CSCI-631-02 Computer Vision HW-03 Due Feb 26th at 11:59 PM.

You can talk with each other, but submit your own independent work. You are responsible for understanding everything you submit.

Submit your programs, and a PDF write-up of what you did, all combined into one single ZIP file describing the results of your experiments. The grader and/or professor might run your code, or might just read your write-up. Be sure that both your code and your write-ups show good documentation practices and correct English.

1. For easy grading, write one driver function that runs your entire homework. (1)
   a. The function is to be in a file named HWNN_Lastname_Firstname_MAIN.m
      Where NN is the homework number.
   b. This function takes no parameters and calls all of the other parts of your homework.
      This way the grader can watch the results.
      Pause for 5 seconds between functions.

2. Professor Kinsman cannot read his shopping list. Here we will try a method for quantizing it to black and white to see if that improves it.
   a. Read in the SHOPPING_LIST image supplied.
   b. Convert it to one color.
   c. Use the graythresh( ) routine to find the best method for converting the image into black and white.
   d. Using this threshold, quantize the image into <= the threshold and > the threshold.
   e. Graythresh( ) uses an underlying clustering method. What is the name of this method? What was it initially designed for?
   f. Display the resulting quantized image. Put the resulting image in your write-up, and discuss the results. How well did this work, and why.

3. Try another technique to the shopping list. Using techniques described in the textbook, or in class enhance the image for readability. Find a way so make the paper white, and the pencil writing dark. You technique may include dynamic ranging (subtracting and multiplying the values), imadjust( ), using a logarithmic or exponential transformation, or a combination of these techniques.

   Do not threshold the image because that it is too easy to set a threshold that works for just one image. Instead, explore and learn about other techniques.

   The goal is to have all of the white paper be rendered as white – from bottom to top and from left to white. And, also to have all the pencil writing be converted to darker values.

   Describe your imaging chain, and show your resulting image in your write-up. In particular, explain what each step of your image chain does to the dynamic range of the image and why.

4. Consider the image THERMOMETER_20160213_1110.jpg. Create an imaging chain to make it easier to read the temperature on the thermometer. Describe what contrast your imaging chain is trying to enhance. Describe your approach to this. Show the results before and after your enhancement.

5. Consider the image of the sign "Parent Drop Off" and answer the following questions:
   a. Do you notice any sampling artifacts (aliasing) in the image?
   b. Using a pair of Sobel edge detectors, generate an imaging chain for finding just the edges of the black-to-white transitions on the sign. The resulting image should just have high edge values (nearly white) for black-to-white or white-to-black transitions, but few other transitions.
   c. Describe the details of your imaging chain, what it does and why. Show the resulting image.

6. Consider the image "HEADs_UP___... "
   Again, use a pair of Sobel edge detectors to detect and enhance the edges on the blue triangle on the sign. The resulting output image should have the strongest edges around the blue triangle. The best color plane for this might not be any one channel. A combination of color channels, or a channel from a different color space may be the best color channel to use.

   Show the image before and after in your write-up. Explain your imaging chain, and why you use each step of your imaging chain.

7. Consider the image named TEST_IMAGES/TBK_Road_Home_frm_CVPR_2012…
   Create an imaging chain to show the edges of the white line on the road. Again, show the image before and after, and explain your imaging chain and what each step of your imaging chain does.

8. Consider the image TEST_IMAGES/TBK_Kite…
   Create an imaging chain that shows all of the edges of the kite. The resulting image should have an edge around any color transition on the kite – regardless of the color. You will need to find the edges in at least two color planes, and combine them so that the edges of any color transitions are present in the result.

   Again, show an image before and after in your write-up, and describe the processing done in your imaging chain, and what each step of the imaging chain is for.