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"Perceiving temporal regularity in music"
By Edward W. Large, Caroline Palmer

Large and Palmer take a high mathematical approach to the perception of metric structures. They focus on self-sustained oscillations which we think of as beat. This is a dynamic system capable of tracking temporal structures against many expressive variations of performance. The model can track difference temporal periodicities within music performances. It can handle small variations like chord asynchronies to larger variations such as rubato. The model focuses on the role of meter in the perception of rhythm. Rhythm is the feeling of the movement in time, pulse, phrasing, and meter. The temporal fluctuations in music are due to the musician's attempt to convey their interpretation of the musical structure to listeners. Melody leads will usually coincide with meter. The emphasis will be on strong beats rather than weak beats in performances. The model has an attentional pulse which is the expectation of the next event to occur. It uses a relative period which is the ratio of between two metrical levels. Usually, in western tonal music this is 2:1 or 3:1. The model categorizes each note onset as marking some beat at a metrical level, and then it perceives temporal deviations from the durations. Multiple onsets with the same attentional pulse are considered a chord. Strong beats correspond to a larger metrical periodicity. Two abilities of the model are tested in the paper. The first is the ability of the model to perceive phrase boundaries with music that has large temporal fluctuations. The second is to ability to simulate the perception of small temporal differences among voice onsets. The first test result of the Bach 2 and 3 part inventions shows the ability of the model to reflect the modest amount of rubato typical of the performances of Bach.

The model had a larger correct rejection rate than hit rate. This is correlates well with the modest amount of rubato used in Bach's polyphonic music. So this multiple oscillator model was able to track temporal variations in polyphonic music very well. The second experiment tested smaller tempo fluctuations between individual voices. A comparison between the model and the performances showed that the model tracked the performances well and also showed that greater asynchrony was realized before melody events. A comparison between the model and listener ratings showed that the model did as well as the listeners and sometimes outperformed the listeners.

The model did very well in tracking temporal variations. The paper shows it is possible to track irregular performances with something as regular as oscillators.