ECE503 Spring 2014 Project1 Report

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1 Files and Methodology

Quantizer.m is to implement a quantizer. *testQuantizer.m* is to test the quantizer and and plot the SNR curve. *withNoiseNoise.m* is to implement oversampled uniform quantization. *without.m* is to implement oversampled uniform quantization with noise shaping. *LPF.m* is to implement a lowpass filter.

In the project, the input is a random signal generated by uniform distribution $[a, b]$, where a and b are extreme points of the quantizer, hence the variance of the input signal is $\sigma_x^2 = \frac{(b-a)^2}{12} = \frac{(2X_m)^2}{12} = \frac{X_m^2}{3}$, which is a constant given X_m. The default value of X_m in the program is 10. Using this input signal, we can plot the theoretical and experimental performance of the quantizer as a function of B and M given X_m.

2 Standard Uniform Quantization

We can see from Figure 1 the experimental results and theoretical results.

3 Oversampled Uniform Quantization

We can see from Figure 2 the experimental results and theoretical results.

4 Oversampled Uniform Quantization with Noise Shaping

We can see from Figure 3 the experimental results and theoretical results.

5 summary

From sections above, we can see that the experimental results and theoretical results line up nicely.

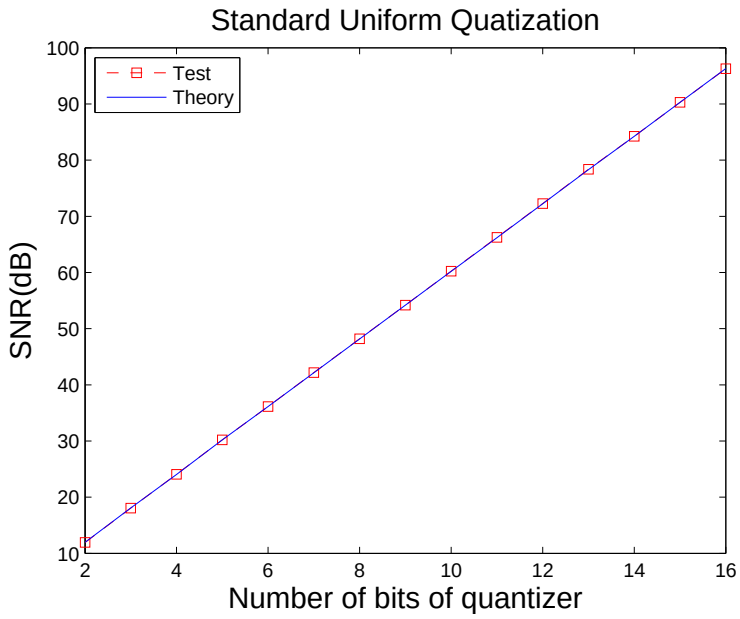

Figure 1: Standard Uniform Quantization.

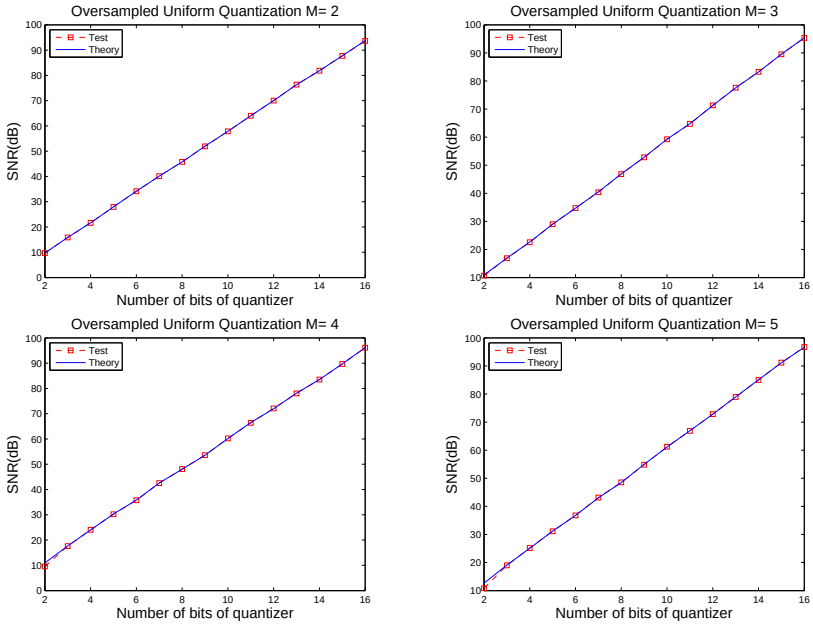

Figure 2: Oversampled Uniform Quantization

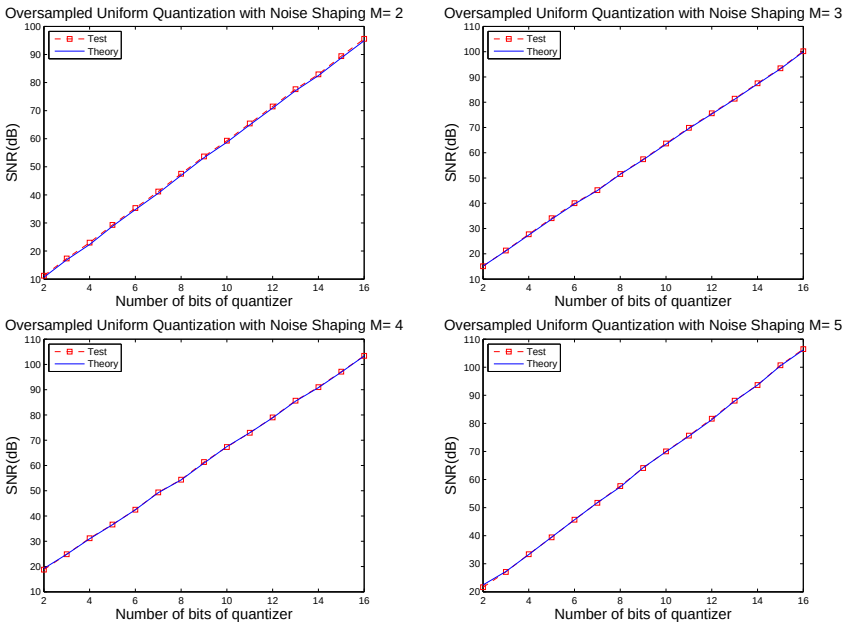

Figure 3: Oversampled Uniform Quantization with Noise Shaping