

Homework #3

Due: 11:59pm 5/19/2011

1. Audio dithering: In this problem, you have to convert an audio file with bit depth of 16 into an audio file with bit depth of 4 or 8. The quantization noise severely affects the audio due to the bit reduction. To compensate for the quantization error, you can perform audio dithering before the bit reduction. The procedure of audio dithering is given as follows:
 - (a) Read in the original file "Bossa/440Hz.wav". Be careful about the data type, sampling rate, and bit number. Plot the audio signal.
 - (b) Uniformly re-quantize the wave to 16 and 256 levels and save them the file as "Bossa/440Hz _4bit.wav" and "Bossa/440Hz _8bit.wav", respectively.
(※ We don't really do the bit reduction. You can still use 16 bits per sample to store the 4-bit or 8-bit audio data.)
 - (c) Generate random noises from triangular distribution, uniform distribution, or Gaussian distribution with appropriate parameter setting, add the random noises into the original wave, repeat the bit depth reduction process in (b), and save the result as "Bossa/440Hz _4bit_dithered.wav" and "Bossa/440Hz _8bit_dithered.wav", respectively.
 - (d) Compute the DFT of the above audio signals and their dithered signals, and show the corresponding Fourier spectrums. Discuss the differences in their spectrums.(You can use the code in Matlab's function browser to plot the spectrum)
 - (e) Discuss the difference between these waves after listening to these audio files. You should plot the audio waves and try to compare the original signal and their dithered versions.