

# Assignment #4 (5%)

CS5263 Wireless Multimedia Networking Technologies and Applications

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**Please attach additional sheets and clearly mark the question numbers. Due at 3:30 p.m. on December 16th, 2013. Please turn in hardcopies before the lecture starts. See course website for grading policies, especially about late submissions.**

- 1) (0.5%) For the following colors in RGB color space, determine their values in YCbCr color space:
  - a) (255,255,255)
  - b) (0, 255, 0)
  - c) (255, 255, 0)
  - d) (0, 128, 128)

Hint:

$$\begin{bmatrix} Y \\ C_b \\ C_r \end{bmatrix} = \begin{bmatrix} 0.257 & 0.504 & 0.098 \\ -0.148 & -0.291 & 0.439 \\ 0.439 & -0.368 & -0.071 \end{bmatrix} \begin{bmatrix} R \\ G \\ B \end{bmatrix} + \begin{bmatrix} 16 \\ 128 \\ 128 \end{bmatrix}$$

- 2) (0.5%) Explain what are 4:4:4, 4:2:2, 4:1:1, and 4:2:0 chrominance subsampling formats. Draw diagrams to illustrate them.
- 3) (0.5%) Explain the concept of profiles and levels in MPEG-4.
- 4) (0.5%) What kinds of scalability are supported by H.264/AVC and H.264/SVC standards?
- 5) (0.5%) What is drifting? When does it occur? Give two approaches to control drifting.
- 6) (0.5%) When and why do video bit streams contain start code?
- 7) (1%) Consider a discrete source with symbols  $\mathcal{S} = \{s_1, s_2, \dots, s_L\}$ . Compute the entropy of the source in the following two cases:
  - a) The source is uniformly distributed among all  $L$  symbols.
  - b) For a symbol  $s_a$ ,  $p(s_a) = 1$  and  $p(s_x) = 0 \forall x \neq a$ .
- 8) (1%) Encode and decode the following sequence using arithmetic coding. Use the occurrence frequency of each symbol in this sequence as the probability of the symbol. Input:  $c, b, a, a, a, c, b, a, b, a, c, c$ . What is the bit rate of the coded sequence? Compare the compression ratio against Huffman coding.