CSE 803: Homework Set #3 Fall 2006

due Fri., 6 Oct. or Sat., 7 Oct

This work is to be done individually. Hand in your written report before class or electronically by 11:59 PM.

Report answers to the following questions.

1. Enhance your programming work by writing a program to input a .ppm image (magic number P3) and output a 64-bin histogram of its color content. (This histogram can be a simple as a list of 64 integer counts.) To compute the bin number of pixel [R,G,B] use the 2 high order bits of R, G, and B. (a) Show the histograms for two of the face test images. (b) For each histogram output, identify in the histogram the presence or absence of evidence for the existence of face pixels in the image.

2. Enhance your programming work from HW2 to address the problem of detecting human faces in a color image. The program[s] should input a .ppm (magic number P3) image that may contain human faces and output a .ppm image with bounding boxes enclosing the detected faces. (The objective is for the student to gain experience in working with color pixels, not to produce a high performance face detector.)

The items below are important goals/requirements in the experiment.

(a) The student should study the face colors in example images (using gimp or xv, etc.) and determine some characterization of human face color. The model may be just a set of example pixels, a distribution, etc. The model may then be given as input data to the face detection program[s] or as internal data for a function, etc. A model for nonface colors is also permissible, if needed.

(b) The program should output the input image enhanced by colored bounding boxes around the regions detected as faces. Inside the bounding boxes should be the ORIGINAL pixels from the input image. The bounding boxes should have color that indicates the certainty that the region is actually a face. (Invent your own scheme for doing this. A simple scheme might be that high certainty of a face produces a red bounding box and a medium probabilty produces a blue bounding box. Be practical, computing good certainty values is a long project itself.)

(c) Other program output should report on whatever region features were used in making the face detection decision.

(d) The student should show results on two additional images from their own collection or from the Internet, etc.

(e) The instructor plans to add one or two test images a week prior to the due date so that students can test on images not used for training.

Resources

Test images containing faces (or none) will be provided. As noted above, students are responsible for using 2 images of their own choosing.