

AUDL 4007

Auditory perception

(with a healthy dose of psychoacoustics ...)

<http://www.phon.ucl.ac.uk/courses/spsci/AUDL4007/index.html>

What is psychoacoustics?

- Psychophysics
 - Mapping the relationship between the physical/objective and perceptual/subjective world.
- Psychoacoustics — psychophysics of sounds.
- How does the loudness of a sound relates to its intensity?
 - loudness depends not only on intensity but also on frequency content
- Changing the fundamental frequency of a periodic sound from 100 to 200 Hz will not lead to the same perceived musical interval as a change from 800 Hz to 900 Hz.



100-200 Hz



800-900 Hz



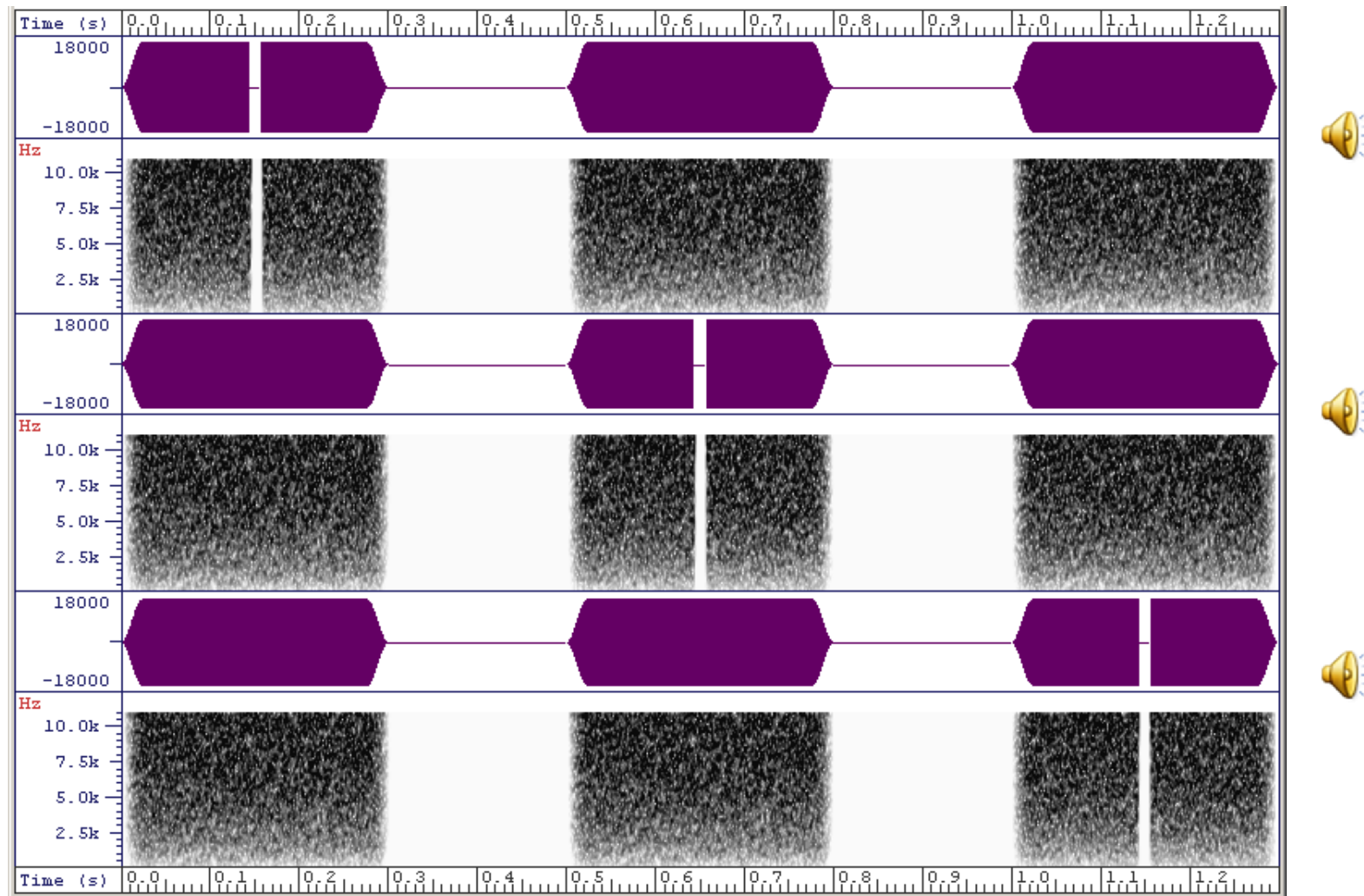
800-1600Hz

What is psychoacoustics?

- Terminology: Objective vs. subjective
 - intensity (W/m^2 , Pa, dB SPL) vs. loudness
 - periodic/aperiodic vs. buzziness/noisiness
 - fundamental frequency (Hz) vs. pitch
 - spectral envelope/shape vs. timbre/quality/colour
- Much of psychoacoustics concerns abilities to ...
 - detect
 - many HI people and CI users need higher levels to detect sounds
 - discriminate
 - many HI people and CI users need greater differences between stimuli to hear a difference between them
 - but limits on detectability and discriminability can also provide crucial data for developing models of auditory perception even in normal listeners

Gap detection (Tone in Noise?)

A fairly typical psychoacoustic task



time →

Gap detection

- Pick the sound with the gap – vary the gap duration to find threshold
 - when a listener is 'doing well', make it harder
 - when a listener is 'doing poorly', make it easier
 - What does this remind you of?
 - adaptive procedure
- Thresholds for wide-band noise are around 3 ms

Course structure

- 10 sessions, a mixture of lectures, demonstrations, laboratory sessions and tutorials
- Topics to be covered
 - A review of peripheral auditory physiology
 - Frequency selectivity and masking
 - Envelope and Temporal Fine Structure
 - Pitch perception, simple and complex
 - Intensity perception
 - Temporal resolution
 - Binaural processing
 - A little bit about psychophysical methods
 - Auditory scene analysis
 - Effects of hearing impairment
 - Cochlear implants
 - Perceiving speech in noise

Readings

- Main text: Plack C. (2005) *The Sense of Hearing*. Erlbaum.
- Supplementary Reading
 - Yost, W.A. (2007) *Fundamentals of Hearing: An Introduction*, 5th ed. Academic Press. A more elementary exposition. Particularly good on the anatomy & physiology.
 - J Schnupp, E Nelken & A King (2010) *Auditory Neuroscience: Making Sense of Sound* (MIT Press). A very new book with much more discussion of the neural substrates, and focus on a more limited range of topics.
 - Moore, B.C.J. (1997). *An Introduction to the Psychology of Hearing*, latest edition., Academic Press. A very complete guide to the literature, but at an advanced level.
- Other suggestions, links and papers on the web site
 - <http://www.phon.ucl.ac.uk/courses/spsci/AUDL4007/index.html>

The End

Assessment

- 2-hour written paper (70%)
You must pass the final exam to pass the course.
- 2 pieces of coursework, each worth 15% of the final mark (max 1000 words each)
 - Written essays presenting a published psychoacoustic study in a journalistic format, appropriate for lay readers.
 - You will also critique another student's paper, and rewrite from comments.
- Start thinking about the first study you will report on, reading carefully the information on the web site
 - Must be about auditory perception
 - Choose a paper you can explain to a lay audience (e.g., your grandmother!)
 - In other words, a topic that is interesting to people generally and not too technically complicated
 - *Not* in an area related to your project
 - *Not* a review paper

How to succeed in this course

- Attend the lectures
- Do the reading
- Check the web site
- Laboratory sessions should help to clarify the material presented
- Bring questions to the sessions
- Keep up with the work
- If you have problems, *ask for help!*