DESN 275 Digital Sound - Week 1

Assignments:

* Be able to answer the study note questions.
• Learn how to use FTP and upload a sound file successfully. (Common software: *Fetch* on Mac, *Filezilla* for Windows or Mac.

Audacity Assignments:

• First download a version of Audacity for your operating system at *http://audacity.sourceforge.net/download/*
And copy LAME into the Audacity folder so that you can make MP3 files. See the links on the drbraukmann.com.

• Using the Audacity User Guide and On-Line Manual, become familiar with the following processes: *opening a wave or aiff file, importing an mp3 file, loading a second file into a second or third track, play stop or rewind a sound, selecting a portion of or the file with either the selection tool or the selection menu options for editing, trimming out a portion of a sound file, adding a fade in or fade out, changing the level of the sound up or down (amplify), making the volume rise or fall over sections of the sound, and exporting the sound as an MP3. Also, know how to create white, pink, and brown noise.*

• This is an easy one to get you used to the class system. Using only sound files from our class web site, create an interesting 10-second collage. Save it as MP3 with the following naming convention: *yourNameWk1As2.mp3*
Our FTP site is ***www.drbraukmann.com*** The username is ***stus1*** and the password given in class.

• Complete the in-class lab activity. We need rain, thundering seas, and the captain in the background. Create whistling wind (two or three layers of 3 second chirps?) and add creaking wood (door creak slowed down?) from our class website. Save it as an MP3 with the same convention: *yourNameWk1As3.mp3*

• Be able to answer the study questions that follow.

Lecture study questions

Physically, what is meant by production, propagation, and perception?

What causes ***resonance***?

Are ***loudness*** and ***amplitude / level*** the same thing? (Answer: *Loudness is perceived and depends on many factors such as frequency, whereas amplitude is simply the maximum sound pressure compared to neutral atmospheric pressure.)*

Why is perceived volume affected by frequency, pressure, harmonics, surface properties of the space, and duration?

What do overtones look like on a waveform?

Why do we compare waveforms to sine waves?

What is a periodic waveform? A complex periodic waveform?

Explain sound frequency using the term “cycles.” What are Hertz (Hz)?

What is the general range of human hearing (that is for those people who have not worked in construction, have not owned a big car stereo, and have not attended rock concerts or trap shoots without earplugs)?

In typical musical tones, what % of the total sound heard is represented by the fundamental tone? (50%)

What do dogs hear that you can’t hear?

What is the fundamental frequency range of a typical male voice (baritone)? *110-425 Hz* Of a typical female voice (contralto)? *200-700 Hz* Of a bass guitar or double bass? *40-200 Hz* Of a piano? *28-4100* Hz Of an alto saxophone? *125-900 Hz*

Why does it make sense to measure sound intensity in **decibels**, considering it is some logarithmic math thing that sounds kind of complicated?

How many dB do you think would represent the difference between a quiet media background sound and a very loud one?

If you want sound 1 to seem to be twice as far away from the listener as sound 2, how much quieter should sound 1 be in dB?

What is the relationship between wavelength and frequency?

If you were preparing sound for a scene in a subway, would you mostly want to create the effect of reflection, scattering, or absorption?

Explain why sound sources that are either in-phase or out of phase change the amplitude of the sound.

What are the characteristics of a good mixing / listening room?

Vocabulary from Class. Be able to explain and use there terms.

Interference of sound waves, Beats

In phase, out of phase

Reflection, Absorption, Diffraction, Resonance

Decibel, LAME, Amplify, Clipping

Study Questions from Web Reading – The links to the web resources needed to answer these questions are found at drbraukmann.com.

Room Acoustics for Home Audio

When are reflected sounds in a listening room good?

When are reflected sounds in a listening room bad?

What are recommended ways to minimize the bad reflections in a room?

Explain standing waves. How do they happen?

What kinds of rooms have the worst standing waves?

Which is better: a flat ceiling or a sloped ceiling?

What is flutter echo?

What reduces flutter echo?

How do movie theaters avoid flutter echo?

Explain sound diffusion. What for instance might cause sound to be diffused?

How can you use a real mirror to help you find spots on your walls where sound absorbers would work the best?

Guide to Monitoring & Acoustic Treatment

What are the two main categories of room acoustic problems?

Reflections of mid-range and high frequencies from hard surfaces; and peaks and troughs in the room's low-end response caused by the room's dimensions and the reflectivity of the walls at low frequencies

What can you identify in the Richard Ecclestone picture that is NOT good for listening to mixes?

Where should monitor speakers not be placed?

What is the problem with "acoustic mirror" surfaces?

What, in general, does the thickness of sound absorbing material have to do with the material's ability to absorb all frequencies?

Say you moved around in your room and found a couple spots where certain musical notes, especially bass notes, were either too low to hear, or twice as loud as anywhere else in the room. What is probably going on?

Why is the guy in the picture putting little spacer blocks behind the foam panels?

What does a diffuser do to the sound?

Acoustics/Basic Room Acoustic Treatments

What are three things that can happen to sound when it strikes a surface like a wall?

What are "standing waves"?

What kinds of rooms have the worst standing waves?

What can you do to reduce standing waves in your room?

Evaluating Headphones

What does frequency response tell you about the performance of a headphone?

Why might a "natural" sounding headphone have a little extra bass response?

What is harmonic distortion?

What is headphone isolation?

Explanatory Notes (and answers!)

Explain sound in terms of compressions and rarefactions.

A single sound wave consists of an increase in pressure (compression) followed by a decrease in pressure (rarefaction).

What does a resonator do to a sound? *The resonator (body of a guitar or violin, the shell of a drum, and the throat of a human) determines the timbre of a sound. Also, without the resonator, the sound level might be too low to be useful.*

What is pitch? How is it related to frequency?

Pitch and frequency are closely related. Pitch is a measurement of sound made by your brain. The

physical property that is related to pitch is frequency. Frequency is cycles per second. However you brain does more than just observe frequency. It analyzes the sound in relation to perceptions it has received before, such as the sound being a harmonic interval of a perfect fifth played on a piano. Also the brain can be fooled.

What part of the ear helps us pinpoint the sound source? That is to say, how do we sense the direction the sound is coming from? *The pinna or outside cone, bounces sound into the ear canal. The pinna changes the sound subtly (filters it) depending on the direction the sound is coming from. This is why headphones designed with a L and R side should be worn that way.*

What frequencies of sound pass through the ear canal most easily? *2k to 5k Hz*

You need your ears to be in great shape if you intend to edit sound. What do you lose if you expose your ears to damagingly loud sounds? Hearing can become dull or muted. The range of frequencies that can be distinguished can shrink. Persistant ringing, or tinnitus, can develop.

In what ways is the perception of sounds different than the physical properties of those same sounds?
Our ears hear a range of levels that can be represented as from 1 to 1 trillion! However, to make a sound seem twice as loud to us, we must put 10 x the energy into the sound. So our perception of level is not linear. Also we are more sensitive to frequencies between 1 k and 5k Hz. So those sounds require less physical intensity.

Define the following terms:

Hertz *cycles per second*
Period *the time needed for one cycle*
Ultrasonic
a higher frequency than we can hear
Loudness
the perceived intensity of a sound
Amplitude (is it different from loudness?)
the actual intensity of the sound. Yes.
Waveform the shape created if we plot amplitude vs time on a graph
Sine wave (be able to sketch one)
Triangle wave (be able to sketch one)
Sawtooth wave (be able to sketch one)
Pulse wave (be able to sketch one)

What is Timbre? *The harmonics in a sound of a particular instrument. This is related to the term overtones on musical notes, and formants in the human voice.*

What is noise in a general sense?
Any sound we don't want. It might be static or hiss in electronic circuits, a fan running in the background of a film dialog recording.

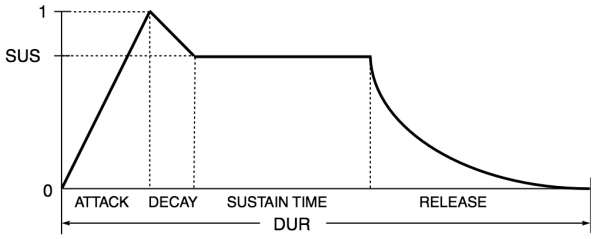
What is white noise? What is it based on?
Random bits of frequencies. All frequencies between 20 Hz and 20k Hz are represented. It sounds bright because there are lots of possible frequencies in the higher ranges.

What is pink noise? What is it based on?
Random bits of frequencies. The frequencies are represented proportionally by octaves between 20 Hz and 20k Hz. It sounds lower or warmer because there are proportionately more low frequencies represented; because there are proportionately more octaves the lower you go!

Which sounds brighter: pink or white noise?
White noise.

Which represents human hearing best: pink or white noise? *Pink noise.*

What is an amplitude envelope? (be able to sketch one)



What is meant by attack decay sustain release?

What do the horizontal and vertical axes on a waveform represent?