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PATTERN IDENTIFICATION IN MELODY VIA WAVELETS

Gissel Velarde

ABSTRACT

This study presents a new approach for music representation and pattern identification in melody. Melody is consider as one of the most important elements of analysis in musical units. Western musical examples taken from Stein's book *Structure and Style: The Study and Analysis of Musical Forms* were digitalized into vectors of events and analyzed via wavelets. The examples correspond to the following uses of figures: repetition, sequence, contrary motion and interlocking or overlapping. The wavelet technique was used because its capability in self-similarity detection caused by scales and dilatations. The coefficients found by the discrete and continuous wavelet transforms were plotted in color scales, revealing similarity degrees. The visualization of the coefficients allows identification of patterns and segmentation of musical units. Future work should study systematically a greater corpus of musical examples and uses of figures and extend the analysis through the structure of the form.

APPROACH

Music representation

Figure 1 presents a pattern presented as a vector of events described by its duration and distance to a reference point, being the concatenation of events a musical unit.
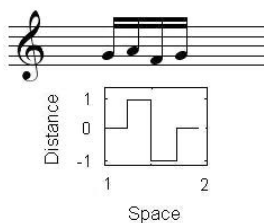

Figure 1. Pattern represented as vector of events.

Similarity Detection

The wavelet coefficient of the vector of events v at scale s and position t is defined as inner product by

$$C(u,s) = \langle v, \psi_{u,s} \rangle = \int_{-\infty}^{+\infty} v(t)\psi_{u,s}(t)dt \qquad (1)$$

The wavelet coefficients quantify the resemblance index between the wavelet and the vector of events. Larger coefficients are represented by brighter colors and smaller coefficients by darker colors.

RESULTS

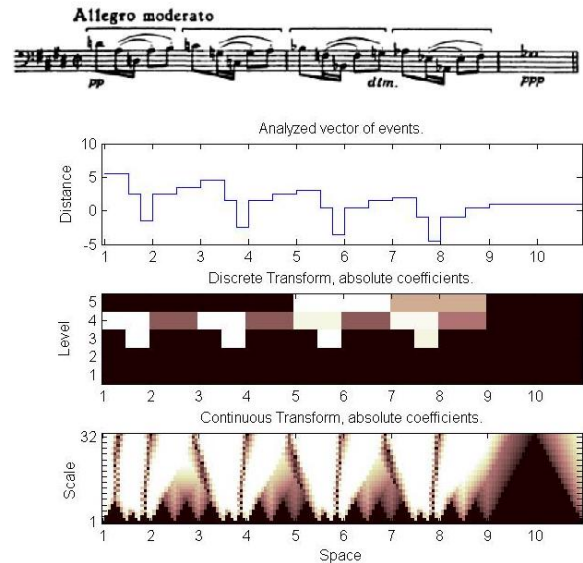The following Figures correspond to two of the four examples analyzed in this study.

Figure 2. Example of sequence. Wavelet analysis of a passage of Buckner's Symphony N. 7, first movement.
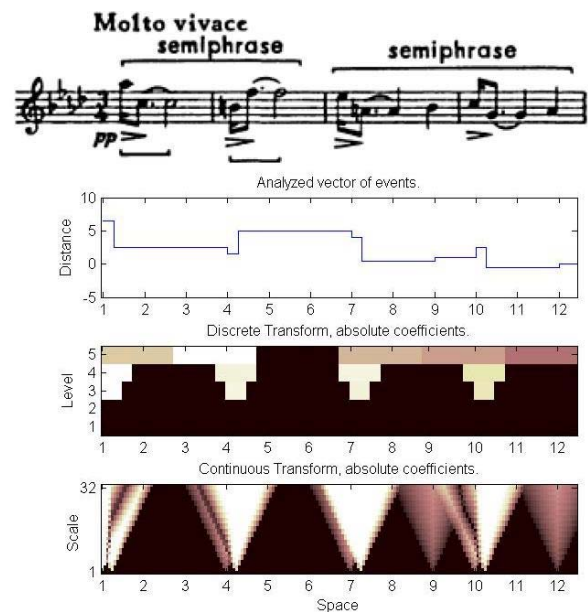

Figure 3. Example of contrary motion. Wavelet analysis of a passage of Schumann's Carnaval, Valse Allemanda.