Acoustics of Speech and Hearing

Week 2-9 Hearing 2: Frequency Analysis in the Inner Ear

Hearing Lectures

- 1. Loudness
 - of sinusoids mainly
 - (see Web tutorial for more)
- 2. Pitch
 - of sinusoids mainly
 - (see Web tutorial for more)
- 3. Timbre
 - of complex sounds



Masking

- Essentially auditory masking is observation that one sound hides another
- Significance for us today is that when two sounds are played simultaneously, masking only occurs when the sounds are similar in frequency
- Implication is that the ear processes different frequency components of the sounds separately













Apex

35 m

















Coding of Pitch of Sinusoids

- Place
 - Variation in position of maximum of excitation pattern on Basilar Membrane
 - Logarithmic frequency & amplitude coding
- Temporal
 - Phase locking of nerve firing to stimulus waveform
 - Limited to low-frequencies, up to about 3000Hz



Summary

- The ear processes different frequency regions of a sound signal separately
- For pitch of sinusoids there seem to be two coding mechanisms:
 - Place coding, due to Basilar Membrane properties
 - Temporal coding, due to phase locking of nerve firing
- Together these give good explanations for perception of pitch and loudness of sinusoids.

Timetable Today

- 09.00 Lecture (G10)
- 10.30 Tutorial Group A (G06) Paul
- 11.30 Tutorial Group B (G06) Paul
- 10.30 Tutorial Group C (Lab) Geoff
- 11.30 Tutorial Group D (Lab) Geoff
- 13.00 End-of-term Test (B02)
- 14.00 Finish