* Quality of sound signal decreases each time we decrease the bit per sample because quantization error increases.
* For a 48000 sample/second sampling rate, bit rate is 48000\*8/1024=375 kbps.
* If we tried to increase the precision of sampling (such as trying to sample amplitude of signals with floating point precision), more bits should have been stored.
* Quality could be increased by using a non-uniform quantizer by applying Lloyd-Max algorithm , which sets the quantization regions by the distribution of samples. It guesses an initial set and it calculates decision thresholds and new representative levels by making use of samples’ probabilty function. And this process continues until no further distortion reduction is possible.

For a song which we have taken 300 samples which is sampled with 44100 sample/second:

Mean of error signal for 8 bit quantization is 3.01e-07.



Figure : Original, decoded and error signals for 8 bit quantization

Mean of error signal for 6 bit quantization is 8.24e-07.



Figure : Original, decoded and error signals for 6 bit quantization

Mean of error signal for 4 bit quantization is 8.99e-06



Figure : Original , decoded and error signals for 4 bit quantization

Resulting number of bits for the 5 seconds of same signal is:

For 8 bit quantization : 48000\*5\*8= 1920000 bits

For 6 bit quantization : 48000\*5\*6= 1440000 bits

For 4 bit quantization : 48000\*5\*4= 960000 bits