Chapter III
XML Music Notation Modelling for Multimedia: MPEG–SMR

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ABSTRACT

The evolution of information technology has changed the use of music representation and notation in software applications, transforming and extending them from a simple visual coding model for music scores into a tool for modelling music for computer programs and electronic devices in general (e.g., keyboards), to support the exploitation of the multimedia characteristics lying behind music notation and representation. The MPEG symbolic music representation (MPEG-SMR) is a new emerging standard for modelling music notation within the MPEG multimedia framework. MPEG-SMR provides an XML-based language to model most of the music notation in terms of the visual and audio aspects, as well as music score annotations. MPEG-SMR also provides a language to define the music score formatting rules, supporting personalisation for the score visual presentation, custom symbols, and control visual rendering of the common notation symbols.

INTRODUCTION

Music in multimedia applications and frameworks is often considered only for its audible dimensions, while neglecting the important issues on the representation of the symbolic aspects. This could be due to historical cultural effects, since many popular and earlier multimedia tools are built for entertainment applications, and not focused on education, preservation, or research purposes.

Music notation is an abstraction of the music. Not all performers use notations, and music notations have many different styles and forms. Currently, multimedia tools frequently use simple symbolic representations of music to represent the production of sound/music – for example, notes produced by an instrument.

Notations for the representation of music symbols have been developed over the years and ages to visually represent the pieces of information
needed by a performer to play the music piece and reproduce the music as the author/composer intended. The production of music notation scores for professional publishing on paper is one of the most traditional applications of music notation on computers (Blostein & Haken, 1991; Rader, 1996; Selfridge-Field, 1997).

The evolution of multimedia applications is accelerating relevant changes in the usages of music representation and notation in computer-based applications. Nowadays, it is no longer unusual to see music notation and modelling integrated into professional and educational music/audio applications (Bellini & Nesi, 2004; Byrd, 1984). In the past, several XML-based languages for music modelling have been proposed, including MNML (Musical Notation Markup Language), MusicML, MML (Music Markup Language), MusicXML (Good, 2001), WEDELMUSIC (http://www.wedelmusic.org) (Bellini & Nesi, 2001; Bellini, Della Santa, & Nesi, 2001), CAPXML (Capella, 2005), and so forth. Past efforts for music notation standardization were SMDL (SMDL, 1995) and NIFF (NIFF, 2005). Most of them are mainly focused on modelling the music elements to preserve and interchange the notation format and information among different applications (for editing and rendering of music scores), rather than to provide features that could support the integration of music notation with multimedia, for example, synchronisation with audiovisual and 3-D rendering, references and hyperlinks, multilingual lyrics, automatic formatting and rendering, and so forth. These features are clearly required and can be seen in tools from industrial projects, and R&D areas:

- Multimedia music for music tuition, such as VOYETRA, SMARTSCORE, PLAYPRO, MUSICALIS.
- Multimedia music for edutainment and infotainment, such as WEDELMUSIC (integrating music notation and multimedia to build and distribute multimedia-music cultural content with digital rights management), or to produce multimedia content for theatres: OPENDRAMA (http://www.iua.upf.es/mtg/opendrama/);
- Cooperative music editing, such as in MOODS (http://www.dsi.unifi.it/~moods), (Bellini, Fioravanti, & Nesi, 1999; Bellini, Nesi, & Spinu, 2002), and more recently using MAX/MSP with I-MAESTRO project (http://www.i-maestro.org).

Most of the applications mentioned are based on a multimedia music content format that is specific for each product. This is why any information exchange among the products can be so difficult, and it is strongly restricted to subsets of the notational part, for example, in MIDI. The lack of standardized symbolic music representation integrated with multimedia content results in each developer/company implementing their own solution, which may vary in efficiency, scope, features, quality, and complexity.

In this context, the MUSICNETWORK (http://www.interactivemusicnetwork.org) project began in 2002 to support a group of experts to identify a standard format for music representation for multimedia applications. The MUSICNETWORK started to work with ISO MPEG on the SMR (symbolic music representation), as described in another chapter of this book. The integration of SMR in MPEG multimedia framework, with technologies ranging from video, audio, interactivity, and digital rights management, has enabled the development of many new applications like those mentioned earlier and in Bellini, Nesi and Zoia (2005).

An overview of the MPEG-SMR standard is presented in this chapter.