

CSc 461/561

Multimedia Systems

Assignment 2: Discussion

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1

Q1 (2.5): entropy encoding

- Entropy
 - symbol s_i appears with probability p_i
 - entropy: $-p_1 \log_2 p_1 - p_2 \log_2 p_2 - \dots - p_n \log_2 p_n$
- Shannon-Fano encoding
 - building a binary encoding tree
 - in top-down by *evenly* splitting symbol sets
- Huffman encoding
 - in bottom-up on *sorted* symbol subsets

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2

Q2 (1): dictionary encoding

- LZW
 - insert new words into dictionary
 - refer to dictionary when they appear again

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3

Q3 (2): quantization

- How to choose quantization steps
 - each bin carries same *amount* of information
 - weighted with the probability of appearance
- How to represent a range
 - within a bin, the weighted “center”

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4

Q4 (1): JPEG

- Chroma subsampling
 - eyes less sensitive to information loss in color
 - in JPEG, RGB => YUV first
 - subsampling on U and V (4:2:0)
- Discrete cosine transform
 - spatial => frequency
 - in JPEG, coarse quantization on high frequency DCT coefficients

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5

Q5 (1): MP3

- Temporal masking
 - a strong tone can reduce the ear's sensitivity to a follow-on weak tone
- Frequency masking
 - a tone at a particular frequency may reduce the ear's sensitivity to tones at nearby frequency
 - in MP3, multiple sub-bands/frames are used
 - if ears cannot hear anyway, then do not encode

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6

Q6 (1): MPEG

- Group of pictures
 - I: intra-coded
 - independently coded and decoded
 - P: prediction-based
 - dependent on previous I or P frames
 - B: bi-directional prediction
 - dependent on previous and next I or P frames
 - B frames cannot be used for reference