Callum Hedemann

Queensland University of Technology & Australasian CRC for Interaction Design Kelvin Grove, 4059 Australia

cl.hedemann@student.qut.edu.au

Andrew Sorensen

Queensland University of Technology & Australasian CRC for Interaction Design Kelvin Grove, 4059 Australia andrew@moso.com.au

Andrew R. Brown

Queensland University of Technology & Australasian CRC for Interaction Design Kelvin Grove, 4059
Australia
a.brown@qut.edu.au

Metascore: User Interface Design for Generative Film Scoring

Abstract

This paper outlines an application called Metascore that provides a visual interface for the control and synchronising of parameters for generative film music scores. Metascore is part of a project under development at the Australasian CRC for Interaction Design (ACID), the aim of which is to create a real-time automatic film scoring system. Metascore allows the user to compose music, using high-level descriptions of compositional intent, in synchronisation with video. Metascore allows control of constant parameters within sections that demarcate film cues, and control of continually varying parameters through free-form break point envelopes. Parameter values in Metascore can themselves be expressions or functions, enabling extensive flexibility for adaptive control of the algorithmic score. This paper will describe the Metascore interface design and illustrate its use in the context of producing an orchestral score for a documentary film.

Introduction

Film music is constrained by the pacing, structure and narrative of the film. Metascore is designed to make the setting and adjusting of these parameters quick and easy to manage. The structure of films is particularly fluid and controlled by the films directors and editors. This means that the composer is often writing to fit a moving target. The use of generative processes in the composition process greatly improve the flexibility composers have in generating music, and Metascore provides an interface to generative music processes that means that variation on the film music can be rapidly developed and tweaked Metascore is being developed in the Impromptu environment (Sorensen 2005) and makes use of the Vienna Symphonic Library as its sound source. The purpose of this project is to provide the non-musician access to an effective film score generation tool which requires only a superficial knowledge of music, or alternatively as a means of quickly and efficiently creating the outline of a score which can then be further refined by a composer. As a film scoring tool, the integration of music with video results in the need for several additional considerations. These considerations include the emotional content of the music and the underlying compositional algorithms, as well the timebased issues which concern the synchronisation of music to video and visual events. However, this paper is primarily concerned with the issues surrounding synchronicity, as the compositional algorithms controlled by Metascore can vary from style to style and will be discussed in other related papers.

Design Considerations

The structure of a film is quite different to the structures commonly found in music. Similarly, the structure of a film score is different to the structure of a standard composition. Thus, in film composition, the standard rules of structure and form do not apply - a rondo or sonata form is unlikely to suit the structure of a film. The placement of scenes changes and events in films are much more irregular than the (relatively) steadily paced structures found in music, and do not necessarily lie within the regular flow of the music. Remember that it is the music which supports the film, and the score should be crafted around the structure of the film in order to enhance the power of its emotional impact. It is therefore important for the film composer to carefully consider the structure of the film in their composition, as it will heavily influence the structure of their composition.

The design of Metascore's user interface accommodates this need for structural synchronisation through the implementation of a number of specialised features. As Metascore uses a number of compositional algorithms to generate its score, as opposed to the use of pre-composed fragments, it is possible to define the composition on a structural level. Not only does the interface provide the user the ability to input compositional information, but does so in a manner which allows for the sufficient precision and control over the synchronisation of musical structure with the film. It does this in a way which makes it easier to incorporate this task of synchronisation directly into the composition process, and reduces the workload required by the composer.

The interface has been developed to facilitate our research of the underlying generative algorithms employed. This means that it is not end-user ready, which is apparent, for instance, in the fact that some parameters require lisp expressions. Although this would be unsuitable as a final release, it allows us as developers powerful expression over the input into these algorithms. We can discover what is types of user input and functionality is effective and provides the most control over the composition, and shows us the possibilities of what an end-user may want in an interface.

Similar Projects

- These projects attempt similar endeavours

- asketch
- cinescore
- smartsound (www.smartsound.com)
- scorebot
- They identify similar issues surrounding the generation of film music

While these applications have many facilities for assisting the creation of music synchronised to film, there are still many issues raised by generative musical score and by the wide range of film structures. The approaches used by Metascore to counter these issues will now be discussed

Metascore overview

Metascore facilitates the efficient experimentation of algorithmic processes for generative film music. It allows the user to control parameters of the underlying generative music algorithms and focus on high level artistic issues such as intensity, complexity, tension and the like. These higher level considerations are often referred to as meta structure (Xenakis 1992) or meta level composition. Metascore facilities this through the use of section markers to segment the film into cues and calculates tempi to ensure that bar boundaries always match cue points. Various parameters are sectional and their settings remain constant within a section, but can vary between sections. In addition, Metascore provides a layer of parameter envelopes that allow for continual variation in parameters over time. Parameter values are interpolated between break points in the envelopes.

Fig 1. Screen shot.

In figure 1 section markers are indicated by vertical lines on the video display area, which acts as a time line, and various parameter envelopes are shown overlayed on top of these. The position and resolution of the time line are controlled by the sliders beside and above the display. The left side of the interface shows the musical parameters than can be controlled by envelopes and allows for them to be toggled on and off. The lower part of the display includes transport controls and fields for parameter values. The next section of the paper will outline these aspects of the interface in more detail.

Sections

Metascore uses sections to group together certain global parameters over specific parts of the music and film. Each section has its own set of values which, when used in coordination with a series of sections, can outline the development of the composition over time. The main purpose of using sections is to assist with the synchronisation of events and to facilitate the use of linear structures often found in film compositions. These goals are achieved through the designed features associated with sections including tempo synchronisation, beat modulo and hit points.

Tempo Snapping

The use of sections relates to events in the film on a macro scale. However, another important aspect of synchronisation lies on the lower level concerning *bars and beats*. As the duration of a section will be primarily determined by the changes and events in the film, it will likely be of an irregular length. However, music often relies on a regular number of grouped beats, so Metascore assigns a specific tempo to a section in order to ensure that it contains a whole number of beats or bars. This is a common practice in film scores and is made easy by Metascore. Tempo Snapping calculations occur when a section is created, when its duration is modified, or when its tempo value is set by the user. In the latter case the desired tempo is adjusted to the nearest value which would accommodate a whole number of beats over the duration of the section. The effect of this is usually to push the tempo up or down by up to five beats per minute. When applied to all sections, this effectively synchronises the beats of the music with the structure of the film.

Beat Modulo

A feature related to tempo snapping is Beat Modulo. This feature allows for the grouping of beats, so that a whole number of these groups fit within the duration of the section. Again, this is achieved by further modifying the tempo. This feature is useful for specifying the bar length used in the section (related to specifying a time signature), which prevents the use of an irregular number of beats and allows for further constraints over the musical length of a section while maintaining tight links to the structure of the film.

Sectional harmonic parameters

The remaining values that can be set in a section are the key, mode, chord intervals and chord durations. These are important parameters that provide further specification of the character of each section. For instance, the pitch scale used in a section can be easily defined by specifying the root note of the key and name of the desired mode. Another useful capability is the ability to supply a list or possible chord intervals and chord durations, which are used as input to the underlying compositional algorithm. This allows the output of the algorithm for each section to be specified in more detail. These features can be used to support the linear structure of a film composition. When these parameters are used effectively and in coordination with the other sections, it is possible to produce an well controlled harmonic basis for the composition.

Hit Points

Even with the use of sections to align the composition and film structures, there still may be cases where particular off-beat actions within a section of the film require musical accentuation. This is a situation commonly encountered in film composition and is known as a hit point. Metascore deals with hit points by subdividing a section at the point where this accentuation is needed and forcing the first beat of the nearest bar to lie on the hit point. Subdivisions created before and after the hit point are tempo snapped. Both subdivisions exist as a part of the same section and still share all of the other section characteristics.

Envelope Control

Metascore allows the definition of some compositional elements as a set of continuously varying parameters. These are most frequently used to express compositional intent through features such as volume, orchestration, melodic continuity, texture, pitch compas and the like. The details and workings behind these elements and the algorithms into which they are input are discussed at length in a related papers about generative music algorithms that Metascore can control. The control of these elements is given to the user as a series of break-point envelopes that consist of a custom number of editable nodes as shown in figure 2. These envelopes represent the value or state of a parameter over the duration of the entire film. These values are used as input into the compositional algorithms which in turn generate the score on a *note by note* level. It is the various combinations and arrangement of the envelopes which form particular compositions.

Figure 2. Break point envelope in detail.

The envelopes themselves can be easily modified, allowing the user to create new nodes, drag around existing ones, or delete unwanted nodes from the break-point envelope. A key editing feature is the fact that the envelopes are overlayed on to the video. This makes for easy editing, as the user can drag the time slider to specific visual events and align envelope nodes with quick precision, ensuring that key compositional points match up with corresponding events in the film. The user can zoom in on an envelope for even finer control. Additional editing capabilities include the option to view multiple envelopes simultaneously, as well as to control the transparency of the overlayed envelopes. Envelope display options can be used to enhance the editing process by putting related envelopes into simultaneous view and editing them in concert. Alternatively, they can be used to depict a meta "score" by bringing all

relevant envelopes into view by increasing their transparency and then seeing the interaction between the envelopes as representing the generated composition.

With effective arrangement of the various envelopes over the duration of the film, the user has essentially composed the film's score using the contours of the envelopes. This method of composition demonstrates the balance between control and efficiency that Metascore achieves for the user. Control of the composition on a *note by note* level is delegated to the generative algorithm and the user engages with envelope control of compositional elements over time.

This provides a high-level description of music composition, a meta-control that can be used to describe the user's compositional intent. The inherent limitation of this method is the fact that it takes away the absolute control of composition usually available to the composer. However, this limitation is balanced (or even outweighed) by both the efficiency of synchronisation between music and film, and the ease of composition available to the user. In fact using this method of composition, even the non-musically inclined user would be able to create a reasonable score to accompany their film.

Orchestral Score case study

Describe how Metascore is used on the case of Orchestral music. What is a typical process of using Metascore?

Parameter choices

[write about, and give examples, of the types of parameters that are used and why there were chosen for the Orchestral style. Also write about, and give examples, of types of values, structures and functions that can be included in parameter fields.]

Conclusion

The role of music in film is to provide support for the actions and events which occur visually in the film. In order to fulfil this role successfully, synchronisation between the structure of the music and the structure of the film must occur. As film structures are irregular in comparison to a musical structure, the composition of a film score requires special consideration. The design of the Metascore interface addresses these issues for the generative music composer and provides a platform for efficient experimentation with a variety of parametric settings and thus a quick exploration of a compositional space occupied by the algorithm.

In this paper we described how the use of a series of break-point envelopes can be easily created to align with the structure of a film. And how the use of sections can support the kind of linear development which is effective in the composition of film music, particularly for harmonic and metric structure.

The future development of Metascore lies in the related areas inherent to film composition, such as the use of precomposed themes and thematic development. As this development continues, the interface design of Metascore will evolve to explore and reflect the needs effective experimentations with generative music for film.

Acknowledgments

The work reported in this paper has been supported by the Australasian CRC for Interaction (ACID) through the Cooperative Research Centre Programme of the Australian Government's Department of Education, Science and Training.

References

S. Abrams, R. Bellofatto, R. Fuhrer, D. Oppenheim, J. Wright, R. Boulanger, N. Leonard, D. Mash, M. Rendish and J. Smith 2001, 'Qsketcher: An Environment for Composing Music for Film', Proceedings of the International Computer Music

- Conference. ICMA, Havana, Cuba.
- Pierce, M. 2000, 'Scorebot: Theory and Design of an Automated Film Scoring Application', Master's thesis, University of Leeds, Leeds.
- Pierce, S. 2004, 'Experimental Frameworks for Algorithmic Film Scores', Master's thesis, Dartmouth College, Hanover.
- Sorensen, A. (2005). Impromptu: An interactive programming environment for composition and performance. *Proceedings of the Australasian Computer Music Conference* 2005. Brisbane: ACMA, pp. 149-153.
- Brisbane: ACMA, pp. 149-153. Vane, RE. 2006, 'Composer-Centered Computer-Aided Soundtrack Composition', Master's thesis, University of Waterloo, Waterloo.
- Xenakis, I. (1992). Formalized Music: Thought and Mathematics in Music. Stuyvesant NY, Pendragon Press.
- cinescore
- smartsound

Hedemann, C., Sorensen, A. and Brown, A. R. (2008). Metascore: User Interface Design for Generative Film Scoring. Proceedings of *Sound : Space - The Australasian Computer Music Conference*, Sydney. ACMA, pp. 25-30.

The submission must also include: # a brief biography (150 words maximum); # technical requirements for the presentation; # and full contact details.

BIO:

Andrew R. Brown

Associate Professor Andrew R. Brown works as the Research Manager of the Australasian Cooperative Research Centre for Interaction Design. Andrew is a musician and computational artist, whose academic expertise is in computer supported creativity, algorithmic music and art, and the philosophy of technology. He is an active composer, media artist, and a builder of software tools for creativity and arts education.