80527 Videokompressio

Exam: May 11, 2001

The answers can be given in English or in Finnish.

1. Explain how bidirectional motion estimation is utilized in a video codec (e.g., MPEG-1 or MPEG-2). What advantages and disadvantages does bidirectional motion estimation have?

2. How are DCT coefficients quantized in a typical video codec? Consider, in particular, the differences related to intra/inter blocks, DC/AC coefficients, as well as perceptual quantization.

3. What are the key differences between the H.261, MPEG-1, and MPEG-2 video coding standards?

4. (a) Design a binary Huffman code for the symbol alphabet $\{a,b,c,d,e,f,g\}$ when the symbol probabilities are $p(a)=0.3$, $p(b)=0.3$, $p(c)=0.15$, $p(d)=0.1$, $p(e)=0.08$, $p(f)=0.05$, and $p(g)=0.02$.
   (b) Design a binary Huffman code for the symbol alphabet $\{a1, a2, a3, ..., a100\}$ when the symbol probabilities are $p(a1)=0.5$, $p(a2)=0.3$, $p(a3)=0.1$, and the probabilities of the symbols $a4$ to $a100$ are known to be very small, $p(a4),...,$ $p(a100)<<0.1$, but the exact values are not known.
   (c) What is the rate of the code (bits/symbol) in each case (a) and (b)?

5. Explain briefly the following terms:
   (a) Loop filter (in H.261)
   (b) Block matching (in motion estimation)
   (c) Affine motion model
   (d) IDCT inaccuracy problem
   (e) Prefix code (relates to variable lengthh coding)
   (f) YUV format (of images)