LAB-12: Texture Based Descriptors

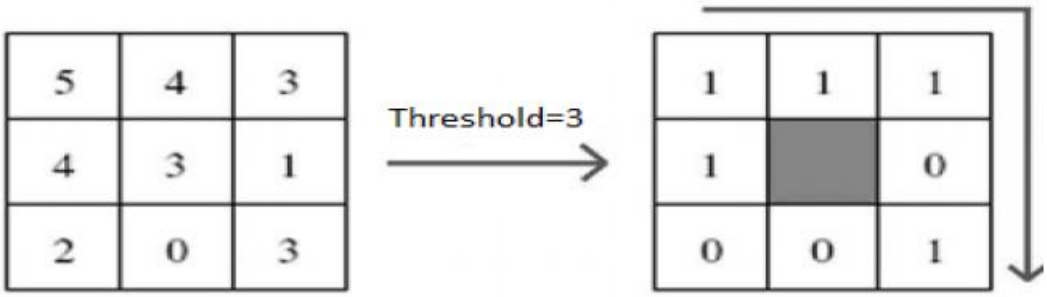
Objective:

The objective of this lab is to develop an understanding of texture based descriptors and how they can be further used.

Theory:

Texture Based Descriptors can be useful for gleaning such information from an image that can provide good features for the said image.

Local Binary Patterns operator is an image operator which transforms an image into an array or image of integer labels describing small scale appearance of the image.



For LBP, the pixel under observation acts as the threshold for its neighboring pixels.

Grey Level Co-occurrence Matrix contains the information of two gray levels occurring together in an image based on a predefined rule. The changes in the rule can change the GLCM. The following parameters of GLCM can be used for texture description:

Maximum probability $\max_{i,j}(c_{ij})$

Contrast $\sum_i \sum_j (i-j)^2 c_{ij}$

Uniformity $\sum_i \sum_j c_{ij}^2$

Entropy $-\sum_i \sum_j c_{ij} \log_2 c_{ij}$

Some Useful Commands:

The python package that will be needed for the following function is **scikit-image.** You may need to download the .whl file and install it manually if pip doesn't work.

1. To find the GLCM of an image: **my_GLCM = skimage.feature.greycomatrix(my_image, [distances_at_which_the_covariance_is_to_be_checked], [angles_at_which_the_covariance_is_to_be_checked], levels=None, symmetric=False, normed=False)**

The output of the above function will be a 4D array. The value my_GLCM [i,j,d,theta] is the number of times that grey-level j occurs at a distance d and at an angle theta from grey-level i. If normed is False, the output is of type uint32, otherwise it is float64. The dimensions are: levels x levels x number of distances x number of angles.

2. To calculate different properties of a GLCM matrix: **my_property = skimage.feature.greycoprops(my_GLCM, prop='my_property')**

The prop flag can be set to 'contrast', 'dissimilarity', 'homogeneity', 'energy', 'correlation' or 'ASM'.

Lab Tasks:

Lab Task 1:

Calculate the Local Binary Pattern image of image3.png. Plot the histogram of the output LBP image. Now divide the histogram of the image into only 8 bins. Plot this new "histogram".

Lab Task 2:

Calculate the Grey Level Co-occurrence Matrix (GLCM) of image1.png and image2.png. Then calculate the parameters of GLCM mentioned above for both the images and compare the results.

Conclusion:

This lab gave an idea of different texture based descriptors that can be used for feature extraction.