Psychoacoustic Approaches for Harmonic Music Mixing

Abstract:

The practice of harmonic mixing is a technique used by DJs for the beat-synchronous and harmonic alignment of two or more pieces of music. In this paper, we present a new harmonic mixing method based on psychoacoustic principles. Unlike existing commercial DJ-mixing software, which determines compatible matches between songs via key estimation and harmonic relationships in the circle of fifths, our approach is built around the measurement of musical consonance. Given two tracks, we first extract a set of partials using a sinusoidal model and average this information over sixteenth note temporal frames. By scaling the partials of one track over ±6 semitones (in 1/8th semitone steps), we determine the pitch-shift that maximizes the consonance of the resulting mix. For this, we measure the consonance between all combinations of dyads within each frame according to psychoacoustic models of roughness and pitch commonality. To evaluate our method, we conducted a listening test where short musical excerpts were mixed together under different pitch shifts and rated according to consonance and pleasantness. Results demonstrate that sensory roughness computed from a small number of partials in each of the musical audio signals constitutes a reliable indicator to yield maximum perceptual consonance and pleasantness ratings by musically-trained listeners.