CS303B: AI Lab 2

Aim: To code some simple image processing and analysis methods in Matlab.

Matlab has a powerful image processing toolbox containing a lot of functions for basic image processing operations. It will allow you to quickly prototype image processing applications.

The images and image sequences

Image used in the Lab are stored in the Blackboard under the **Lab** menu item, filed as **Labimages.zip**. Unzip it, you will find the sub folders: the **\WalkSequence** and **\Image** folder. Please make sure that you can access them. You need to backup them as well as you might need them for next few Labs.

The simple pixel operations

Load the image 'lena.bmp' using the *imread* function.

1. Perform a photographic inversion.
2. Perform contrast scaling for the intensity range of [100, 200], (i.e, intensities not higher than 100 will be mapped to 0, while intensities not lower than 200 will be mapped to 255, intensities within the range [100,200] will be linearly scaled into [0 255])and store this image as 'lena_inst_scale.bmp'
3. If you multiply the intensities with the range [0,100] by 2 and the intensities within the range [100,200] by 3, what will you get? (Note there will be potential overflow here, and you need to take care of this).
4. Try different images you may find on the web and play with different intensity ranges for scaling. (if they are color images, use *rgb2gray()* to convert it to grey-scale first.)

The histogram and its comparison

1. Compute and plot the histograms of lena.bmp, lena_inst_scale.bmp and panda.jpg (using *imhist*()).
2. Try changing the number of intensity bins and observe the change in the histogram.
3. Calculate the pair-wise chi-square distance between those three histograms (noting that the histograms need to be normalized) from step 1, and discuss which of the two images are similar? Can you obtain the same conclusion using Euclidean distance or intersection distance metric?
4. DIY programming: would you be able to write your own program to calculate the histogram?

Thresholding

1. Load the image 'coins.png' into the matlab working space and plot its histogram.
2. Use a threshold of 50 to binarize the image and show the results. Can you segment the coins out?
3. Observe the histogram shape and select a threshold, and binarize the image.
4. Try Ostu's optimal thresholding method using '*graythresh*()', and show the results. How close is your chosen threshold in step 3 to this one? (Note the output threshold of *graythresh ()* will be a value in [0,1], and you will need to scale it to the range of [0,255] in order to compare with you chosen threshold)
5. Try steps 2-4 on other images.

Frame differencing and background extraction

1. Load the walking sequences from the *WalkSequences* folder (use the grey level version)
2. Perform frame differencing and select a threshold
3. Background extraction:
    a. Compute the mean image as the background B
    b. Compute the difference between B and each frame
    c. Display the difference
    d. Set a threshold to segment the foreground (human) out

Finally…

Make sure you **backup** your work so that you might continue development in next week's workshop using some of the code.