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Synopsis and Response Paper of Perceiving Temporal Regularity in Music by Edward W. Large and Caroline Palmer

The paper addresses the issue about how audiences perceive temporal regularity in music performance. Large constructs a mathematical model, a self-sustained oscillation system, to explain the effect of temporal and melodic fluctuations of beat-tracking process. The results of experiments prove that the model successfully tracks temporal regularity with respect to fluctuations and also provides high sensitivity to the deviations of performers' structural (phrasal and melodic) intentions.

The paper is well organized for the reader to understand. First it introduces some essential definitions of music notations from western conventions, such as rhythm, metrical structure, meter, and metrical unit. Then Large discusses two kinds of temporal fluctuations. One is phrase-final lengthening and the other is melodic fluctuation in music performance. In order to model meter perception, a lot of information or cues are proposed such as multiple temporal periodicities in complex auditory sequences and metrical accents which are performed by either metrical duration or beat intensity. The self-sustained model, which is based on the perception that "once established, beat perception must be able to continue in the presence of stimulus conflict or in the absence of stimulus input," establishes a whole series of mathematical equations to represent the features, such as relative phase and expectancy of beats. A focus parameter is defined to adjust the concentration of temporal expectancy. Large also develops functions to model hierarchical metrical structures by mixing two von Mises distributions. The model's sensitivity to temporal fluctuations is presented in two steps: one is the categorization of each note onset which calculates the probability that the onset belongs to certain metrical level. The other step is the perception of temporal differences which is also presented as probability functions. One experiment is about horizontal temporal fluctuations (rubato). The results nicely support the perception principle of the self-sustained model.

The paper explains the concepts clearly and orderly so that I learn certain crucial understanding of the temporal definition in music. However, I got lost when reading the numerous mathematic definitions. While I am clear about mathematical function, the physical meaning of each function corresponding to music is vague to me. Intuitively, I doubt the accuracy of the mathematics with a lot of adjustable parameters. But I am still amazed about the use of mathematics, such as probability distributions, in music analysis.