COUNTERLINES: STUDIES IN INTERFACING GRAPHIC AND MELODIC LINES

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ABSTRACT

This paper describes introductory studies for an intermedia performance *Counterlines* - a duet for Disklavier and Wacom Cintiq, in which both performers generate audiovisual materials that relate to each other contrapuntally. In the described five studies the pianist generates graphic lines while playing music and the graphic performer generates piano lines by drawing. The paper discusses our approach to audio-visual interfacing and intermedia composition.

Keywords: intermedia, Disklavier, Wacom Cintiq, mapping, visual music, sound-image relationships, interactive art, audiovisual performance

1. INTRODUCTION

The essence of intermedia lies in the prefix 'inter'. According to the Fluxus founder Dick Higgins, what defines intermedia works is that they fall conceptually between media [6]. *Counterlines* is an intermedia performance work built on the interactions between live music and real-time visuals. It uses Yamaha Disklavier piano, Wacom Cintiq 21UX and Mac 2 x 2.8 GHz Quad-Core Intel Xeon with patches programmed in Max/MSP/Jitter (Figure 1). It is a duet for a pianist and a graphic artist each of whom performs dual content in counterpoint to the other. So far, as part of the development process five studies have been produced and performed in concert. In describing them, this paper focuses on the issue of interfacing visual and musical elements.

Musical counterpoint is popularly defined as two or more melodic lines that are independent in contour and rhythm but interdependent in harmony [1]. Our project seeks to simultaneously employ visual, musical and intermodal counterpoint. To reinforce the clarity of relationships between visual contours all graphic elements are projected on a single screen. To provide a similar unified canvas for music all sounds, including those generated by the tablet use the piano timbre.

The use of computers in media performances often results in the masking of details of human control. In a duet based on counterpoint it felt particularly important that the clarity of who, how and when is in control of audio-visual material was maintained. To achieve it visual and aural elements played by individual performers need strong intermodal coherence. We imagined audiovisual gestures balanced in a way that neither sound nor image dominates. We not only found this equilibrium necessary to serve the needs of performance clarity or contrapuntal development but also as a potentially most idiomatic characteristic of intermedia in general. In this paper we report on the most effective correspondences that served us to link elements from both domains.

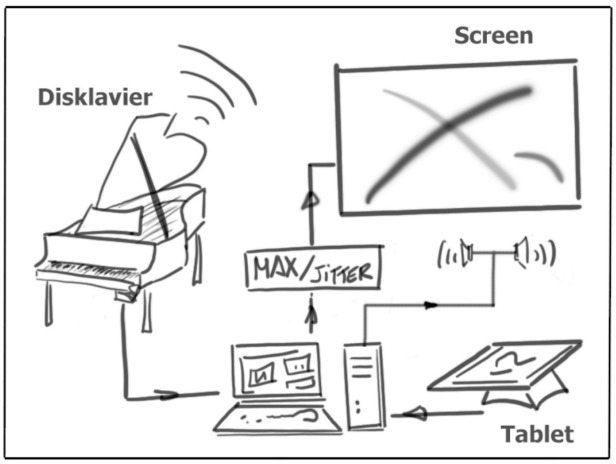

Figure 1. *Counterlines* set-up.

2. RELATED WORK

The emphasis on audiovisual coherence led us to draw on research related to mapping images to sound. Many artists and researchers have made visualization attempts capturing different aspects of music. Some approaches try to establish a mathematical or geometric analogy between visual space and pitch relationships [5]. The creation of analysis tools to capture the structure of a melodic theme or patterns of form can be found in *Music animation machine* [11] and others [4,7]. Some researchers try to extract the harmonic structure and relationships between key regions in a musical composition [14]. The

relationship between music and color has also been studied [16]. Numerous approaches were developed with the intention to capture and visualize musical expression [2,3,12,13,17]. This included the use of virtual objects or characters [2]. Many new interfaces were developed using visualization principles [8,9,10,15]. Having studied these examples and others we concluded that our approach could use selected elements of mapping to establish an audiovisual causality but no attempt would be made to consistently represent any aspect of music. In our project audiovisual coherence is only a tool needed to establish performance believability but it is not the conceptual or expressive focus.

3. FIVE STUDIES

Most musical studies are characterized by an expansive use of a strictly defined, limited, often simple musical idea or performance technique. Some of the best examples of piano etudes by composers like Chopin, Debussy or Ligeti prove that this approach can be extremely fruitful. In our view the clear presence of a live performer does not have to be based on virtuosity defined as a large number of notes executed in a short time. The refined and skillfully controlled timing and articulation of simple elements was to us even more desirable as long as it showed potential for interesting intermedia elaboration.

The melodic and graphic lines seemed to fulfill this requirement. We will begin by shortly describing aural and visual materials by medium then proceed to the intermedia correspondences, as they were composed within the five studies.

3.1. Melodic Lines

The basic expressive unit of melody is an interval of two notes. These can be considered as basic melodic vectors or lines. We decided to compose the studies using rhythms or melodic structures that would emphasize two-note groupings. Using MIDI a two-note motive can be represented by two events of given pitch, velocity and timing. The time, attack velocity, direction and the interval between events can be measured and used as input. Additional expressive potential of intervals seems to come from harmony or the relationship to a tonal center. For this reason we decided also to allow occasional presence of notes, which did not have to be interfaced with graphics.

3.2. Graphic Lines

In geometry the fundamental element analogous to a melodic interval is a line. It is constructed with two end points with a defined X and Y positions, distance and orientation. Such simple data can easily be tracked by Max/MSP/Jitter when drawn on a Wacom Cintiq. The added advantage was that from the computational point of view lines could be efficiently generated in real-time within the Jitter visual programming environment. A lot of effort was put in making the lines appear analog or hand-drawn but for lack of space it will not be further discussed in this paper. Background graphic elements were considered acceptable in the same way and for the same reasons as for the background notes.

3.3. Interfacing Graphic and Melodic Lines

A central element of our research was the interfacing of graphic and melodic lines to create expressively engaging and audio-visually coherent entities and composition. Since we are accustomed neither to seeing a piano generate imagery nor to hearing drawings generate sound this kind of linking or causality had to be established anew. As mentioned earlier, for that purpose certain elements of mapping seemed to be useful. Parallel motion was applied to different parameters at different times while independent motion was preserved within remaining parameters.

The studies were based on a principle that one melodic interval generated one graphic line and vice versa. The basic approach to interfacing sounds and images is synchronicity. In our case the two participating elements did not always start together nor were of equal duration. It seemed to us that even if they profited from occurring in temporal proximity or from overlapping, the coherence can be achieved also through the sense of a cause and effect relationship, which can be perceived even when one modality precedes a reaction in the other modality.

Intermedia linking can be observed and composed on various formal levels. Depending on artistic need it can manifest itself in a short audio-visual motive or as a much larger phrase or section. The detailed description of individual studies that follows will show examples of varying approaches to linking formal levels as well as sequences of linked parameters.

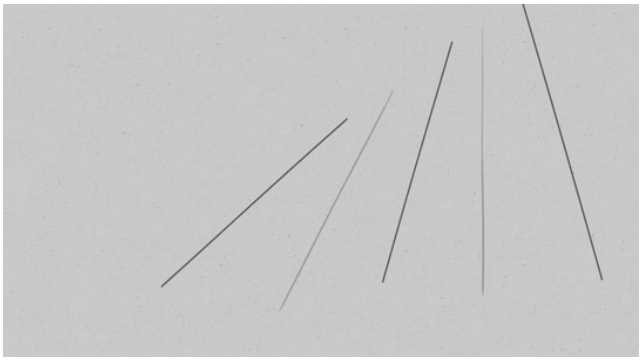

Figure 2. *Counterlines.* Still frame from Study 1.

Different sets of audio-visual correspondences dominate in each of the studies and can change even within single ones. In the first section of Study 1 melodic intervals get gradually smaller and softer. This is paralleled by the gradual counter-clockwise change in orientation from vertical to horizontal and shortening length of consecutive

graphic lines. In the second section the size of intervals remains static but they get louder and move steadily higher. The graphic lines match it with new lines appearing at a steady distance while gradually getting longer (Figure 2). The main rules of the third section are a reprise of the first but in a variant – extra layer of melodic intervals is played by the piano, which is reflected by graphic lines now allowed to cross each other. The fourth section brings back musical material from the second section but with irregular transpositions in register. These skips are linked with irregular distances between the graphic lines, which are now all horizontal

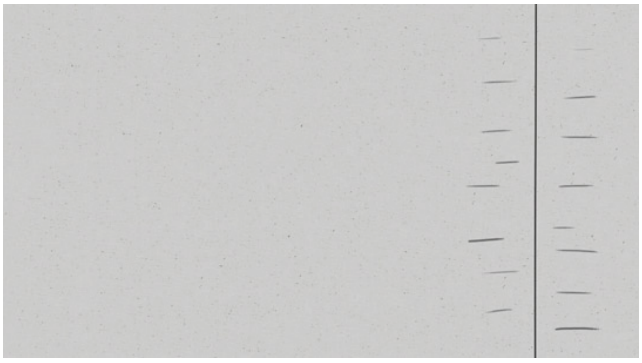

Figure 3. *Counterlines.* Still frame from Study 2.

In Study 2 the pianist continues to use the interfacing rules from Study 1. The tablet performer superimposes new ones. His material consists of very fast short strokes that appear at different relationships and distances to long graphic lines generated by the pianist (Figure 3). When the short lines of the tablet performer are close to or cross a long line generated by the pianist the melodic registers of both players match. When both players are far apart on the drawing plane so they are in musical register. In two sections that are limited to horizontal or vertical orientations of the short lines the intervals triggered by them are more consonant then in sections where multiple mixed orientations are used.

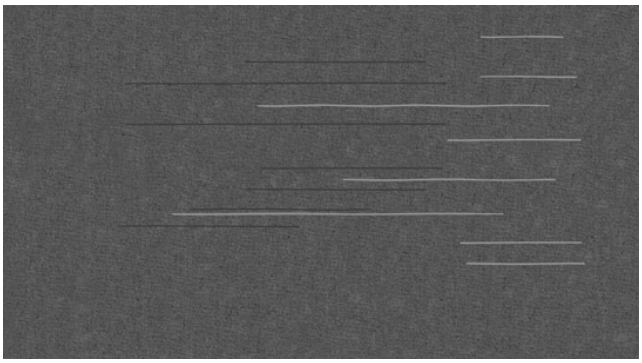

Figure 4. *Counterlines.* Still frame from Study 3.

Study 3 utilizes the size and up-or-down direction of melodic intervals in correlation with speed and left-or-right direction of appearance of graphic lines (Figure 4). Unlike the first two this study has a slow but regular pulse. The steady flow of musical material is linked with continuous and steady upward traveling motion of graphic lines. This time the graphic lines of each performer are different in color. It is related to the fact that the melodic lines of the tablet are in parallel motion with the piano, a major tenth above it. The difference in register is illustrated by the tablet's graphic lines being brighter then those of the piano.

Figure 5. *Counterlines.* Still frame from Study 4.

The premise of Study 4 is to link the expression of groups of lines rather then single ones. The melodic material is based on permutations of very few notes within a very limited range. The graphic lines are also limited in number and are drawn to form a rotating but single geometric figure of a triangle (Figure 5). At a central stage six held melodic notes are matched in number with a structure of six graphic lines. As the study progresses some of the new notes are held while the older ones released. This is paralleled in the graphic structure by older lines disappearing as new ones are drawn. When fewer piano notes are held fewer graphic lines remain.

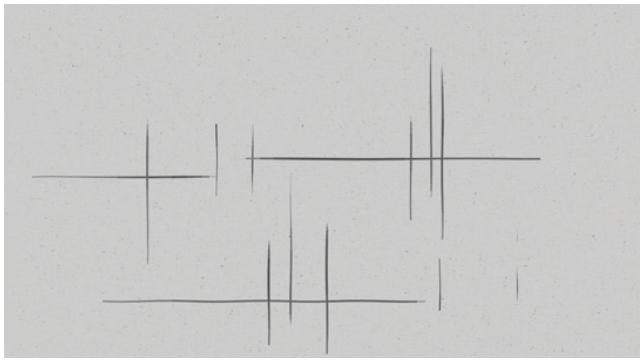

Figure 6. *Counterlines.* Still frame from Study 5.

The visual language of Study 5 is limited to vertical and horizontal lines appearing either very fast or very

slowly (Figure 6). Musically it consists only of major tenths appearing either melodically or as a repeated dyad. On the tablet side all lines and musical motives are fast. Every vertical line generates a staccato melodic interval while every horizontal line triggers a fast repeated dyad. The up-or-down direction of the interval is dependent on the up-or-down direction of drawing. The pianist also plays major tenths but both his musical and graphic lines appear very slowly. When the pitch material for both performers matches harmonically, the graphic lines generated by the pianist cross the ones drawn on the tablet.

4. CONCLUSIONS

Counterlines is a work, in which two performers generate sounds and images but one from musical, the other from a graphical input. Our need to clearly perceive who at any point was in control of the audio-visual material led us to the use of audio-visual mapping. As we tried a variety of strategies we found that using linear mapping of parameters, even if conceptually logical was not very expressive and did not hold interest for a long periods of time. Reductionist by necessity, fixed and strict use of mapping better serves the purpose of analysis than creation. We opted instead for correlating relative changes in parameters and for frequent shifting of interfacing rules. This allowed us to be less predictable and gave more expressive freedom to individual layers as well as more creative freedom to the composition as a whole.

In this spirit, we saw *Counterlines* as a system that allows flexible performance of composed sequences with only limited elements of improvisation. The use of pre-composed elements was not a creative limitation. To the contrary, because any sensing of live input by the computer results in a reduction, a 'direct' output into the other dimension is impoverished without some process of enrichment. Our way to do it was by pre-composition. The triggered pre-composed elements could have the refinement and expressive precision that satisfied our artistic needs.

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