

Commentary on “Calculating Sensory Dissonance: Some Discrepancies Arising from the Models of Kameoka & Kuriyagawa and Hutchinson & Knopoff” by Keith Mashinter

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ABSTRACT: The commentary asserts the importance of conducting additional research on additive dissonance, and points to the need for terminological precision in discussions of sensory versus systemic (i.e. learned, context-dependent) dissonance.

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IN his paper on sensory dissonance, Keith Mashinter (2006) provides software implementations of two models, and explores their predictions. In several conditions, he found that neither the model from Kameoka & Kuriyagawa nor that from Hutchinson & Knopoff produced the results that were published in their original articles. Although Mashinter concluded that sensory dissonance remains an elusive phenomenon, he gave a summary of at least some basic features that may be considered valid, and he listed a few observations that might be helpful in conducting future research.

Before designing badly needed new perceptual experiments on consonance and dissonance, it is important 1) to specify the field of interest from a musical point of view (Are we for the time being restricting ourselves to music that is composed before the 19th or 20th century and that is performed on fixed-pitch keyboard instruments such as the harpsichord, the organ and, eventually, the piano, or are we already able to cope with much more complex conditions including more recent compositions performed by ensembles with free intonation?) and 2) to discriminate between tonal or sensory consonance, i.e., the perception of consonance for isolated intervals, and musical consonance, in which one or more harmonic intervals are rated in a musical context.

Mashinter is not always consistent in this respect, e.g. when he discusses effects of learned versus innate components, and differences between musically trained versus musically naïve subjects. Moreover, 3) it is important to give an unambiguous definition of consonance. Does the definition comprise concepts like pleasantness, beautifulness, euphoniousness, in-tuneness and roughness, or have the subjects to rate only one specific aspect? There are data that support that in the perception of pure and tempered musical intervals, both the sensation of beats or roughness and the degree to which the size of the tempered interval deviates from that of the pure interval are relevant (e.g. see Vos, 1986).

Mashinter acknowledges that additivity of dissonance is a critical point in dissonance models for complex tones. I fully agree with him, and for me research on this aspect would have a high priority. In the case of tonal or sensory dissonance, Kameoka and Kuriyagawa computed the total dissonance of two simultaneous complex tones by combining all subdissonances resulting from the various interfering harmonics according to a power function, in spite of the fact that many of these subdissonances are the result of interference within different critical bands. In line with Zwicker's established model of loudness summation, one would expect different addition procedures for determining specific subdissonances in each separate critical band and the total of the subdissonances. Mashinter summarized this issue by stating that “a marriage of some of the Kameoka and Kuriyagawa methods with those adopted in the model of Plomp and Levelt would yield a more durable model for sensory dissonance.” It is a pity that Mashinter was not able to further explore the advantages of such a marriage. In the case of musical dissonance, it would in line with my previous experiments on the subjective acceptability of tuning systems in musical fragments (Vos, 1988) be of interest to investigate in what way the dissonances of the various harmonic intervals are integrated into an overall rating.

REFERENCES

Mashinter, K. (2006). Calculating sensory dissonance: Some discrepancies arising from the models of Kameoka & Kuryagawa and Hutchinson & Knopoff. *Empirical Musicology Review*, Vol. 1, No. 2, pp. 65-84.

Vos, J. (1986). Purity ratings of tempered fifths and major thirds. *Music Perception*, Vol. 3, No. 3, pp. 221-258.

Vos, J. (1988). Subjective acceptability of various regular twelve-tone tuning systems in two-part musical fragments. *Journal of the Acoustical Society of America*, Vol. 83, No. 6, pp. 2383-2392.