A REALTIME AUDITORY MODEL OF RHYTHM PERCEPTION AND COGNITION

Recent theories of rhythm have taken into account observed human responses to sequences involving agogics, syncopation, and context (Longuet-Higgins and Lee, 1982; Lee, 1985), but have made little progress in accounting for these behaviors. Meanwhile, data gathered from auditory nerve fibers has induced new theories of how temporal and spectral information is conveyed (Miller and Sachs, 1983; Secker-Walker and Searle, 1989), with implications on how neural adaptation and suppression may influence event discrimination.

We propose a new theory of how the encoding of auditory stimuli can account for observed human response to rhythmic structure -the phenomena commonly described by grouping and preference rules. In our model, audio input is split into numerous sub-bands to simulate nerve fiber transmission, and each channel is then convolved with an impulse response simulating auditory persistence. The data is continually viewed through a three-second exponential window (short term memory), and analyzed for event patterns using sharpened autocorrelation (Brown and Puckette, 1989). A feedback mechanism induces rhythmic contextual expectation, which is either confirmed or suppressed by subsequent input.

The model is implemented on a Macintosh II computer, supercharged with 100 mips of audio processing power. This work is related to my previous work on tracking live performers (Vercoe, 1984; Vercoe and Puckette, 1985), but the physiological basis provides a more realistic platform for the growth and testing of new theories.

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