PITCH: the Percussion Instruments' Timbral Classification Hierarchy

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Abstract

This paper discusses a new 'Percussion Instruments' Timbral Classification Hierarchy' (PITCH), in which percussive timbres are classified according to approximately two hundred different aspects of frequency spectrum and time-domain. Samples of percussion instruments are spectrogram and temporally analyzed, and the acoustic data gathered on each sample forms the body of the classification. The classification data is stored in an integrated analysis/database program currently being developed for the Macintosh computer. PITCH is designed to be used as a timbral resource for electronic music composers, students, ethnomusicologists, and others interested in gaining a further understanding of the complex nature of percussive timbres.

1) Background

PITCH is a classification of percussive sound, designed to provide comprehensive information on the timbres of percussion instruments, and easy access to this information for the researcher and musician. The classification structure, which lists over 200 aspects of acoustic behaviour in percussion instruments, provides a set of limits and standards to the vast array of complex sounds generated by this group of instruments, whilst minimizing the need to make inadequately 'generalized' about percussive sound. It serves as a point of reference and a resource for the timbral analyst by defining parameters for analysis, and permitting quantitative data to be recorded. It provides a practical and logical approach to gathering, analyzing, and interpreting acoustic data on percussion instruments.

2) Classification Structure

PITCH is a downward hierarchical taxonomy (Karns, 1990), with six hierarchical levels. In order, these are:

1) Attrs - 2 levels: Frequency Spectrum and Time-Domain. These define the general scope of the classification.
2) Categories - 9 levels: each outline the basic aspects of frequency spectrum and time-domain being classified. They include Spectral Density, Spectral Distribution (Gray, 1975), Harmony of parts (Rosing, 1990), Envelope (Rosing, 1990), etc.
3) Classes - 27 levels: these classify various aspects of each category.
4) Sub-classes - 81 levels: these quantify and qualify each class.
5) Orders - 98 levels: these provide additional detail for each sub-class.
6) Sub-orders - 37 levels: these provide additional detail for each order.

Figure 1 shows the structure and functions of each level for a section of PITCH. All sounds fall under the first three levels. This means that all sounds will be identified by a set of 27 classes, each of which represents different acoustic phenomena. The fourth, fifth and sixth levels actually provide the quantities and qualities of each acoustic phenomena. In this manner a detailed, yet concise overview of each sound is obtained.

An alphanumeric code has been developed to facilitate ease of data management. This code is loosely based on the Dewey Decimal System (Dewey, 1989), whereby each level is represented by a number, or in the case of Categories, by an alphabetical letter (Attrs are not encoded, as they function merely as headings). The first value of each symbol represents a particular domain, and the place value represents its position in the hierarchy. Each number is divided by a decimal point; for divisions, only the number of digits past the second level alpha symbol. A classification code may appear as:

9 1.2.3.4

A complete copy of PITCH, including code definitions and applications are available by contacting the author (see above).
3) Analysis Method

In the course of this research, instruments have been sampled and analysed in order to implement PITCH as a working tool. 92 instruments have been chosen for analysis, including orchestral, African, Latin American, Asian, custom made instruments, and found objects. These were recorded to DAT using a B&K & Riga 3002 microphone. Recordings were then sampled into the Macintosh computer, using Digidesign’s “Sound Designer II” software and the DAT I/O digital interface. Sounds were sampled in 16 bit, 48 kHz format. Each sample was stored in a separate sound file, and analysed from this file using "Amelia v.2". Fourier analysis software developed at La Trobe University, Australia by Thomas Stemdie and Chris Scallan. At present, analysis is still in progress, although early research shows that the classification does enable timbres to be clearly defined.

4) Integrated and automated Analysis/Database Program: work in progress

Current work in progress involves integrating the PITCH classification with computer-based analysis tools in an automated analysis/database package. Intended for the Macintosh computer, this package will enable sounds to be sampled, Fourier and spectral analysis to be performed, and quantifiable data to be automatically classified in a relational database format to allocate classification codes to an instrument's file. Qualitative data, related to performance technique, morphology, and such will be entered into the database via manual user input. Each instrument's file will incorporate sound playback of the sample, graphic representations of Fast Fourier Transforms, amplitude waveforms, etc., morphological details, as well as the classified data defined by PITCH. Files containing matching data will have the potential to be cross-referenced, in ways that are commonly implemented in relational databases. This will act as an important tool in discovering relationships between timbres of different instruments; namely, similarities between timbres across various aspects of spectral and temporal phenomena. When completed, the package will be used by the author to aid in creating new persuasive timbres for electronic composition.

References

