TD 4- Image Codec - (part 2)

The deadline for handing in the report with the first 4 lab assignments (TD 1,2,3,4), is the 16^{th} of October 2017. As already specified, you need to send one written report/pair to agrapa@i3s.unice.fr

During this lab session, you will compare the image codec that you built in the previous TD3 with the image codec standards for still picture: **JPEG/JPEG 2000**.

According to the coding work-flow (see course notes), the last part of the source coding is the entropy coding.

- Compute the Huffman entropy:
  - Determine the Huffman code associated to the Haar wavelet (or Laplacian Pyramid) 2 level decomposition of the image. You can use already available toolboxes to build a Huffman code tree (see course notes) and associate a codeword to Haar wavelet coefficients in your decomposition.
  - Compute the average length of the codewords (Huffman entropy) both for each subband and the total one.
  - Compute the total Huffman entropy compression ratio between quantized and non-quantized images.
- Compare the Huffman entropy to Shannon entropy (see TD3) and explain the difference.

JPEG/JPEG 2000

- Compare the results of the codec you implemented, to those obtained by performing the compression with JPEG and JPEG 2000 standards:
  - Using a JPEG compressor (for instance you could check if your development environment of choice provides a JPEG module with the capability of writing data in **.jpg** format), compress your input image for various values of "quality" parameter.
  - Measure the distortion between the compressed images and input image. Plot a graph D=function of (bit rate(bpp)). Plot a graph $PSNR_{dB}$ = function of (bit rate) of different JPEG compressed images. Comment the results. (Note: The bit rate in bits per pixel is the file size expressed in bits divided by the total number of pixels.)
  - The same requirement for JPEG-2000 compressed images (commonly, the corresponding formats are **.j2k**, **.jp2**, **.jpx**, etc., depending on the codec used by your library). Compress your input image for various "Compression Ratio" parameter. Measure the distortion and plot the graph $PSNR_{dB}$ = function of (bit rate) of different JPEG-2000 compressed images. Comment your results.
  - Compare the previous plots obtained between JPEG, JPEG-2000, and your codec version. Comment your observations.