# Book review

Walter B. Hewlett and E. Selfridge Field (eds.), *Computing in Musicology 12. The Virtual Score: Representation, Retrieval and Restoration*. MIT Press, Cambridge, MA, London, 2001. 291 pp. ISBN 0-262-58209-0, ISSN 1057-9178
DOI:10.1017/S1355771802211127

*The Virtual Score* is the twelfth volume of the series *Computing in Musicology* edited by Walter B. Hewlett and E. Selfridge Field. As with many of the other books in the series, this volume provides an excellent collation of articles and represents a broad piece of knowledge collated from an international community of music academics involved in the field of, what the book calls 'the virtual score, representation, retrieval and restoration'.

True to the tradition of the whole series, it is more a survey of different areas of research/development within this sub-topic, rather than a comprehensive homogenous view. The value of this is immense to anybody involved or interested in the field.

As the editors mention in the foreword, the format from volume to volume has changed slightly over the years and this is, in my opinion, of immense benefit. As many readers of this series will know, the series started off being a directory (Directory of Research, Directory of Applications) and progressed almost seamlessly into one of the major periodical publications about music processing, a term which does need some explanation for the 'uninitiated'.

'Music processing', in the way that this community uses it, denotes the processing of music information, which is stored in its structured symbolic musical 'Gestalt'. The term 'music processing' implies a difference from the signal processing community, in that it does not deal with sound as the source material for investigation, but deals with music as score or music as time-based structure stored in a symbolic form, such as codes, languages, etc. Obviously the boundary between signal and 'music processing' can become very blurred, but it is useful to mention this division as it seems that the research, its communities and their methodologies tend to be different and do not overlap in a major way. This makes the existing polarity socially more understandable even if not content wise.

Unlike the music processing community, the signal processing side of music technology has always had a large following, consequently the literature is overflowing in abundance of work in this area, with spills into the more unacademic popular reading lists. A guess that *MP3 for Dummies* is already a published book is proven correct by a simple search on Amazon, and it can also be read that: 'customers who bought this item also bought: *Delia's How to Cook Book 3*; Hardcover'. Music signal processing has achieved mainstream relevance.

This is in complete difference to the area of music processing, which is still a relatively small research area, possibly as its research topics demand for an even higher amount of interdisciplinary expertise between the engineering and computer sciences and the music and musicology arts, but possibly also due to the fact that the applications until now have a much smaller commercial potential.

Thus the literature and the circle of researchers is still relatively small, and a periodical such as *Computing in Musicology*, which deals with issues in this area, such as notation, computer supported music analysis, music archives, databases, musical formats for interchange, music encoding, representation and retrieval is of immense value for not only disseminating the expertise, or documentation of work in this area, but also to provide a sounding board for the need to support this area of research.

The book *The Virtual Score* is divided into three major areas: 'Representation and Interchange', 'Retrieval and Analysis' and 'Virtual Restoration of Sources'. All articles thoroughly describe the idea as well as the implementation, which makes it an invaluable source, even more than the usual conference papers, which tend to be forced to concentrate on design and method due to constrictions on length, rather than details of implementation.

The first section, which contains by far the largest collection of papers, starts off with two papers by Theodor Dumitrescu and Stefan Morent, who deal specifically with early music and its representation using computers. Theodor Dumitrescu attempts the development of a new encoding language from the perspective of mensural notation, implying that mensural notation owns a richer set of descriptions than the modern system, when restricted to notating early music. Interesting is the notion of looking at other notation systems

than our common music notation in order to grasp the – or one possible – elementary meaning of music. Most currently available and developing music systems have just this weakness of starting from the notion that our modern notation is the most adequate symbolic representation of music, based on the questionable grounds that we are using it most ubiquitously to represent all types of musics. It is a very valid point and an important argument that before trying to devise and develop a music data structure for representation as well as analysis, that one should lose any attachments with our modern notation, in order not to be blinded by a cultural subjective attitude towards what music is and how it is supposed to be stored.

Another important aspect in his article is the separation of what I have always called the view and model, and which Dumitrescu tends to call the 'visual layer' and 'editorial layer'. But interestingly, in opposition to current developments of data structures differentiating between view and model, within his aim of providing an adequate representation for early music, the notation of a manuscript is the starting point, which normally would be seen as the view and not the model. But the adequate representation of early music as found in manuscripts is the goal, and there is no other symbolic meaning of music other than the symbolic representation on paper. All other information, performance, analysis, composition needs to be drawn from this manuscript representation, as in early music, not much else has survived. Thus his 'visual layer', which provides the direct description of manuscript content, is his central layer, the actual data representation structure. His 'editorial layer' provides means of interpreting the contents. It will be interesting to follow his work using this strategy.

Stefan Morent's article describes a project which developed a music representation specifically targeted for analytical purposes (and not printing or sound generation) of the whole Hildegard von Bingen corpus. It uses the predefined 'kern' representation, and will be able to be processed within the HUMDRUM Toolkit, catering very well for highly flexible and powerful analytical tasks. The author mentions that the lack of enough detailed representation of the graphical score – too much concentration on the logical structure of the music – is problematic, presumably specifically for music in which the score manuscript, as in this case, is the only single content on which we can base all our investigations. But as the system structure is open and allows the representation of different and specialised musical information concurrently, a new scheme using HUMDRUM can be designed to fit specific music notations, such as early music.

As mentioned by the author, one of the extremely musicologically interesting aspects of this project is that it is thought that the entire musical output of Hildegard is known and thus encodable. This completeness of corpus is unique for the twelfth-century manuscripts, and will undoubtedly provide interesting investigations into her music.

The next two articles from Langolff and Brown explore the production of Braille Music Scores. Didier Langolff, Nadine Baptiste-Jessel and Danny Levy decided to use NIFF encoded music as the source material, and describe the parsing and converting of the tree-like structure of NIFF into Braille. In addition to this, several tools to aid the process are described. Silas Brown describes work based on his theses which is interesting due to its approach using OOP as well as lexers and parsers. In a typical object-oriented fashion, but unusual for music processing applications, its design moves from the general to the specific with the core system not knowing anything about music. It also uses a design aspect, which I wholeheartedly agree with: the notion of using dynamic typing as much as possible. His system uses tuplets with attributes and values, where type is just another attribute, making the type of an event a matter of the characteristic (attribute) of the musical event. This retains the flexibility and expandability needed in music representation, if presumably needing more detail in error handling.

Holger Hoos, Keith Hamel, Kai Renz and Jürgen Kilian describe in the fifth chapter the GUIDO Music Notation Format, which is by now already very well known and widely used, and has been described in many conference publications, with particular reference to its emphasis on representational adequacy, a term coined by the creators of GUIDO and meaning a sort of 'complexity scalability': simple musical concepts should be able to be expressed by simple structures and complex musical concepts by more complex structures.

Despite its already existing popularity within the developer community, to include it in this volume is an important step, as it was not described in Selfridge-Fields' *Beyond Midi*, possibly due to its relative novelty. Thus, the inclusion in this volume has filled this missing link of documenting an important standard in an important reference work of formats, which this volume will undoubtedly act as for readers, continuing on from *Beyond Midi*.

The following last four articles of this first part of the book deal with XML-based music notation formats, and start with a general overview of XML and its adequacy for representing music information. This is obviously an area in which future standards may emerge with a fast uptake through browsers, and although no acceptable interactive music notation applications based on these standards have yet been created, it is surely only a matter of time until are.

Gerd Castan has followed the NIFF standard to provide an XML implementation based on NIFF. This is useful in more ways than Castan mentions himself (discussion and analysis of the NIFF data model itself and formal way of describing the model), amongst them the hope of a possible resurrection of the movement to

https://doi.org/10.1017/S1355771802211127 Published online by Cambridge University Press

include a notation interchange file format, such as NIFF or NIFFML in future applications, as NIFF itself seems not to have made it to that stage until now. It is also interesting that he mentions the existence of arbitrary tags as a weakness, rather than a strength, based on the grounds of non-compatibility between applications. This, one would think, is surely a design problem and not a structural one.

Michael Good describes MusicXML, which is supported by already existing applications using converters reading from MuseData, NIFF and Finale, and reading into Sibelius and MIDI. It is different from Castan's proposal in that it does not so much represent the 'score on paper information', as the logical structure of music itself. In this, it is more similar to SMDL and HUMDRUM, as NIFFML is to NIFF. Perry Roland's proposed XML standard deals with yet another aspect in music information representation: the storage of comprehensive and expandable metadata about the music, i.e. bibliographic metadata. This will be important especially for archives and libraries, and one would imagine that there needs to be collaboration between the developers creating XML-based descriptions of the content with developers creating XML-based descriptions of the metadata, in order to supply one standard acceptable for modern comprehensive representation and retrieval aspects.

The first section of the book ends with an article by Don Anthony, Charles Cronin and Eleanor Selfridge-Field concerning copyright and legal issues, and possible existing business models within digital storage and distribution of musical information. Starting with a short history and a copyright primer, it continues to discuss the issue of musical authority, followed by a list of thirteen models used for delivery in present projects, companies and organisations. This last section is a good attempt at a comprehensive overview of the different models existing and emerging. The thirteen models described range from 'Paper Music Publishers', 'Notation Software Vendors – Hybrid Publishing Systems', ' Digital Images of Paper Archives', 'Electronic Archives of Encoded Musical Data', to 'Systems under Development'.

The smaller second section about 'Retrieval and Analysis' contains an article by Bret Aarden and David Huron who describe the use and creation of analytical tools for the Essen Folksong Collection, specifically concentrating on the geographical information. Jane Singer develops a meta-representation for melodies in order to provide more perceptual effective and efficient similarity searches, and Jim Stanley and Antony Kearns describe a software providing searching facilities for a database of hymn tunes and hymn texts in support of churches, based on DARMS encoded music and relational database technology.

The last section about 'Virtual Restoration of Sources' starts with a helpful overview by Bill Koseluk, outlining the notion of more graphical/image processing problems in music information retrieval. These issues include aspects of score digitisation, image acquisition – methods, costs, image resolution, storage – data/software management, access and distribution. These problems are not inherently musical, and are similar to those found in other non-musical fields, such as in digital image archives. They will and have already created their own research and development communities, a 'musical subgroup' of the image processing communities. Although some of the problems are unique to music, it might in the future be questionable to include projects, research and articles in this area in a book about musical data storage, retrieval and representation. The growth of this area, its different methodologies and different technological prerequisites, might demand in the future a separate publication solely based on image processing for music applications. Nevertheless, it is helpful at this stage to have these included in a book, as one should not forget that this is just one aspect of the possible breadth of types of content when dealing with digital music information holistically.

Andrew Wathey, Margaret Bent and Julia Feely-McCraig describe the 'Digital Archives of Medieval Music', which contains British manuscripts of pre-Reformation polyphonic music and coins the notion of 'virtual restoration', making the point that image processing tools can provide the necessary non-destructive restoration. The examples before and after processing are impressive. So although the tools described are normal Photoshop ones (layers and colour adjusting), the method of using them provides valuable insights into how old music manuscript can be made legible again. Similarly, Alejandro Enrique Planchart advocates the use of image processing to recover manuscripts formerly thought to be irrecoverable due to deterioration, wilful damage or alteration of the original. The examples for these illustrate this nicely. Philip Brett and Jeremy Smith investigate specific editorial discrepancies in early prints of Byrd Editions, and how through digital methods of superimposing texts and images this research was made possible. Dexter Edge similarly deals with the imaging and digitisation of existing watermarks, which can be used to date and locate the origin of manuscripts, and are therefore often objects of scrutiny, but until recently not with the aid of image processing tools.

The last article by Patricia Hall concerns the photographic techniques used to digitise facsimiles of Alban Berg's sketches for Wozzek. This article does fall to a certain extent outside the remit of the others, as I found that the methods used might have been improved by the availability of more professional equipment (document duplication photographic stands, professional lighting and professional film), and also of digital technology (digital camera). This might have helped in the rapid acquisition and checking of quality. Nevertheless, most musicologists will at one time or another find themselves

https://doi.org/10.1017/S1355771802211127 Published online by Cambridge University Press

without the necessary funds or the 'carrying power', and be forced into similar situations, in which case this article might come in very useful, or at least provide encouragement.

Thus, the volume ends on a rather weak note, and it might have been more structurally aesthetical to put Anthony, Cronin and Selfridge-Field's summarising article about 'The Electronic Dissemination of Notated Music: An Overview' at the end of the book, where it undoubtedly would have not only fitted better, but would have also provided a final paper of excellence, ending this valuable resource on a high note.

Carola Boehm

https://doi.org/10.1017/S1355771802211127 Published online by Cambridge University Press