in electroacoustic music involves enhanced embodiment or not, it is essential to consider the embodiment or lack thereof as another compositional choice that can be made. The importance of the re-incorporation of the body or the further removal of the body is the wrong item to be inquiring about, as this type of discourse will always result in polarizing proponents of either as superior. Both have merit, and current and subsequent generations of composers have entirely different ideas of interaction than prior generations. Julio D'escriván mentioned in an article regarding effort and embodiment in performance, that "Since the advent and popularity of Nintendo computer games system in the early 1980s, so many new ways of human-computer interaction have sprung forth that a generation brought up on a diet of video games is, in my opinion, ready to accept the rupture of what we could call the 'efforted-input paradigm'."<sup>12</sup> This statement implies that the current generation of performers and composers will find themselves unconcerned with embodiment and the gesture-musical result connection, yet there is still a considerable amount of "effort nostalgia" among composers of all generations, and there will always be proponents of embodiment and gesturally-connected composition. By removing the discussion of one as superior to the other however, and simply providing a means with which to allow composers to choose and evaluate material consciously for aesthetic reasons, we can collectively move forward toward new aesthetics

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<sup>12</sup> D'ESCRIVÁN Julio d'Escriván, "To sing the body electric: Instruments and effort in the performance of electronic music", *Contemporary Music Review* 25 nos. 1 and 2 (2006): 188.

and sophisticated compositional output in electroacoustic music, especially in genres such as mixed music that have had such difficulty becoming part of the standard concert repertoire.

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