EXPLORING MOVEMENT AND MUSIC IN A GRID MUSIC SYSTEM

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ABSTRACT
This paper presents an exploration of the ways music and movement are intimately related, particularly where human movement creates music in performance, aside from the purely mechanical activities of playing an instrument or interface. I discuss the fundamental connection of music and movement, and extend this understanding to investigate this activity in interactive music systems, where musical space becomes not only the interface for movement to music, but an activated “living” space of functionality, imagination and musical creativity.

I describe performance testing with my Grid Music System (GMS), DanceBass. This is the 2012 version of DanceBass, a mobile version of the HarmonyGrid system (2008) [1], designed specifically to explore pitch space. A correlation between movement and musical styles was found to be facilitated and enhanced by the interface. The system presented the active musical space as a surprisingly fluid and creative space, in contrast to the rigid geometry and musical triggering of the system. This can be understood by considering styles of user engagement defined by Williams et al. [2].

1. EXPLORATIONS WITH GRID MUSIC SYSTEMS
Performing and playing with DanceBass continues my exploration into the use of movement to trigger musical elements in music-space [3]. My initial interactive music system was the HarmonyGrid [1]: a GMS which allows a musician to improvise with a portable instrument while moving around on the projected grid, and triggering the musical elements. Projected grids include a Volume grid, a Rhythm grid, a Timbre grid and a Harmony grid. The system provides the almost unique method of full-body movement on the floor grid, being tracked by a webcam. Additionally, short loops of pitches as a bassline or harmonies can be recorded, which are displayed as icons as they play, and a live musical line may be played over the top.

The 2012 version, DanceBass, was aimed at exploring a desire to dance, or at least move freely, over a pitch space thereby triggering melodic shapes of a more tonal nature, and omitting the idea of simultaneously improvising with an instrument. The initial grid was expanded from 4x4 squares to 8x8 squares and currently only provides control of the pitch parameter. The Y-axis plays scales including the usual Western scales, the Blues scale, and a selection of non-Western scales. The X-axis plays either arpeggios (adapted for the scale) or semitones using the Western conventions of upward pitches going right and downward pitches going left. Rusconi et al [4] confirm that performers respond better to lower sounds relating to a leftward gesture and higher sounds to the right. Velocity and volume curves are incorporated and smoothed to provide for a more natural result. A Bassline may be recorded and looped, to allow live melodic improvisation as a main feature. Drones, sampled beats, and a Rhythm unit may also be used. Figure 1 shows the grid as it is projected onto the floor, at around two meters square.

Figure 1. A screenshot of the projected grid of DanceBass, featuring a Balinese scale on D. The currently playing square is F9 near the top left.

2. MOVEMENT AND MUSIC

Jensenius states “music is movement” at the outset of his 2008 thesis. He argues that we create music by moving and that music is sound that vibrate and penetrates our bodies and any attached or connected materials. Furthermore, in performance the flow of music itself induces body movement which “seems to be an integral part of both performance and perception of music” [5].

Trulsit, in his 1938 paper (translated and presented by Repp [6]) states that the essential characteristic of music is the expression of its inner motion; which is the external driving force of music. Furthermore, he said “that real or imagined motion is necessary to generate musical expression.” Some examples illustrate this. When the composer Carl Maria von Weber observed the landscapes outside his coach window they “evoked compelling melodic images in his mind” [6, 50]. Trulsit reports ethno-musical research that mountain dwellers sing songs containing jagged lines, while songs of hill dwellers typically are gently arched, and those of plains dwellers monotonous. He notes that the experience of musical motion is in the vestibular system. He also mentions people with a pronounced visual sense who can translate auditory motion to a visual version as “synoptic pictures”. In a detailed discussion of the process, he says “The artist’s motion experience creates the form and gives it content” [6, 49]. Trulsit states that motion can generate musical tones, and the reverse is true - that tones can generate motion (- one need only consider oscillators or speaker cones). On mechanical motion, e.g. for human movement or to play an instrument, he lists the components of impulse, resistance and friction, and that space and time are needed. Given these parameters, and by observing the trajectory of an object, one can infer the energy used; and similarly with sound. I draw a parallel with Smalley’s treatment of “soundshapes” in his “Spectromorphology” [7], where he describes the energy and trajectory of soundshapes. To this discussion of the intrinsic relationship between movement and generating music, we may add the element of creative expression in Section 4.

3. MOVEMENT AND MUSICAL STYLES

To discuss movement and musical styles I refer to performance testing with the DanceBass system. In my performance of May 2012 I had intended to use dolls rigged as marionettes on the grid, as the active “agents” on the grid. Instead I decided to use a variety of toy animals including dinosaurs, fitted with a stick behind them to operate them. I “rediscovered” that different animals had different styles of moving, and so a kangaroo hopped around the grid, and a dinosaur “ lumbered” around, and a small bird-like creature “ buzzed” quickly around. These varying styles and tempi could create various musical styles. This in turn reminded me of various movement or dance styles I might use on the grid, and mapped to various scales and synthesizer timbre settings, e.g. Disco, stomp, or martial styles.

For example, using the bird-like creature, a light, soft timbre was selected in order to “buzz” arced and quickly and smoothly, and semitones were the selected mode for X-axis movement. In this way fast, chromatic notes in the style of “Flight of the Bumblebee” suited the performance. In another segment, the Brontosaurus toy was used to “ lumber” around, triggering a heavy timbre with a dull attack, and moving through semitones and augmented seconds. A more athletic dinosaur, akin to an Allosaurus standing on its hind legs, was used with a brighter timbre with a sharp attack, and faster movements. While the dinosaur’s styles would be heard on the recording [8]. Figure 2 shows the control screens, in this case incorporated into the laptop version.

4. EXPRESSION

A pleasantly surprising result of performance testing the DanceBass system was that fluid expression could be found between the tracked grid interface, my musical intentions and the resulting sound. This was hoped for, as the design provided for interacting with the musical space, “music-space”, through whole-body interaction. Some recent and some earlier researchers concur with this idea. In testing “MoBoogie”, a mobile phone application “that allows users to manipulate and arrange music through movement”, Halpern et al state that “creative expressions arise in the joint space of movement and music, and did not primarily have to be in one form or the other” [9, 557]. They found their application fostered whole-body expression, not tied to “a precise input scheme”. Furthermore, “the ambiguity surrounding the nature of that expression is potentially its greatest strength”. Dance and music became a creative experience through a positive loop.

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For example, using the bird-like creature, a light, soft timbre was selected in order to 'buzz' around quickly and smoothly, and semitones were the selected mode for X-axis movement. In this way fast, characteristic notes were used in the style of "Flight of the Bumblebee" suited the performance. In another segment, the Brontosaurus toy was used to "lumber" around, triggering a heavy timbre with a dull sound, and moving through semitones and augmented seconds. A more athletic dinosaur, akin to an Allosaurus standing on its hind legs, was used with a brighter timbre with a sharp attack, and faster movements. I illustrate these styles to be heard on the recording [8]. Figure 2 shows the control screens, in this case incorporated into the laptop version.

In my performance in October 2012, I danced on the grid, using a light attached to my shoe for tracking. I found it to be a surprisingly free experience, and a highpoint towards which these GMS had always aimed. As previously, I moved in various ways to suit the selected and the X-axis pitch patterns and scales. As an entertaining highlight, I ran a radio-controlled car around the grid, to trigger some robust "synth"-style timbres. The car swerved, reversed and spun, in typical style of such a toy. Once again a different movement style revealed a new character, hopefully suitably matched to the musical timbres.

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[1] Sound Spectrum concert at WAAPA, Edith Cowan University, Perth, Australia

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Figure 1. A screenshot of the projected grid of DanceBass, featuring a Balinese scale on D. The currently playing square is F9 near the top left.

Figure 2. DanceBass version for laptop with main control screen, and lower screen with timbre, loop and mixer settings.
motion were the basis of musical expressivity and music pedagogy" and his programme demonstrates this connection [10, 419]. Seitz reports that "Musical expressivity is both embodied -- that is, resides in the physical characteristics of the body -- and entails physical and social interaction with others" [10, 421].

Referring again to Halpern et al and MolBoogie [9, 557], they find "Acts of expression are a function of both mind and body. An act of expression is not purely emotional or intellectual, but rather, it is purposeful and evokes emotion." In summing up their research, they concluded: "The findings ... indicate that the object of expression is not necessarily a dance, nor is it a piece of music. It may be described as something in between, or as neither" [9, 559].

5. INTERACTION

In testing 'SignalPlay', an interactive environment with objects that can be "played" including chess pieces and a light saber, Williams et al describe three types of user engagement: iconic, intrinsic, and instrumental [2]. Iconic interaction is described as interacting with an icon in the ways it affords, or the way the object that it represents, affords. Adapting iconic interaction to a two dimensional grid, suggests that the performer move strictly along grid rows and make turns ninety degrees, or multiples of, like a soldier; as the custom with grids is to move across line boundaries rather than apexes. Intrinsic interaction, using the intrinsic properties of the physical grid (although it is projected), is to use it as a reference whilst freely moving around the horizontal plane. In this way movements may cross the corners of squares at angles, and form curves over the space in a more natural way. Performing in this way feels more like "painting" over the surface and "letting" the object that it represents, affords. Adapting iconic interaction to a two dimensional grid, suggests that the performer move strictly along grid rows and make turns ninety degrees, or multiples of, like a soldier; as the custom with grids is to move across line boundaries rather than apexes. Intrinsic interaction, using the intrinsic properties of the physical grid (although it is projected), is to use it as a reference whilst freely moving around the horizontal plane. In this way movements may cross the corners of squares at angles, and form curves over the space in a more natural way. Performing in this way feels more like "painting" over the surface and "letting" the object that it represents, affords. Adapting iconic interaction to a two dimensional grid, suggests that the performer move strictly along grid rows and make turns ninety degrees, or multiples of, like a soldier; as the custom with grids is to move across line boundaries rather than apexes. Intrinsic interaction, using the intrinsic properties of the physical grid (although it is projected), is to use it as a reference whilst freely moving around the horizontal plane. In this way movements may cross the corners of squares at angles, and form curves over the space in a more natural way. Performing in this way feels more like "painting" over the surface and "letting" the grid respond as it will -- a much more natural process. By this analysis, we can discuss what becomes obvious when performing with the grid system. The rigidity of the grid and its triggering system are what we see initially, namely, the iconic interaction style of engagement. But in the reality of moving fluidly in the music-space, intrinsic interaction becomes the engagement style of choice.

DanceBass simply requires movement over it to trigger sounds, and so a square is either triggered or not. In data terms, any sensing data present reports a grid position, for the duration it is active. However, the use of duration and movement from one square to other squares provides temporal data including tempo, activity, and flow -- in terms of smoothness of triggering. These temporal parameters are used by Antle et al [11] in their "SoundMaker" environment, an unadorned square space in which multiple performers may move around in, tracked by camera. As with DanceBass, the only data gained is the position in the space, tracked from overhead. And so, although seeming to provide limited input to the system, a performer has directional or path control, that could be considered gestural for small scale movements. This control also incorporates the performative elements of pacing, activity and flow to add texture and detail to the musical output.

6. SUMMARY

Music and movement are intimately and, in some ways, reciprocally related. Jensenius [5] and Truslit [6] describe the many ways they are related. Human movement is a pathway to creating music. Different kinds of movements allow different styles of music to be made, and remind us of the many dance styles and their accompanying musical styles. It can be concluded that movement is a key driver in musical expression.

Movement may be used to create music more directly in an interactive system. Fluid expression is found in the movement/music-space interface, with the GMS DanceBass. Furthermore, ambiguity arises as to what the expression is, or rather that it isn't either movement or music. Halpern et al [9, 557] report similarly exploring their MoBoogie application, where "creative expressions arose in the joint space of movement and music", and that the object of expression becomes not a dance or a piece of music but something in between. In this way the movement/music-space interface becomes a medium of expression for artistic creation.

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