Choreographic approaches to music composition for a new musical interface: The eMic

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Gesture in performance is widely acknowledged in the literature as an important element in making a performance expressive and meaningful. The body has been shown to play an important role in the production and perception of vocal performance in particular. This paper is interested in the role of gesture in creative works that seek to extend vocal performance via technology. A creative work for vocal performer, laptop computer, and a human-computer interface called the eMic (Extended Microphone Stand Interface controller) is presented as a case study to explore the relationships between movement, voice production, and musical expression. The eMic is an interface for live vocal performance that allows the singers' gestures and interactions with a sensor based microphone stand to be captured and mapped to musical parameters. The creative work discussed in this article presents a new compositional approach for the eMic by working with movement as a starting point for the composition and thus using choreographed gesture as the basis for musical structures. By foregrounding the body and movement in the creative process, the aim is to create a more visually engaging performance where the performer is able to use more effectively the body to express their musical objectives.

Keywords: eMic; gestural; voice; performance; technology

The eMic is a gestural controller for live vocal performance and electronic processing that has been in development since 2003 (Hewitt and Stevenson 2003, Hewitt 2003). The eMic is designed as a means to extend the voice in performance via electronic processing technologies. It aims to address the desire for the vocalist using amplification to increase the level of control over
their own sound in the sound system and to harness the audio processing technologies once confined to the recording studio. It aims to do this in a way that is not only musically responsive to the performer, but also visually engaging for the audience. The design is discussed in Hewitt and Stevenson (2003) but in summary consists of a modified microphone stand that captures the physical gestures of the vocalist via an array of sensing devices including pressure sensors, distance sensors, tilt sensors, ribbon sensors, and a joystick microphone mount. The data captured from gestures is sent to a computer, running audio-processing software, which is used to transform the live audio signal from the microphone and/or other musical materials.

The design of the eMic draws upon the stylized and stereotypical gestures used by popular vocal performers (Hewitt and Stevenson 2003). By drawing on the existing gestural interactions that singers make with their microphone stands, the design aims to minimize the need for the vocal performer to retrain to use the device and is also a means for drawing on the performance codes of popular music performance. The extent to which these intentions are understood from an audience perspective in the works so far composed varies according to the gestural data to sound mapping relationships and how closely these relate to the familiar gesture/sound relationships found in the popular music tradition.

The eMic represents a merging of the designer’s practice as a laptop artist with her experience as a pop singer, bringing the embodied, expressive and contextual aspects of the pop vocalist together with the wide-ranging musical possibilities offered by audio processing software.

The designer has created and performed numerous works for the eMic since its 2003 debut. The compositional process for these works has typically commenced at the computer, building processing patches and assigning parameters to the eMic sensors. In order to play the composition, the body needs to adapt to “playing” the instrument. This approach treats the eMic more like a traditional “instrument” that requires the human body to develop a command over it. The recent collaborative work Idol, discussed in this paper, offers an alternative approach to composing for the eMic where movement is the starting point for the generation of musical materials (Hewitt 2010a, 2010b). At the core of the eMic concept is a desire to integrate the body into the process of creating works for performances with voice and technology; each work with the eMic is a new experiment with this idea.

Jacques Dalcroze (writing in 1931) points to body movement as being crucial to the process of unifying the musical elements and focusing on musical expression. He says that human motion is the instrument by which human beings translate inner emotions into music (cited in Choksy et al. 1986, p.31).
The approach taken to creating *Idol* could be seen to be in alignment with the views of Dalcroze.

A number of studies have attempted to understand the relationship of bodily gesture in the production and perception of vocal performance. (Davidson 2001, Dibben 2010). Understanding the function and meaning of gesture in vocal performance is critical to the development of more meaningful mapping relationships with the eMic. Dibben (2010) has drawn upon the field of research around the types of gesture used in vocal performance in order to create a system to categorize the types of gestures used in vocal performance. This research will be used to help gain some insight into the mapping relationships used in *Idol*.

**MAIN CONTRIBUTION**

**Compositional process**

The process for generating the work *Idol* commenced with the choreographer experimenting with gestures and movement relative to the eMic interface. Initial ideas produced movement gestures that mimicked recognizable microphone gestures and uses. The choreographer further explored the human-computer interface as follows: (1) as a theatrical device, an object, and a prop; (2) as a dance partner, personifying the stand, treating the stand is if it were another human; and (3) as a traditional musical instrument operating as an extension to the body. The choreographic end result comprised an embodied abstraction of the various elements described above.

Choreographing for the eMic also posed some notable challenges and limitations, as follows: (1) the movement needed to remain in close proximity to the eMic to ensure the vocalist could sing into the microphone and operate the sensors; (2) the cables and leads associated with the eMic provided physical obstacles; (3) the activation of the sensors predominantly required elevated arm gestures in the coronal and sagittal planes; (4) creating movement that could produce musically effective results when coupled to the data mapping and signal processing networks designed by the composer; (5) the performer was not a professional dancer.

The choreographer developed a choreography for the work which the eMic performer was subsequently required to learn. The learned choreography was videoed and the data coming from the sensors was simultaneously recorded. The data and the video were then used as a basis for the compositional process, providing both a visual reference point and a data set representing the movement. The composer was also able to draw on an understanding of the choreography as the performer/participant in that phase.
Table 1. Movement types for mapped sections of Idol.

<table>
<thead>
<tr>
<th>Gesture</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depictive gestures: ideographs that track the speaker’s thought process or musical flow</td>
<td>17/17</td>
<td>100</td>
</tr>
<tr>
<td>Manipulation of the body and immediate physical environment (includes “adaptor”)</td>
<td>1/17</td>
<td>6</td>
</tr>
<tr>
<td>Physical movements necessary for sound production or manipulation</td>
<td>17/17</td>
<td>100</td>
</tr>
<tr>
<td>Display/dance</td>
<td>17/17</td>
<td>100</td>
</tr>
</tbody>
</table>

Note. This is not an analysis of the complete work, just the sections where there are mappings of movement to sound via the eMic.

Mapping choices: Correlating movement and sound

In order to understand how movement is used in the context of the musical work, an analysis has been undertaken of the sections of Idol where there is a mapping of gesture to sound via the eMic. The classificatory scheme adopted is from Dibben (2010), which was itself an adaptation of the scheme used by Rimé et al. (1991), Davidson (2001), and Clayton (2005). Where the categories were not applicable they have been excluded from the table.

There were 17 identified mappings analyzed according to movement types (see Table 1). The findings are as follows: (1) the gestures typically related to multiple categories; (2) all the gestures analyzed were involved in “playing” the eMic so all were necessary for sound production, to control the computer processing and at times the voice as well; (3) all of the movements associated with “playing” the eMic are arguably depictive gestures in that they track the musical flow and typically follow the morphology of the sound; (4) all the movements are arguably display movements in that they are choreographed and rehearsed, devised by the choreographer for their visual appeal. The fact that the choreography is based on the stylized movements found in popular music is also interesting in that the performer is thereby consciously making movements that are related to the expressive conventions of a particular musical genre. This approach to musical expression is described in Clarke (1993) as mimetic and has been identified as an important component in musical expression. Imitation offers a practical experience of music, which is directly related to the bodily involvement of the performer. Clarke says, “the apparent choreographical extravagance of expressive performance may actually be quite a practical way to control the finer details of performance by exploiting
the natural tendencies and resistances of the body as a physical system” (p. 216).

**Playing two instruments at once**

Where there is simultaneous vocalization and “playing” of the eMic, the performance design must negotiate the demands of both of these “instruments.” A complicating factor for this performance scenario is that the eMic may also be controlling processing of the live voice. The muscular programming of the voice is mediated by aural and other bodily perceptions and there is a very tightly connected feedback system between vocal production and perception. Interfering with this via heavy processing of the voice can impede the ability of a vocalist to produce the desired sound.

There are a number of strategies adopted in *Idol* to deal with these issues. Example (1): at 2 mins 49 s the performer is seen to tilt the stand and sing a high, sustained note. The tilting gesture triggers the opening of a processor that creates a spectral drone effect on the voice. The gesture that is made allows for simultaneous vocalization and activation of the eMic sensor to occur, while the processing is an extension of what the voice is already doing and so feels quite natural for the performer. Example (2): at 2 mins 7 s the performer is seen moving the joystick and squeezing the pressure sensor on the mic clip as she sings “ahhs” and breathes into the microphone. The squeezing of the mic clip sensor is opening a filter that has the parameters changed by the movement of the joystick. The gesture again allows both vocalization and manipulation of the eMic to occur simultaneously, the processing does not interfere with vocal production and the gesture follows the morphology of the resulting sound.

From the perspective of the performer, the most satisfying sections of the performance were those where the function of the gesture allowed simultaneous activation of the eMic and vocalization but was also an expressive gesture that followed the morphology of the sound. Designing mapping strategies for the eMic may also benefit from further research into acoustic performances that involve simultaneous playing and singing.

**IMPLICATIONS**

This case study demonstrates the importance of the integration of the body into the music making process as a means to develop expressive performance in the context of extended vocal performance using human-computer interface technology. Developing mapping strategies that combine functional and expressive gestures, has been shown to enhance the expressive performance
experience for the vocalist, particularly where the voice and HCI interface are simultaneously performed elements of the performance.

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References