Demo 13 Exercises: Fast Fourier Transform and Numpy

DSP Lab (ECE 4163 / ECE 6183)

2019

Demo files

```
FFT_demo_01.py
FFT_demo_02.py
FFT_demo_03.py
FFT_demo_04.py
FFT_demo_05.py
plot_microphone_input.py
plot_microphone_input_spectrum.py
```

Exercises

1. **Amplitude Modulation.** Modify the Python program `plot_microphone_input_spectrum` so it applies *amplitude modulation* (AM) to the microphone input audio signal. The program should plot the live frequency spectra (Fourier transform) of both the input and output signals (use two different colors and/or two subplots to distinguish the two signals). The Fourier transform should be computed using the FFT. The program should also play the output (result of AM) to the speaker/headphones. What is the relation between the spectra of the output and input signals?   SUBMIT

2. **Filtering.** Modify the Python program `plot_microphone_input_spectrum` so it applies a *bandpass filter* to the microphone input audio signal. The bandpass filter should have a passband from 500 Hz to 1000 Hz. The program should plot the live frequency spectra (Fourier transform) of both the input and output signals (use two different colors). The Fourier transform should be computed using the FFT. The program should also play the output (result of AM) to the speaker/headphones. What is the relation between the spectra of the output and input signals? What is the relation between the two spectra?