**HW1 Report**

**Problem 1**

My strategy to determine the quantized levels:

I use the uniform quantization method, where the input signal values are rounded to the nearest quantized level. In the uniform quantization method, the dynamic range is split into different levels, with equivalent intervals in between any two closest levels.

图表, 折线图

描述已自动生成Figure 1. The comparison of the original and quantized signal

图表, 直方图

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Figure 2. Probability Density Function of Quantization Error

**Problem 3**

The X, Y, Z parameters that provides the best SQNR result is:

X = 2

Y = 5

Z = 7

In this case, the output SNR in dB is 25.7867 dB

图片包含 游戏机

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Figure 3. Float & Fixed point FIR Results Comparison

图表, 直方图

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Figure 4. The Histogram of the Error

**Problem 4**

1. The relationship between the control value and the actual generated frequency

N is the number of bits in the fixed point quantized value representation.

The control signal functions as an address increment and decrement signal, controlling the phase change signal which is the input of the Cosine\_LUT module. In this task, both positive and negative address change (or phase change) are required. This brings the control signal to a signed value with 9 bits in total, ensuring that the control signal is able to make a +/- 255 units phase shift and cover the full phase range.

**For 3.29 MHz:**

**For -1.35 MHz:**

**For 0.43 MHz:**