ISS Tutorial 1

Acoustics Quiz

1. How would you classify the waveforms of these sounds?
    a. The consonant [s]

    b. The vowel [i:]

    c. a hand clap

2. If the repetition frequency of a periodic sound is 100Hz, what are the frequencies of its harmonics?

3. What are the axes of a spectrum and what does it show?

4. How would the spectrum of a complex waveform of constant waveshape change with increasing amplitude?

5. How would the spectrum of a complex waveform of constant waveshape change with increasing repetition frequency?

Further discussion points

Week 2 Lab

- Review Fx contours and Dx data from last week's lab
- How are the changes in pitch shown on the Fx contour related to the linguistic differences between the statement and question forms of the sentence?
- Why do we need to refer to the Dx distribution from the speaker to interpret the Fx values used in the production of the sentences?

More questions linked to week 2

- How is the Laryngograph (Lx) waveform related to the changing pitch of speech?
- What properties of the speech waveform are related to the Lx waveform?
- What can you conclude about the nature of the speech waveform when there is no vocal fold vibration?

Questions on week 3

- What is a harmonic?
- Think of some ways in which musical instruments produce sounds of different pitches – In each case, consider how this sound production is similar to the operation of the vocal folds
- What is the difference between pitch and repetition frequency?

Summary for tutors of key points so far

Key points from lecture 2

Source-filter theory of speech production – (Focus for now is on the SOURCE)
The cycle of vocal fold vibration (i.e., phonation cycle)
How vocal folds can change pitch and voice quality
How problems with the vocal folds can cause voice pathologies
How the Laryngograph can be used to analyze vocal fold vibration

Key points from lecture 3

Periodic vocal fold opening/closing gives rise to a periodic pressure waveform

Like all air pressure changes, this waveform propagates through the air, in this case, up into the vocal tract then out of the body

The pressure wave from the glottal cycle is a **complex** waveform – it is composed of a series of simple sinusoidal waveforms (sine waves)

Adding harmonically related sine waves produces a complex wave
– and conversely complex waves can also be decomposed in to a series of sine waves

Alternative description of a waveform as a spectrum

Spectrum of a sine wave – a single frequency component with associated amplitude and phase

Spectra of complex periodic waves – a series of harmonically related frequency components (or harmonics) each with a frequency, amplitude and phase value.

There are also aperiodic waveforms in speech – (discussion of their spectra comes later)
