

Demo 12 Exercises: Block Processing

DSP Lab (ECE 4163 / ECE 6183)

2019

Demo files

`AM_demo.py`
`AM_blocks.py`
`AM_blocks_corrected.py`
`AM_blocks_from_microphone.py`

The demo program `AM_demo.py` applies amplitude modulation (AM) to a signal obtained from a wave file. This moves the signal to higher frequencies and changes the way the signal sounds.

The usual practice is to read and write of samples to and from audio devices in *blocks* rather than one sample at a time. The demo programs include a program that reads the input signal from the microphone. When reading the input signal from the microphone it is recommended that headphones be used to avoid feedback problems (sound passing from the speaker back into the microphone).

Exercises

1. The demo program `AM_blocks_from_microphone.py` shows how to read the microphone signal SUBMIT
in blocks, apply amplitude modulation to this signal, then send the resulting signal in blocks to the output audio device. In a previous demo, we saw how to plot audio signals in real time.

In this exercise, modify the program `AM_blocks_from_microphone.py` to plot the output signal on the computer screen at the same time the output signal plays on the loudspeaker. The input signal can also be shown on the computer screen. You can use different colors for input and output signals (and/or offset the two signals) so they are more easily distinguished.

As part of your submission, submit a video (or a link to a video) using the NYU video streaming tool. The video should be a screen recording of less than one minute, of you introducing yourself with the AM effect applied.

2. Write a Python program to implement audio AM with a stereo output, where different modulation frequencies are used for the left and right channels. The output stereo signal should be saved to a wave file. Listen to the output using headphones. Submit your wave file as part of your work.
3. Modify the demo program `AM_blocks_corrected.py` so that it works for stereo wave files. Listen to the output using headphones.

The following exercises refer to the vibrato effect and the corresponding demo programs.

4. The past demo program `play_vibrato_interpolation.py` does not use blocking (it reads and writes one sample at a time). Write a version of this program that reads, processes, and writes the audio signal in blocks of 64 frames. Verify that the output signal of the new version (using block processing) is the same. SUBMIT
5. Same as the previous exercise, but the input should come from the microphone instead of a wave file.
6. Same as the previous exercise, but it should produce a stereo output signal. The left and right channels of the output signal should have different vibrato parameters (frequency and amplitude).