



Lecture 1-9: Acoustics Review

Overview

Signals

- **Sound**
 - Pressure waves
 - Loudness → amplitude/intensity
 - decibel scale
 - Sound Pressure Level scale
- **Periodic Signals**
 - Pitch → repetition frequency
 - Sinewaves
 - Complex periodic signals
 - Principle of harmonic analysis and synthesis
 - Fundamental frequency, harmonics, spectrum, phase
 - Timbre → relative amplitude of harmonics
- **Aperiodic Signals**
 - Narrow pulse
 - White noise

Systems

- **Simple Resonators**
 - Damped pendulum
 - Acoustic resonator
 - Damping
 - Forced oscillation
 - Response
 - Frequency response
 - Bandwidth
- **Filters**
 - Low-pass, high-pass, band-pass
- **Vocal Tract Filter**
 - Combination of simple resonators
 - Formants
- **Audio recording systems**
 - Measures of quality: frequency range, SNR, distortion

Spectra of sections of speech waveforms

The spectrum of a section of speech waveform will be different depending on whether the sections are shorter than a pitch period, or longer than a pitch period. This is because the spectrum of a section of speech signal that is less than one pitch period long will tend to show a continuous spectrum with formant peaks; while the spectrum of a longer section encompassing several pitch periods will show individual harmonics of the source.

Lab 1-9: Recording Session

Introduction

In this session you will make some recordings onto cassette tape that you will analyse in laboratory experiments next term. The recordings comprise:

- (i) A passage that will be used for an analysis of fundamental frequency usage. If you are a non-native speaker of English you can substitute the passage below for one in your native language.
- (ii) An intonation contrast that will be used to look at how intonation maps onto fundamental frequency.
- (iii) Two short sentences designed to show particular phonetic contrasts.
- (iv) Some nonsense VCV words used for spectrographic measurements.
- (v) Some nonsense VCV words used for some timing measurements.

Please speak clearly.

Name and date

My name is _____

Today is the 4th December 2012

Reading Passage

The Natural World

By the end of the twentieth century, very few children in Britain will know what "unspoilt nature" really means. Well-kept urban parks and gardens will be all they know. They'll never see a rich carpet of wild flowers in a woodland glade, nor hear a bird-song at dawn without the disturbing buzz of traffic.

Already, vast tracts of land are spoilt each year by greedy speculators. As a result of the demand for improved transport, huge machines dig ragged scars across our hills, fields and valleys. Airports may mushroom overnight in regions of scenic beauty. Any town with the slightest self-esteem has to be part of the air-line network. In some areas, rural peace is a thing of the past, with the roar of jets shaking buildings and deafening people every three minutes.

Thanks to the National Trust, of course, the preservation of some areas is guaranteed. But increasing leisure also ensures that other beauty spots are overrun. Nothing seems able to stop the decay. Only a weak shadow of former splendour is left, when car park and gravel path take over from moor and heather, and look-out towers dwarf the trees.

Does it matter? Will the youth of the twenty-first century be missing anything vital? What the eye doesn't see the heart doesn't grieve over. Life means change, mental and physical; change is the stimulus for adaptation. Young people will just see the preserved features as a natural part of the world they live in, not as a reflection of a better age that is gone forever.

More important is the question "Will nature survive?". Doubts about the ability of the world to survive are growing in strength. How can plants breathe and feed if we poison the air and the earth? The death of trees and shrubs will rob animals of food and shelter, and the death of flora and fauna will presage the end of human life. The slow downward spiral has begun, but action now can still keep the earth alive.

Intonation Contrast

They saw twenty \Snowmen.

They saw twenty /Snowmen?

Phonetic Sentences (read carefully but fluently)

Gene had thirty four smart \boots.

The thin fish swims in \heaving seas.

Nonsense words (read carefully but fluently)

/z 'bɜ:/

/z 'wɜ:/

/z 'mɜ:/

/z 'vɜ:/

/z 'pɜ:/

/z 'fɜ:/

/'əʊə/ (think 'lower')

/ɑ 'bɑ/

/ɑ 'pɑ/

/ɑ 'dɑ/

/ɑ 'tɑ/

/ɑ 'gɑ/

/ɑ 'kɑ/

