EE 637: Final Project Description
Spring 1998

The object of this project is to implement and test a lossy image compression algorithm. Projects should be done individually. While they may use existing software and algorithms, these algorithms should be referenced and clearly documented in the report, and each project should contain some novel or innovative aspects. You may want to use lossy compression methods incorporating wavelets, block transforms, vector quantization, segmentation, or any other technique that you find interesting.

Objective: Design an image coder which minimizes the distortion as a function of bit rate.

Definitions:

Distortion:

$$D = \frac{1}{N} \sum_{pixels} 4(\Delta \tilde{L})^2 + (\Delta \tilde{a})^2 + (\Delta \tilde{b})^2$$

Assume the use of $\gamma = 2.2$, Rec. 709 color primaries, and a D_{65} white point. Here the values $\tilde{L}$, $\tilde{a}$, and $\tilde{b}$ are formed by filtering the L, a, and b components of the image using a 3×3 separable filter formed by using a three point Hamming window. The values $\Delta \tilde{L}$, $\Delta \tilde{a}$, and $\Delta \tilde{b}$ are then computed by as the changes in $\tilde{L}$, $\tilde{a}$, and $\tilde{b}$.

Bit rate:

$$R = \frac{8(\text{Number of bytes})}{\text{number of pixels in image}}$$

Test image: The test image is img03.tif contained in the directory /home/yara/bouman/images/pix/photo-CD/tiff.

Deliverables:

1. Report You will need to prepare a three page report including figures, plots, and bibliography. The report should be formatted with two columns, single space with nine point font. The components of the report should include the following.

   (a) Title and author

   (b) Abstract: The abstract should clear describe what you have done in 200 words or less.

   (c) Introduction: The introduction should explain the current state of the art, cite relevant references and explain your contribution in 800 words or less.

   (d) Description of method: This is the body of your paper which should *clearly* explain what you have done.

   (e) Experimental results: This section should present your experimental results. It must include the following items.

      i. Rate-Distortion Plot: Produce a plot of the distortion versus the bit rate for your coding method. This plot should be clearly labeled and computed for the test image.

      ii. Rate-Distortion table: Tabulate your distortion for the 5 bit rates of 1, 1/2, and 1/4 bits per pixel. You can linearly interpolate between the achievable bit rates and distortions for your tabulated results.

      iii. Example: Show a decompressed version of the test image at a bit rate as close to 1/2 as you can achieve. List the actual bit rate in your figure caption.

   (f) Bibliography: List at least two references and cite them in your report.

2. Source code: Email me a path to a publically readable tar file that contains a single directory named proj<Your last name>. The directory should be designed so that:

   (a) By typing "make", it will compile all source code on a HPUX platform such as are in the VISE lab.

   (b) By typing "run" it will run the compression/decompression example on the test image at a bit rate close to 1/2 as shown in your paper.