

AUTOMATIC EXTRACTION OF PERFORMANCE VARIABLES FROM AUDIO RECORDINGS

Anders Friberg^{1,2}, Erwin Schoonderwaldt^{1,2}, Patrik N. Juslin²

¹ Speech Music and Hearing, Royal Institute of Technology, Stockholm, Sweden

² Uppsala University, Department of Psychology, Sweden

Background

The analysis of audio recordings is often a time-consuming and difficult task in studies of music performance. Many previous studies have for practical reasons been limited to studying timing in piano playing. Recent studies, e.g., regarding emotional communication, have raised the need for analysis of a more complete set of performance variables, including sound level, timbre, and attack velocity.

Aims

Our aim is to provide a computer algorithm that from an audio file of a monophonic music excerpt automatically analyzes a set of performance variables. The intention is to produce an algorithm that is sufficiently accurate in each estimated variable to be useful for research purposes.

Method

The audio input is first segmented into onset and offset position for each note by means of a combination of pitch detection and sound level analysis. Tones are recognized from the pitch analysis by identifying areas of similar pitch, and from the sound level analysis by detecting substantial dips in the sound level. For each detected tone, the following eight variables are computed: sound level, instantaneous tempo, articulation, attack velocity, spectral content, vibrato rate, vibrato extent, and pitch.

Results

The current algorithm works best with instruments with sustained notes, such as violin, flute, and voice. Preliminary test data using violin and flute indicate that the system has an average note detection accuracy of up to 97%. The algorithm has been used in a computer system for quantifying emotional communication between musicians and listeners. More test results will be given during the oral presentation.

Conclusions

According to the preliminary results, the algorithm has a potential to be useful for research into music performance.