Relating judgments of dissonance to sensory consonance in the context of North Indian classical music

Parag Chordia
Department of Music
Georgia Institute of Technology

Correspondance: ppc@gatech.edu
Dr. Parag Chordia
Department of Music
Georgia Institute of Technology
840 McMillan St
Atlanta GA 30332-0456
Tel: 650 814 2408
Fax : 650 725 4868

Preferred presentation: oral

131 survey respondents were asked to judge the subjective dissonance of tones sung with a drone by an experienced North Indian classical music (NICM) vocalist. A weak, but significant, correlation (.10, $p < .00$) was found between subjective dissonance judgments and sensory dissonance. Sensory dissonance was calculated using the Kameoka and Kuriyagawa algorithm (1969). As expected, subjective dissonance was highest for the raised fourth, flat second, major seventh, and flat third scale degrees, and lowest for the tonic and fifth.

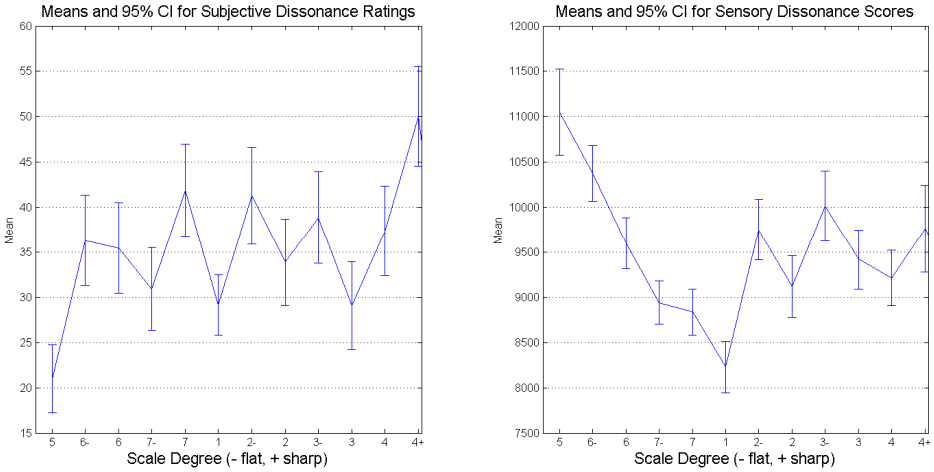
Motivation

Dissonance plays a central role in music theory. Despite this, there have been few empirical evaluations of subjective judgments of dissonance (Huron 2003). This is particularly true for complex sound stimuli, and even more so for stimuli derived from non-Western music. Jairazbhoy (1971) has hypothesized that musical tension in NICM is due to both sensory dissonance and melodic expectancy. However, no empirical work was done to substantiate this theory. This work attempts the preliminary research needed to build a more robust theory of musical tension in NICM music.

Methods

An internet-based survey (http://paragchordia.com/survey/survey.php) was conducted consisting of examples of a NICM vocalist singing each note of the chromatic scale with *tanpura* accompaniment. Subjects were asked to rate the dissonance of each note using a vertical slider, which ranged from 0 to 100. Subjects were recruited via email from usenet groups devoted to Indian music as well as from the Georgia Tech music department.

Results



The figure shows the dissonance responses for each tone and the calculated sensory dissonance scores. A one-way ANOVA test was used to reject the null hypothesis that the type of tone had no effect on the subjective dissonance score ($p<.00$). Further, a multiple comparison test was used to determined what other values were significantly different for each tone. Similarly, a one-way ANOVA test was used to reject the null hypothesis ($p<.00$) that the type of tone had no effect on the sensory dissonance score. The correlation coefficient of the subjective dissonance judgments and sensory dissonance scores was .10 ($p < .00$), indicating a weak but significant correlation. It can be seen that there was good correlation between scale degrees from the tonic to sharp fourth and sensory dissonance scores, but poor correlation for the fifth through major seventh scale degrees with the corresponding sensory dissonance scores.

Discussion

Significant departures of the subjective dissonance rating from the sensory dissonance score, such as with the fifth scale degree, suggest that sensory consonance is not the only attribute of dissonance, even in examples presented with limited musical context. This suggests that dissonance is a multidimensional attribute. Possible confounds in this survey include pitch height, intonational precision, and *tanpura* consistency across tones. Future work will use a greater variety of tones, including instruments, and different *tanpura* recordings. It will also examine whether dissonance judgments differ between experienced and inexperienced NICM listeners.

References

Huron, D. (2003). Issues and prospects in studying cognitive cultural diversity. The 8th International Conference on Music Perception & Cognition.

Jairazbhoy, N. (1971). The Rags of North Indian Music: Their Structure and Evolution. New York: Faber and Faber.

Kameoka, A. & Kuriyagawa, M. (1969). Consonance theory, part II: Consonance of complex tones and its computation method. *Journal of the Acoustical Society of America,* Vol. 45, No. 6, pp. 1460-1469.