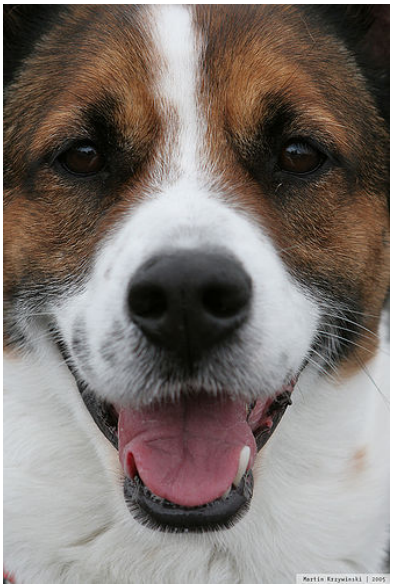
Medical/Digital Image Processing and Analysis

ENSC 474/895

Assignment 2

Due January 21st, 2022 at midnight

1. Write a Matlab program:
   - To reduce the resolution of an image by factors of 2 and 4, 8, 16 and 32. Use the deleting scheme in this case.
   - To reduce the resolution of an image by factors of 2 and 4, 8, 16 and 32. Use the mean value substitution in this part.
   - Write another program to reduce the number of gray levels in an image by factors of 2, 4, 8, and 16 and 32.
   - Try your programs on the image 'bernie1.pgm' from the assignment directory on Canvas.
   - Show the output images in each case and discuss the results in each case.



Bernie1

2. Write a program:

   - To reduce the resolution of an image by factors of 1.5. Use a bilinear interpolation scheme in this part.
   - Try your program on the image 'harbor1.pgm' from the assignment directory on Canvas.
   - Show the output image and comment on the result.

Harbor1

Both of these images are gray-level images with 256 levels.

You are not allowed to read/write the image using imread or imwrite (or any off-the-shelf codes) commands in Matlab. You must write your own interfaces for reading and writing the PGM input/output images using commands such as fopen/fclose, fread/fwrite etc. If you create your output file correctly, you will be able to see the image content and otherwise you won't.

About the PGM format:
The PGM format is a grayscale file format. It is designed to be extremely easy to learn and write programs for.

1. A "magic number" for identifying the file type. A pgm image's magic number is the two characters "P5".
2. Whitespace (blanks, TABs, CRs, LFs).
3. A width, formatted as ASCII characters in decimal.
4. Whitespace.
5. A height, in ASCII decimal.
6. Whitespace.
7. The maximum gray value (Maxval), again in ASCII decimal. Must be less than 65536, and more than zero. In sample images the Maxval is set to 255.
8. Newline or other single whitespace character.
9. A raster of Height rows, in order from top to bottom. Each row consists of Width gray values, in order from left to right. Each gray value is a number from 0 through Maxval, with 0 being black and Maxval being white. Each gray value is represented in pure binary by either 1 or 2 bytes. If the Maxval is less than 256, it is 1 byte. Otherwise, it is 2 bytes. The most significant byte is first. A row of an image is horizontal. A column is vertical. The pixels in the image are square and contiguous.

Note: For each problem you need to submit the code as well as the report. Your code should be self-sufficient so the TA can run them on his own machine if he wants to.