

ELEC 484 Project Phase 1

1. Implement a phase vocoder using the ideas in DAFX chapter 8.
 - a. Review Assignment 5 question 1c windowed overlapping segments, raised cosine windows, cyclic shift, and overlap-add (DAFX figure 8.5)
 - b. Test with a cosine wave with an integer and a non-integer number of samples per cycle, verify that after the overlap add the output is the same as the input. Choose the frequency such that there are many cycles per segment, about 1 cycle per segment and a small fraction of a cycle per segment. (6 frequencies total).
 - c. Plot the amplitudes in the time/frequency plane (3D or color coded plot of amplitude vs time vs frequency) for each case and interpret the result
 - d. Plot the phases in the time/frequency plane (3D or color coded plot of amplitude vs time vs frequency) for each case. Also plot the phase versus time for frequency bins close to the frequency of the cosine wave. Explain why the phases change with time for cosine waves of different frequencies. Identify the amount of phase change as a function of frequency and explain why it is so. Hint: consider the idea of instantaneous frequency.
 - e. Investigate the effect of the cyclic shift. Test with and without cyclic shift using a cosine wave and an impulse signal, and explain the results.
 - f. Test also with the Tom_diner signal and verify the output is the same as the input.
 - g. Implement the following audio effects by manipulating the amplitudes and phases, as explained in DAFX chapter 8: time stretching, pitch shifting, stable/transient components separation, robotization, whisperization, denoising. Also implement and test the filter of assignment 2 in the frequency domain. Test with the Tom_diner signal, cosine wave signals and other signals which demonstrate the effect clearly.

Document all Matlab code in detail, with clear reference to the math in the text. Quality and clarity of documentation will be considered in the marking. A good way to check is to have another student read and try to understand your code.

Phase 2 to be announced