ELEC 221 Lecture 07
Fun with filters: let's play (with) some music

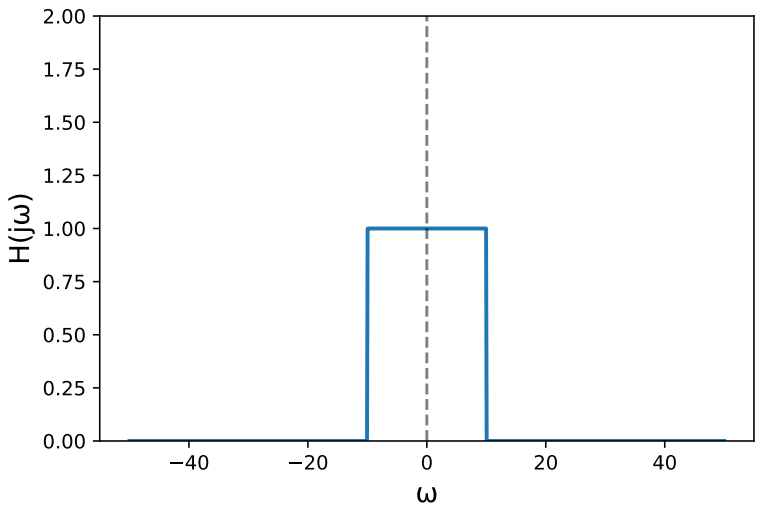
Thursday 29 September 2022

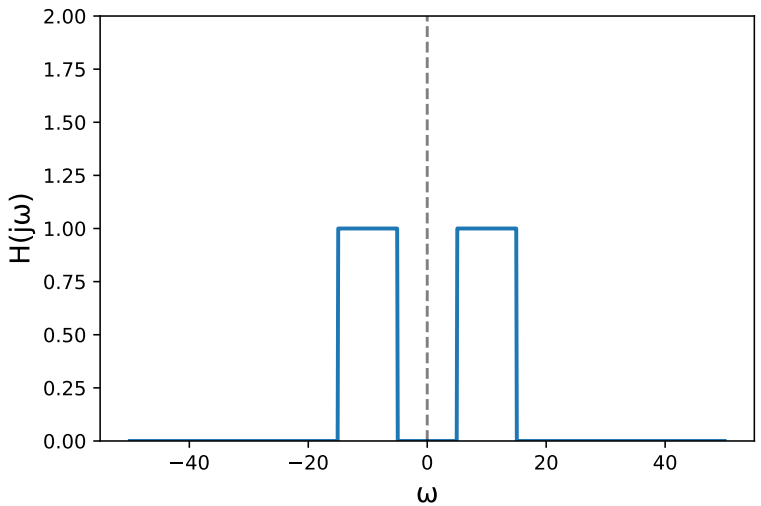
Announcements

- Assignment 3 available, due next Wednesday
- Quiz 4 on Tuesday. Please vote on Piazza regarding time change.

Last time

We explored frequency response of some basic frequency-selective filters in both CT and DT.





In DT, we distinguished between FIR and IIR filters.

Today

Audio processing is a very common application of signal processing.

Probably you have used something like this before:

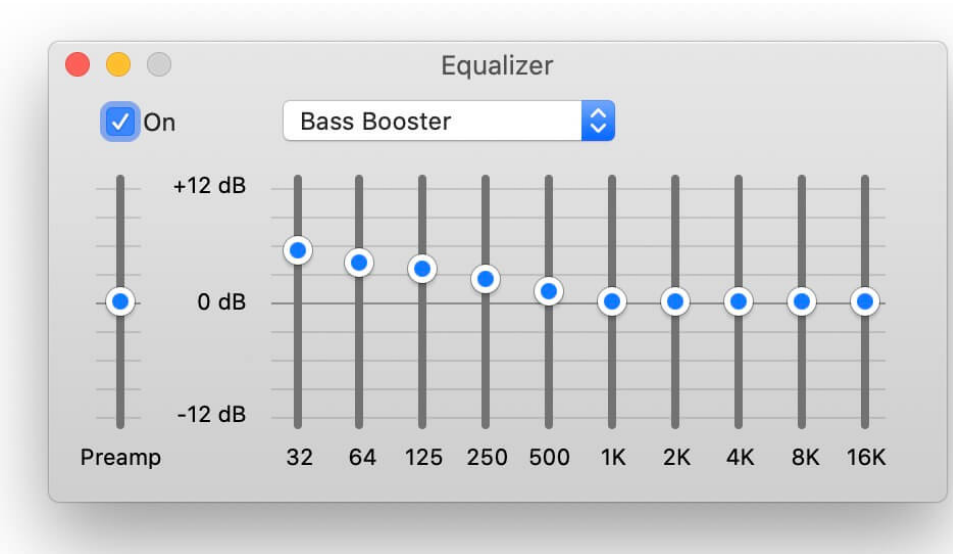


Image credits:

- https://nationalguitaracademy.com/how-to-eq-a-guitar-amp/
- https://descriptive.audio/best-equalizer-settings/

Today

Learning outcomes:

- Describe how the process of music equalization works from a signals and systems perspective
- Apply the FFT and related methods to a signal using Python and NumPy
- Use the FFT to manipulate and modify audio signals

Today

In groups of 3-4 build a simple audio equalizer using filtering.

- Recommend to have at least one musician and one more experienced Python programmer in your group
- The notebook in PrairieLearn "Homework 3.5" will be your starting point
- At 2pm, a few groups can showcase what they made

If you do not have an audio sample (or want to learn my taste in music), flag me down and I will give you one.

Today

This activity is *not graded* and not part of the assignments and quizzes. However, your group is welcome to submit the completed worksheet for up to 2 bonus *points* (not percent) that can be banked for future assignments and exams.

Point bank:

- Points can be applied to quizzes, assignments, or exams
- Points cannot be used to increase your score beyond the maximum during the term
- All unused points at the end of the term will go towards your final exam.

Example: you get 16/17 on an assignment, and have 2 points banked. You may apply one of these points to that assignment to improve your score to 17/17, with one point still banked.

For next time

Content:

- CT Fourier *transform* (note: deviating from the syllabus and covering CT before DT)

Action items:

1. Assignment 3 is due next Wednesday
2. Quiz 4 is on Tuesday

Recommended reading:

- From today's class: Oppenheim 3.9-3.12
- For next class: Oppenheim 4.0-4.3