EE706 – Midterm 1 – Due 21. April. 2003

Q1 (%20) What are the pros and cones of progressive versus interlaced scans? For the same line number per frame what is the relation between the maximum temporal frequency that a progressive raster can have and that of an interlaced raster that divides each frame into two fields? What about the relation between the maximum vertical frequencies?

Q2 (%30) Consider the following deinterlacing method:

$$\hat{f}(t,m)=\frac{1}{2}f(t-1,m)+\frac{9}{32}\left[f(t,m-1)+f(t,m+1)\right]-\frac{1}{32}\left[f(t,m-3)+f(t,m+3)\right]$$

where *f(t,m)* represents the image value at field *t* and line m. For field t, we assume that the lines *m+2k, k=0,1,...* are missing. Find the equivalent interpolation filter and draw its frequency response using MATLAB.

Q3 (%20) a) What are the main advantages of the multiresolution motion estimation method, compared to an approach using a single resolution? Are there any disadvantages?

b) You are asked to design a cheap motion estimator, that is to mimic an expensive estimator. The expensive one works with SIF format images, uses standard macroblocks, and does a full search over a [-8, 8] range. You will use 176x120 images for motion estimation, full search, and cut the search range by half. What is the the ops/image for motion vector estimation in i) your estimator, ii) expensive estimator?

Q4 (%30) A memoryless time-discrete process with the probability density function

$$f_X(x)=\begin{cases}1-0.5x\,;\ 0\le x\le 2\\ 0\quad\ ;\textit{otherwise}\end{cases}$$

is quantized to four levels using uniform quantization. The quantized data is then Huffman coded. Calculate the resulting avergae distortion and the data rate?