Generation of Perceptible Rhythmic Timbral Events

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ABSTRACT

Tonal stimuli are traditionally described by the relatively obvious dimensions of pitch and loudness, and some more ambiguous ones, such as brightness, roughness, fullness, intensity flux, density, which are generally grouped under the broad term of timbre. Most research so far has tried to approach timbre by focussing on the perceptual and/or the acoustical properties of sounds. Whilst obviously linked, few studies have actually looked at timbre from a musician's/composer's perspective, or used an approach that could make more sense in a musical setup. For musicians it is hard to translate perceptual based results of academic research into a musical interface. For example, a bass in an Electronic Dance Music (EDM) song or a Guitar-Drone/Pad in a Post-rock piece relies solely on timbral changes over an extended period of time. These changes are however controlled by seemingly arbitrary parameters of sound effects and manipulations. This study examines how timbre changes resulting from the manipulation of such parameters affects the perception of tonal events and how they relate to each other. More specifically these parameters include: the amount of partials in relation to the fundamental (which may help to determine "brightness"), the ratio of even- to odd-numbered harmonics (Square/Saw oscillation), the spectral shaping resulting from different plucking positions on a string (e.g.,"comb filtering"), the detuning of partials from perfect hamonicity and the combination of detuning and distortion/overdrive. These parameters are sonified by a self-built additive synthesizer and they are the timbre descriptors used for analytical purposes and to account for participants' responses.

The experiment looks at how much each of the chosen timbre manipulators has to be changed for a subject to notice a new event in a gap-free sound stimulus. Pilot studies so far have revealed perception asymmetries in the direction of stimulus change, as well as a notable sensitivity to phase position of partials (particularly in stimuli with slightly inharmonic partials) which contradicts the common belief that humans are insensitive to phase. Additionally the step sizes appear to be strongly dependant on the starting value of the chosen parameter. Overall, the results advance our understanding of sound perception and pave the way for future work designed to test listeners' ability to detect rhythmic sequences of timbral only stimuli (meaning no change in fundamental frequency or perceived loudness).