Homework #5: Laboratory Exercise 5
Due Date: May 24, 2011

Level Detection

Problem 1. [50 Points]

In this exercise you will implement an *Auto-Wah* effect — a Wah pedal where the cutoff frequency is set according to the signal level. The effect's signal flow is shown in Figure 1.

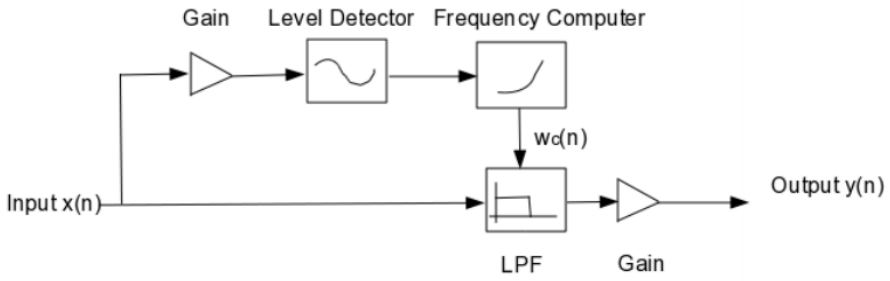

Figure 1: Auto-Wah Block Diagram.

This structure is partially implemented in the started code provided (`Lab5_MAC_VST.zip` or similar). Feel free to reuse code you have written for previous labs.

1(a) [20 Points] Start by implementing a peak detector to track the level (complete the *Signal Tracker* struct already in place) according to the attack and release controls.

1(b) [30 Points] Then, form a cutoff frequency computer to convert the tracked signal level $\lambda(n)$ into cutoff frequency. Develop your own cutoff frequency computer, although good results may be obtained using one of the form

$$\omega_c e^{\lambda(n)\log\rho},$$

where ρ is the ratio of the cutoff frequency when $\lambda(n)$ is small (near 0) to the cutoff frequency when $\lambda(n)$ is large (near 1). Some audio files will be posted, exemplifying the auto-wah effect.

Problem 2. [**40 Points**]

The starter code in `Lab5_MAC_VST.zip` or similar, implements a very simple compressor, but there are a couple of missing parts. Your task is to complete the code according to the following instructions. Please submit different set of source code files for parts 2(a) and 2(d).

2(a) [**10 Points**] Copy your peak detector from the previous problem and modify it to realese to threshold. Now, only the gain computer logic is missing. Complete the code, implementing the threshold and compression ratio controls.

2(b) [**5 Points**] Set the compression ratio to 20, the attack time to 10 ms, the threshold to 0.1 (linear scale), the release to 100ms and process the provided file. Using matlab plot the initial and processed files. Point out the relevant features. Does it work as expected?

2(c) [**5 Points**] Set your compressor's parameters to the values shown at page 36 of the notes and comment on the acoustical features of the compressed audio.

2(d) [**20 Points**] Now, keeping you gain computer implementation, replace the current peak level detector with an RMS level detector. You will need to remove the controls for attack and release times, and add a control for the RMS integration time.