Lab #6: Sample delays and reverberation.

Q1

For 700 samples at a sample time of .0002 seconds, the delay is equal to .1400 seconds. At a speed of 340 m/s, a sound will travel 47.6 meters in .1400 seconds. If the distance needed to travel is then 47.6 meters, a wall that is 23.8 meters away from the snap will echo back to the snap location for the same time that a sample delay of 700 with a sample time of .0002 would echo.

Q2

If the gain in the IIR is set to 1, then the sample being delayed will feed back into the delay loop infinitely, with no loss, causing the sample to be played back indefinitely. If the gain is set greater then 1, the sample being fed back into the delay loop will be amplified, causing it to grow louder with each loop. Not only will it loop indefinitely, but also it will most likely become unbearably loud. This is the kind of phenomenon when a mic is placed in front its amplifier.

Q3

The following answers assume a speed of sound at 340 m/s and a sampling rate of 44100 (a sampling time of 1/44100 seconds).

1. A room that is 12x10x8 feet has equivalent metric measurements of about 3.66x3.05x2.44 meters. There for, the echo time for each distance is about 3.66/340 seconds, 3.05/340 seconds, and 2.44/340 seconds for each wall respectively. If there is a decay factor of 85% for this room, then the gain set to reproduce this effect should be set to .85. If there is a sample time of 1/44100, then the sample delay amount for each wall should be the seconds it takes for the sound to reflect the distance back to the middle of the room multiplied by the sample rate; about 475 samples, 396 samples, and 316 samples for the 12x10x8 foot room respectively.
2. A room this the same dimensions as the room in the previous problem will have the same sample delay number. It will, however, have a gain of .30 to represent the 30% sound reflection in the room.
3. Using the same method used to calculate the sample delay count in the first problem, the sample delays for each side of the 160x100x40 foot room will be 48.77/340 seconds, 30.48/340 seconds, and 12.19/340 seconds respectively. Because the sound reflects at 85%, the gain should be set to .85.
4. A room of the same dimensions has the same sample delay times (48.77/340 seconds, 30.48/340 seconds, and 12.19/340 seconds). This room has a 30% sound reflection, so the gain should be set to .30.