

CS510 Intro to Multimedia Networking: Homework #4

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Problem 1

What are four main differences between GIF and PNG?

- 1) Color Pallet. GIF uses only 256 colors pallet, when JPEG is full color (24 bit)
- 2) Encoding. GIF encoded with LZW, when JPEG uses series of transformations, such as DCT transform and only then entropy encoding (LZW, RLE, Huffman, Zig-zag reordering).
- 3) Use - GIF great on images that use small set of colors for example logo, and JPEG is better for pictures that have wide range of colors.
- 4) Tunable compression rate. JPEG images quality can be adjusted, whereas GIF cannot.

Problem 2

Why is zig-zag reordering used in JPEG compression?

Resulting matrix after quantization tend to contain most of the coefficients clustered together in the upper left corner. Zig-zag reordering helps to keep most of the zero coefficients together.

Problem 3

What are the entropy encoding techniques employed in JPEG?

JPEG uses all encodings studied so far: run length (RLE), Huffman, LZW and zig-zag reordering.

Problem 4

What is the main difference between how the macroblocks are encoded in h.261 versus MPEG-1?

The main difference is that MPEG-1 macroblock type in addition to I and P frames can contain B frame - motion based bidirectional predictive coding frame, which uses both past reference frames and future reference frames, which allows higher compression rate.

Problem 5

Suppose we have a set of frames (number 1 ... n) that we would like to compress into MPEG-1 with the following frame types:

$I_0 \ B_1 \ B_2 \ I_3 \ P_4 \ B_5 \ P_6 \ I_7 \ B_8 \ B_9 \ I_{10} \ I_{11} \ B_{12} \ B_{13} \ P_{14} \ P_{15} \ P_{16} \ I_{17}$

Assuming, they all fit into one group of pictures (GOP), what order do these frames appear in the compressed stream?

Frames should be reordered so each frame that depends on another frame should appear after it in the compressed file.

$I_0 \ I_3 \ B_1 \ B_2 \ P_4 \ P_6 \ B_5 \ I_7 \ I_{10} \ B_8 \ B_9 \ I_{11} \ P_{14} \ B_{12} \ B_{13} \ P_{15} \ P_{16} \ I_{17}$