Lab 6
Sound Processing Lab

September 24, 2012

DSP may be used to manipulate sound to generate effects such as echoes and chorus effects. In this lab you will be able to perform these sound effects.

1 Introduction

Echoes are generated using delays. Using an IIR filter, an infinite number of echoes that are decaying exponentially are generated. Here is an example of an IIR filter for echo generation.

$$H(z) = \frac{z^{-D}}{1 - \alpha z^{-D}} \tag{1}$$

where α is a constant, and D is a delay.

Another Equation that might also generate echoes is given by

$$H(z) = \frac{\alpha + z^{-D}}{1 + \alpha z^{-D}} \tag{2}$$

Another effect, is a *chorus* effect. A simple chorus effect may be generated with the equation:

$$y[n] = x[n] + \alpha_1 x[n - D_1] + \alpha_2 x[n - D_2] + \alpha_3 x[n - D_3] \tag{3}$$

where α_i and D_i are different. α_i should be less than 1/3 to prevent the system from saturating.

2 Prelab

1. Write the frequency response of the echo generated using Equation 1 and plot the magnitude response. Assume a value of D to generate a delay of 300ms using a sampling rate of 48kHz. What should you use for α?

2. Write the frequency response of the echo generated using Equation 2 and plot the magnitude response. What is the difference between this response and the one from Equation 1?

3 Lab

1. Implement an echo system. Try different values of α and D.

2. Implement a chorus effect and experiment with different values of $\alpha_i s$ and $D_i s$.