



Department of Electrical and Computer Engineering, University of Maryland ² The Institude for Systems Research, University of Maryland

Introduction

The perception of an auditory stimulus can be modified by its surrounding context in multiple ways. Context effects can best be studied using ambiguous stimuli where the stimulus is held fixed while the context is varied. A compelling example of such a stimulus is a sequence of two Shepard tones spectrally shifted by half an octave, which can be perceived as ascending or descending in pitch. Chambers et al. found that preceding this pair by a 'biasing' sequence of appropriately shifted tones leads to stable shifts in perception.

To investigate the neural representation of this phenomenon, we recorded MEG responses in human subjects listening to these sequences. In order to measure the effect of the biasing sequence, we inserted "diagnostic" tone sequences between the bias and test so as to measure the effects of the bias tones on cortical responses.

We find that responses collocated in frequency bands activated by the biasing sequence are reduced relative to other regions, consistent with neurophysiological data we have obtained in the ferret auditory cortex (B. Englitz et al.) Furthermore, matching the behavioral responses of the subjects to their neural response, we see that the suppression is only there for congruent trials and it's lost in incongruent cases, supporting the hypothesis that suppression and "contrast enhancement" mechanisms underlie the biasing effect.

Background

Shepard Tones and Tritone Paradox

- Shepard tones : Superposition of sinusoids separated by an octave
- Tritone paradox : Listener dependent perception of tritone-spaced Shepard pairs

Down	Up	Down ? Up ?	
Orientation Variatio	on of pitch _{Strong}	ו circle Individual differences ir	ר per-
according to circular structure	ceive	d direction, among subj	ects
1 0 11 2 10 10 3 9 9	0.5		Subject 1 Subject 2
4 5 7	0 0-1 1-7 2-8	3-9 4-10 5-11 6-0 7-1 8-2 9	9-3 10-4 11-5

Shepard (1964), Deutsch (1986,1987)

Investigating the Perceptual Mechanism of Ambigious Stimuli in Auditory Cortex S. Akram^{1,2}, B.Englitz², C. Chambers³, D. Pressnitzer³, J. Z. Simon^{1,4}, S.A. Shamma^{1,2,3}





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Down	Up	Down ? Up ?

Orientation Variation of pitch circle



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