Spraakherkenning en -synthese, lecture 5

Paul Boersma, September 2019

Spectral analysis

- The inner ear divides sound up into its constituent frequencies
- Therefore, frequency analysis is important in speech technology
- We can replicate freqyency analysis: Fourier analysis

Summing up sines and cosines

- A sound of duration 10 seconds...

- ...can be seen as a sum of sines and cosines of frequencies 0, 0.1, 0.2, 0.3, 0.4... Hz (all the way up to the Nyquist frequency)

- Adding a 0.1 Hz sine wave to a 100 Hz sine wave
  - Formula: $\sim 0.3 * \sin(2*pi*0.1*x) + 0.8 * \sin(2*pi*100*x)$

- **To Spectrum**

- Peaks at 0.1 Hz and 100 Hz

dB

- The spectrum in Praat is measured in logarithmic units, because the ear does so as well.

- A sound with a root-mean-square amplitude of 0.2 Pa is 6 dB more intense than a sound with a root-mean-square amplitude of 0.1 Pa.

- A sound with a root-mean-square amplitude of 0.2 Pa is again 6 dB more intense. Note the analogy with the concept of "octave".

- A sound with a root-mean-square amplitude of 0.001 Pa is 20 dB more intense than a sound with a root-mean-square amplitude of 0.0001 Pa.

- dB difference = 20 log10 (amplitude ratio) = 10 log10 (power ratio)