CS 5420 **Digital Image Processing**

Assignment # 2 Due Date: October 12, 2016

Important: Please do all assignments on `hoare`

Image Statistics

In problems 3, 4, 5, and 6, if the input is a color image, convert it to grayscale using `cvtColor` before applying the functions.

1. Write a program to compare two grayscale images of the same size. You should compute the average distance between corresponding pixel intensity levels. For an 8-bit image, the average distance will result in a value between 0 and 255. Make sure you find the absolute difference between pixels to compute the distance. Also, it will be better to accumulate the distance as `int` but report it as a `float` or `double`.

2. Write a function to convert a color image to a gray scale image. If a color pixel is denoted by $\mathbf{p} = [R\ G\ B]^T$, the equivalent grayscale pixel p_g is given by

   $$p_g = [0.30\ 0.59\ 0.11]\mathbf{p}$$

   Write a program to test your function by converting a color image to grayscale. Compute the distance of your grayscale converted image from the grayscale conversion by OpenCV (using the function `cvtColor`) using the program from last question.

3. Write a program that will provide some statistical information on gray scale images. In particular, we want to find out average gray scale value of pixels as well as standard deviation. In addition, plot a histogram of this image on a 256×256 pixel canvas, with each column of the histogram giving the relative total of the number of pixels at that intensity level. Draw some conclusions about the image from the histogram and print the same to `stdout`. The conclusion could be about the brightness (light/dark) and contrast (low/high) in the image.

4. Write a program to subsample a grayscale image by removing alternate rows and columns. Save the subsampled image and display it to screen as well.

5. Write a program to split a grayscale image into bit planes. Save the bit planes and display them on screen as well. Each bit plane should have two intensities: black (0) and white (255) corresponding to the non-zero pixels in the bit plane.

6. Write functions to flip and flop an image in-place. That is, your code should work if the input and output images are the same. The prototype for the functions are:

   ```
   void flip ( const cv::Mat& input, cv::Mat& output );
   void flop ( const cv::Mat& input, cv::Mat& output );
   ```

What to handin

Handin an electronic copy of all the sources, `README`, `Makefile`(s), and results. Create your programs in a directory called *username*.2 where *username* is your login name on admiral. Once you are done with everything, *remove the executables and object files*, and issue the following commands:

```
% cd
% chmod 755 ~
% ~sanjiv/bin/handin cs5420 2
% chmod 700 ~
```