**PROBLEM STATEMENT:**

Implement a Histogram equalization from scratch using C++ .  Input should be an Image and the output should be a Linear filtered Image, Neat Documentation is expected with Code, Explanation, Input, and Output Image.

**Solution:**

**#include <opencv.hpp>**

**#include <iostream>**

**using namespace cv;**

**using namespace std;**

**int main(int argc, char\*\* argv)**

**{**

**Mat image = imread("D:/My OpenCV Website/fly-agaric.jpg");**

**if (image.empty())**

**{**

**cout << "Could not open or find the image" << endl;**

**cin.get(); //wait for any key press**

**return -1;**

**}**

**cvtColor(image, image, COLOR\_BGR2GRAY);**

**Mat hist\_equalized\_image;**

**equalizeHist(image, hist\_equalized\_image);**

**String windowNameOfOriginalImage = "Original Image";**

**String windowNameOfHistogramEqualized = "Histogram Equalized Image";**

**namedWindow(windowNameOfOriginalImage, WINDOW\_NORMAL);**

**namedWindow(windowNameOfHistogramEqualized, WINDOW\_NORMAL);**

**imshow(windowNameOfOriginalImage, image);**

**imshow(windowNameOfHistogramEqualized, hist\_equalized\_image);**

**waitKey(0);**

**destroyAllWindows();**

**return 0;**

**}**

**Output:**



#### **Explanation**

**Mat image = imread("D:/My OpenCV Website/fly-agaric.jpg");**

**if (image.empty())**

**{**

**cout << "Could not open or find the image" << endl;**

**cin.get(); //wait for any key press**

**return -1;**

**}**

The above code segment will load the image from the specified file. The program will exit if the image load-up is failed.

**cvtColor(image, image, COLOR\_BGR2GRAY);**

The above function converts the image in BGR color space to grayscale color space.

Please note that the color space of the loaded image is BGR, not RGB. (i.e. - Channels are ordered as blue, green and red.)

**Mat hist\_equalized\_image;**

**equalizeHist(image, hist\_equalized\_image);**

The above function equalizes the histogram of the grayscale image and store the output in the hist\_equalized\_image.

**String windowNameOfOriginalImage = "Original Image";**

**String windowNameOfHistogramEqualized = "Histogram Equalized Image";**

**namedWindow(windowNameOfOriginalImage, WINDOW\_NORMAL);**

**namedWindow(windowNameOfHistogramEqualized, WINDOW\_NORMAL);**

**imshow(windowNameOfOriginalImage, image);**

**imshow(windowNameOfHistogramEqualized, hist\_equalized\_image);**

The above code segment will create windows and show images in them. As windows are created passing the flag WINDOW\_NORMAL, they can be resized freely.

**waitKey(0);**

**destroyAllWindows();**

return 0;

The program will wait until any key is pressed. After a key is pressed, all created windows will be destroyed and the program will exit.

**Summary**

In the above example, you have learnt how to

Load an image from the file

Convert a color image to a grayscale image

Equalize the histogram of a grayscale image

Create windows and show images in them

Keep your program waiting for a key press

Destroy all created windows