

**Computer Science 215**  
**Fall 2003**  
**Project 1 – Image Processing**

**Due: Friday, 9/12/2003 5:00 p.m.**

Write a program called `img.c` that reads from standard input, writes to standard output, and accepts a single argument to indicate one of three tasks:

1. argument **grayscale**

The program should read in a color image file that is in `.ppm` format. It should convert the file to grayscale using the NTSC standard conversions:

$$Y = 0.30 * R + 0.59 * G + 0.11 * B$$

and then write out the grayscale image in `.pgm` format.

2. argument **dither**

The program should read in a grayscale image file that is in `.pgm` format. It should convert the file to binary using ordered dither with matrix:

1/32	17/32	5/32	21/32
25/32	9/32	29/32	13/32
7/32	23/32	3/32	19/32
31/32	15/32	27/32	11/32

and then write out the file again in `.pgm` format, using only the characters 255 (white) and 0 (black) for pixel data.

3. argument **colorize**

The program should read in a grayscale image file that is in `.pgm` format. It should “colorize” by selecting, for each grayscale pixel, a random color whose luminance (Y value) matches that of the grayscale pixel. It should write out the color image in `.ppm` format.

4. argument **HDTV**

The program should read in a color image file that is in `.ppm` format and of NTSC standard resolution, 720 x 540 pixels. It should then uniformly stretch the image to fit an HDTV resolution, 1920 x 1080 pixels, and write the stretched image in `.ppm` format.

For all parts, if the input file is not of the correct type, as indicated by the first two characters, the program should print an error message and exit.