

CSc 461/561: Multimedia Systems (Spring 2006)

Assignment 1

To be handed in at the lecture on Jan 24, 2006

1. For a fixed sampling frequency at 8KHz, please write down the frequency of the reconstructed signal, when the signal to be sampled is at the following frequency:

Freq of "to-be-sampled"	1KHz	2KHz	3KHz	4KHz	5KHz	6KHz
Freq of "reconstructed"						
Freq of "to-be-sampled"	7KHz	8KHz	9KHz	10KHz	11KHz	12KHz
Freq of "reconstructed"						

2. Suppose voice is digitized at 8K samples per second, 8-bit per sample.
 - (a) What is the data rate (in bit-per-second) of the digitized voice?
 - (b) If 16-bit per sample is used instead, what is the improvement of signal-to-quantization-noise-ratio (in decibel) of the digitized voice?
 - (c) Given the fact that power is proportional to the square of voltage, what is the ratio (in decibel) of the quantization noise voltage with 8-bit sample to the quantization noise voltage with 16-bit sample?
3. Explain the purpose of having adaptive quantizer and predictor in adaptive differential pulse code modulation (ADPCM).
4. Given the RGB-to-YUV transformation
 - $Y = 0.299R + 0.587G + 0.114B$
 - $U = 0.492(B - Y)$
 - $V = 0.877(R - Y)$

If $(Y,U,V)=(0.5,0,0)$, please write down the corresponding (R,G,B) .

5. Explain the purpose of having gamma correction for CRT display.
6. Suppose a digital video has the following format:
 - picture resolution: 352 x 288 pixels; frame rate: 30 frame/second
 - YUV color space: 8-bit each for Y, U and V; chroma subsampling: 4:2:0

Please write down the raw data amount (in bytes), i.e., without compression, for 1-minute video of this format.

7. Explain the purpose of having interlaced scanning in PAL/NTSC TV.