THE EMERGENCE OF GRAPHICAL MUSIC

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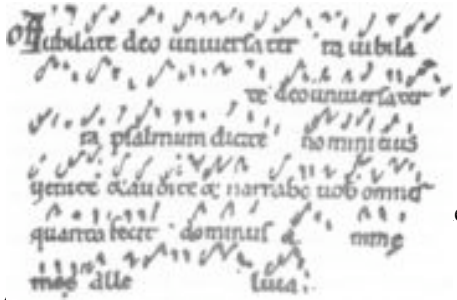
Abstract

This research analysis music notation tools and explores their impact on practices of musical composition. Conventional music notations first evolved to support teaching and to document composition. For example, the first neumatic notation, which emerged in monasteries in the 9th century, consisted of a free form line, usually above a text, which represented pitch (see figure 1).

Figure 1: Example of early neumes



The first lattice-based representation of music, combining neumes with a 4 line stave, is attributed to Guido d'Arezzo in the 10th century. D'Arezzo invented this notation as a mnemonic aid for teaching chant to his students. These notations helped to reduce the introduction of accidental changes due to oral transmission from one generation to another. In addition to increasing copying fidelity they also altered the task of composition. They provided composers with an abstract representation of music that could substitute for the music itself.

A number of historical changes in musical form correlate with innovations in notational systems. For example, musical ideas such as polyphony and counterpoint co-evolved with the changes spatial arrangement of notes vertically (polyphony), or the specification of note durations (counterpoint) (see e.g., Burkholder et. al. 2006 for discussion). Anecdotally, there are many examples of musical ideas that developed as a result of experimentation with different notational formats. For example, the symmetric or reverse process used by J.S. Bach, A. Schoenberg's serialism or the formalized music of Iannis Xenakis (Xenakis 1992).

From notations to user interfaces.

Scores evolved to represent pitch, tempo, dynamics and also playing modes (such as *flatterzunge*, a way of blowing in a flute) or improvisation (cf K. Stockhausen). The notation of playing modes captures abstract gestures rather that concrete sounds. This is significant because it treats aspects of performance of a piece as parameters that can be controlled. This practice has developed to include, for example, scores that explicitly locate musicians in a concert hall, notate the sounds to be played by a tape, or even schematic representations of electronic devices used to transform sound.

The potential of computers to enhance the manipulability of musical structure was appreciated early on. Max Matthews developed Music I, an influential program for sound generation at Bell labs in 1957. Contemporary technologies employ a rich variety of graphical user interfaces for editing and mixing sounds and instruments.

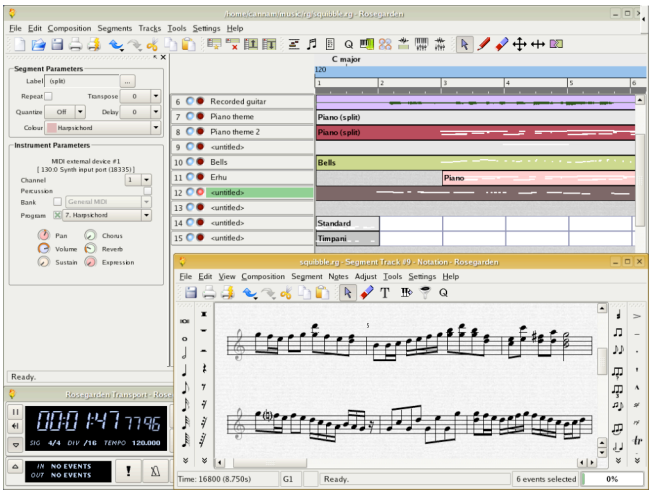


Figure 2: The Rosegarden User Interface

For example Rosegarden (Figure 2), a free music program similar to Cubase and Nuendo uses a time line paradigm inherited from d'Arezzo to represent sounds and symbolic data. Part of the interface represents sequences (shown in the upper right). Another part supports editing. These systems can provide instant feedback and are commonly used to prototype compositions, where instruments are played by a sampler and mixed with recordings.

Despite the emergence of a variety of sophisticated user interfaces, studies have shown that music programs provide little effective support for creativity (e.g., Dannenberg 1993, Abrams et al. 2001, Eaglestone et al. 2001, Dahan 2005). In order to get a better understanding of the use of different visual representations during musical composition we carried out a survey of compositional practices.

Contemporary practices in composition

The aims of the survey were to get a better overview of the typical first steps in composition, the role of technology, instruments and other artifacts and to assess the importance of sketching for music composition.

A short online questionnaire was designed and calls for participation were distributed to mailing lists that target computer literate composers. Across the sample, the most common media used for initial composition were pen and paper. 24 composers (75%) reported using pen and paper in the first stages of composition; 16 (50%) reported using pen and paper exclusively. 5 composers reported (15.6%) using a computer at this stage and only one composer started by interacting with an instrument.

The most commonly reported initial representation of a piece was a drawing (50%). Six participants reported starting from an idea or mental representation and the remainder used either a textual description (3) text plus visuals (3) or nothing (6).

The general pattern suggested by these responses is that composition is not initially a task where sounds – which ultimately constitute the composition – are manipulated, but rather a task where higher level concepts or representations of music provide the starting point. Most of the composers in the sample begin with an abstract idea or concept of the composition. For 13 (40%) of the sample this corresponds to a concept of coarse grain musical structure or states, for 8 (25%) it corresponds to temporal patterns or dynamics. In most cases these concepts are rendered in a visual representation of some kind. In contrast to this only 5 people in the sample develop the first stages of composition using specific sound parameters. 20 participants (63%) reported beginning with only vague details of the final piece.

The results of this survey suggest that the initial stages of composition involve processes similar to those described for design (see above). Participants start with a vague conception of what they want to do. For many composers it appears that an effective way of developing these ideas is through a 'dialectical' processes of sketching and revision (cf. Goldschmit, 1991).

Discussion

Overall, the evidence from the survey, and a case study carried out suggests that in musical composition, as in other forms of creative design, sketching plays an important role in facilitating the development of ideas. It appears that this is partly because people start out with relatively underspecified concepts of what they wish to achieve. Following Green (1989) it seems that sketches provide a suitably underspecified representation that helps composers to avoid premature commitment to the concrete details of a piece. Analysis of a case study highlights several aspects of the sketching process that go beyond the generic advantages of an underspecified representation.

Conclusion

These properties of sketches for composition are problematic for computational music systems that aim to provide interfaces that support music composition. As noted, programming languages require as clearly defined a syntax and semantics as possible. However the external representations that provide the most effective support for creativity seem to exploit under-specification of their syntax and semantics. Rather, it appears that the dynamics of shifting semantic frames are a key part of the process of composition. This is not to claim that a situation in which there are no constraints is the ideal (contra Dahan 2005). Rather it is to claim that it the process of managing these dynamics that must be accommodated in the design of these interfaces.

Despite the wide availability of sophisticated software for editing, mixing and rendering music, the early stages of musical composition, like other forms of creative design, are still primarily executed with pen and paper. The reason for this appears to be that it supports a degree of vagueness and ambiguity that facilitates the creative processes involved in the early stages of design. It seems that vague ideas need vague media. In addition, they allow a dynamic interplay between drawing spaces, semantic frames and compositional frames that avoids enforcing premature commitment.