Sound Scale: Perspectives on the contribution of flute sound classification to musical structure

Panayiotis Kokoras
Department of Music Studies, Aristotle University of Thessaloniki, Greece
Olivier Pasquet
Institute for music/acoustic research and coordination (IRCAM), France

BACKGROUND IN COMPOSITION

Composers have been using sound classification as a tool for musical structure since the beginning of the twentieth century. Futurist composer Luigi Russolo in his manifesto “The Art of Noise” (1913) proposed six main categories of noises. Pierre Schaeffer in his “Traité Des Objets Musicaux” (1966) provides a framework on the typo-morphology of sound object. Karlheinz Stockhausen in his piece “Mikrophonie I” (1964) includes a long catalogue of words describing the different sound colors required for the piece. This list can be further extended with composers such as R. Murray Schafer, Wayne Slawson, Trevor Wishart, Dennis Smaley, John Michael Gray, Robert Erickson, and Fred Lerdahl.

BACKGROUND IN MUSIC TECHNOLOGY

The analysis of timbre has been an ongoing research, from the early findings of Helmholtz and Fourier until now, with the MPEG-7 ISO/IEC standard. Several types of signal features have been proposed for the task of sound classification coming from the speech recognition community; psychoacoustic studies (McAdams, 1994); audio fingerprinting applications (Haitsma, 2002); and content-ware sound browsers like “Soundfisher” (Keislar, 1999), “Music Browser” (Pachet, 2006), and Ircam’s “Cuidado” (2003), a content-based search and classification interface.

AIMS

The aim of this article is to offer a model of a “sound scale” classification based on the timbre possibilities of the flute. The sound scale, implemented by the software environment, classifies the given sounds according to their similarities.

MAIN CONTRIBUTION

The sound scale is an audio classification model based on the similarities as they result from the data analysis of flute sounds that take into consideration typical descriptors (called LLD – Low Level Descriptors in the Mpeg7 jargon) proposed by Mpeg7 standard. The descriptors concern superficial signal characteristics such as means and variance of spectral frequencies, spectral centroid, and ZCR (zero crossing rate). For the particular paradigm, eleven different flute timbres have been taken from “Sound Palette,” an extensive database of instrumental sounds developed by Ircam and subsequently classified by the software environment. The resulted sound scale can become a functional and creative tool in the hands of a composer. It can be applied for specific structural uses such as fusion or separation in sound texture and similarity relationships in sequential movement. It is a model of classification that could organize the instrumental sound possibilities and offer solutions to the compositional challenges that today’s composers face. This paper concentrates only on flute sounds. The flute was selected because of its rich timbral palette and because it is well-documented in both scientific and musical literature. Moreover, the flute is the first instrument in the typical orchestra score order. However, the same methodology can be applied to all other instruments of the orchestra. A future development of this project includes a complete catalogue of sound scales of the orchestral instruments.

IMPLICATIONS

The proposed model is a tool not only for the composer, but also for the orchestrator, musicologist, or performer. It aims to better organize, analyze, or control sound material, whether complex musical structures or simple sequences of sound events. Our auditory system is limited in easily and accurately classifying a large amount of sound information. This makes a

computer-aided compositional tool indispensable that allows us to classify the sound material and get suggestions of order and matching possibilities according to the similarities of the sounds.

Instrumental timbre relations and classifications are essential for the structure of a composition and of central interest to the composer. However, the concepts are difficult to investigate scientifically. The technological advantages explored in recent years make this kind of computer process possible, but further progress may be possible only if composers collaborate with computer music scientists to focus on the available technology for further development.

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Panayiotis Kokoras

Current position	Aristotle University of Thessaloniki President of Hellenic Electroacoustic Music Composers Association
Main field of research	Electroacoustic Music, Computer Aided Composition
Main research areas:	Sound Morphology, Perception timbre, Musical Texture, performance
Relevant Qualifications	Master of Arts (composition), University of York, UK, 2000 Ph.D. (composition), University of York, UK, 2004
Contact:	www.panayiotiskokoras.com, email@panayiotiskokoras.com

Olivier Pasquet

Current position	Computer music designer, IRCAM - Institut de Recherche et Coordination Acoustique/Musique
Main field of research	Real-time interactive systems, max msp jitter, media arts, compositional meta-systems
Relevant Qualifications	Bachelor of Science (computer music), Cambridge University, UK
Contact	www.opasquet.fr, Olivier.Pasquet@ircam.fr