music 174a - winter 2021

recording 1 - tracking, editing, home recording, collaborations

week one a

music 174a - week one - overview

- structure: 174a, 174b, 174c

- 3 assignments (w1, w4, w7)

- n groups of 2-4 students

- in class critiques (w7, w10)

- nature of assignments

- grading - possible quiz?

music 174a - week one - topics

- basic terminology, simple acoustics and electronics

- recording work flow: tracking, editing, mixing, mastering

- studio components and configuration

- microphone types

- microphone technique

- using room acoustics for good sound

- recording multiple instruments

music 174a - week one - resources

- protools licenses

- audio interfaces

- microphones

- equipment checkout

- classmates

- office hours & TA

- books

music 174a - week one - introductions

- correct me if i scramble your name.

- what music do you make?

- what instruments do you play (including software)?

- what are you listening to currently.

music 174a - week one - amplitude

- amplitude is measured in decibels - dB (from Alexander Graham Bell)

- about 6dB for each doubling of amplitude dB = 20 x log10(amp). if 1/2 volt is 0 dB, 1 volt is 6 dB, 2 volt is 12dB, …, 128 volt is 48 dB. also, amp ratio = 10^(dB/20)

- dB is a relative scale measuring differences of amplitude. it can be fixed to a known zero point however as in:

  - dBSPL (sound pressure level: 20 µP)

  - dBu (volume unit: 0.7746Volt or 1mw into 600Ω),

  - dBFS (full scale: largest digital number)

  - dBV (1 Volt).

- hearing range

  - 0 dBSPL: threshold of hearing (quietest audible sound)

  - 25 dBSPL: quiet concert hall

  - 40 - 60 dBSPL: normal conversation

  - 80 - 90 dBSPL: busy traffic

  - 120 dBSPL: possible permanent hearing loss (at ear)

  - 130 - 140 dBSPL: threshold of pain (ear starts to feel pain)

- bits needed for threshold of hearing to threshold of pain? amp ratio = 10^(140/20) = 10^7 = 10,000,000. 24 bits needed to represent this number.

music 174a - week one - frequency

- the frequency of a tone is the number of cycles per second - cps, cycles, kilocycles, hertz, kilohertz, megahertz, etc.

- the **period** of a tone is the number of seconds per cycle or spc. period = 1000/frequency = ms

- **wavelength** is the physical length of a cycle in space. wavelength = period x speed of sound = speed of sound / frequency. 1125 fps/440cps = 2.556 fpc. useful when measuring resonance or tuning feedback

- **pitch** is based on the perception of frequency. can be notated by letters ("C3" - middle C), MIDI note numbers (60 - middle C) or frequency (261.63Hz - middle C)

- conversion from MIDI note to frequency in A440 tuning is $f = 2\wedge(MIDInote/12) * 440/(2\wedge(69/12))$

- human hearing is typically given a range of 20 Hz to 20 kHz. to represent a single cycle we minimally need 2 samples. because of this a 40kHz sample rate is minimally needed to represent a sound.

- however, a sample clock creates harmonics at multiples of the sample rate, and the sampled sound makes sidebands around the harmonics. to avoid these sidebands, we need a higher sample rate.

music 174a - to do this week

- suggested: read Bartlett chapters 2, 3 & 4

- subscribe to TapeOP (free from tapeop.com)

- take the survey on canvas

- w2 tuesday: overview of recording process, home acoustics

- w2 thursday: forming recording groups

- w2 thursday: demonstration of setting up protools and recording gear…