Analysing the Impact of Music on the Perception of Red Wine via Temporal Dominance of Sensations

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Supplementary Material

Definition of Sound Attributes

Pitch: Pitch is one of the primary auditory sensations, along with loudness and timbre. In music, sequences of pitch define melody, and simultaneous combinations of pitches define harmony. It is the perceptual correlate of the periodicity, or repetition rate, of an acoustic waveform (Oxenham, 2012).

Timbre: sometimes referred to as sound colour, texture, or tone quality, mainly correlates with the spectro-temporal shape of the audio signal. It is one of the primary perceptual vehicles for the recognition, identification, and tracking over time of a sound source (e.g., singer's voice, clarinet, set of carillon bells) (McAdams and Giordano, 2009).

Spectral Centroid: a quantity correlated with the perceptual brightness of sound. It is calculated as a weighted mean of the frequencies present in the musical signal (Grey and Gordon, 1978).

Root Mean Squared Energy (RMSE): the sensation of loudness is related to sound energy by Stevens' law (Moore, 2013).

Musical Novelty Detection

We use a musical novelty detection technique (Foote, 2000) to have a systematic way for accounting salient musical events or boundaries of musical segments. The technique involves three steps. The first step concerns transforming the sound signal to a features time series that captures the desired sound characteristic to be analysed. In this case, we wanted to capture the instrumentations changes in the Mussorgsky soundtrack and the sound textures in the Eno. For this, we use the MFCC (Mel Frequency Cepstral Coefficients) sound descriptor that is known to be correlated with musical timbre (Siedenburg *et al.*, 2016). The second step involves creating a recurrence matrix. This is done by building a matrix where the elements indicate how different two moments of the sound are by computing the distance between every pair of points in time of the sound descriptor. This recurrence matrix often has a block-like structure in the principal diagonal that indicates autosimilar fragments of music, for example having the same arrangement, dynamic or other musical aspect. The final step consists in inspecting the matrix with an edge detection kernel to measure whether this block-like structure changes, by convolving the kernel along with the principal diagonal. The output is a continuous curve that states the amount of novelty for every time frame and has sharp peaks when salient events or transitions occur.

Taste Curves and Music Videos

Two videos were rendered to show the taste curves with the music and they are available at:

https://www.dropbox.com/s/oltc2h4d9nogzjr/eno.mp4?dl=0

https://www.dropbox.com/s/d64on02gnfvftlg/musso.mp4?dl=0

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