PRACTICAL - 2

Name: Shivanshu Anant Suryakar

PRN: 1841048

Batch: B3

Class: L.Y Computer Engineering

Aim: Program for image enhancement using histogram equalization in python

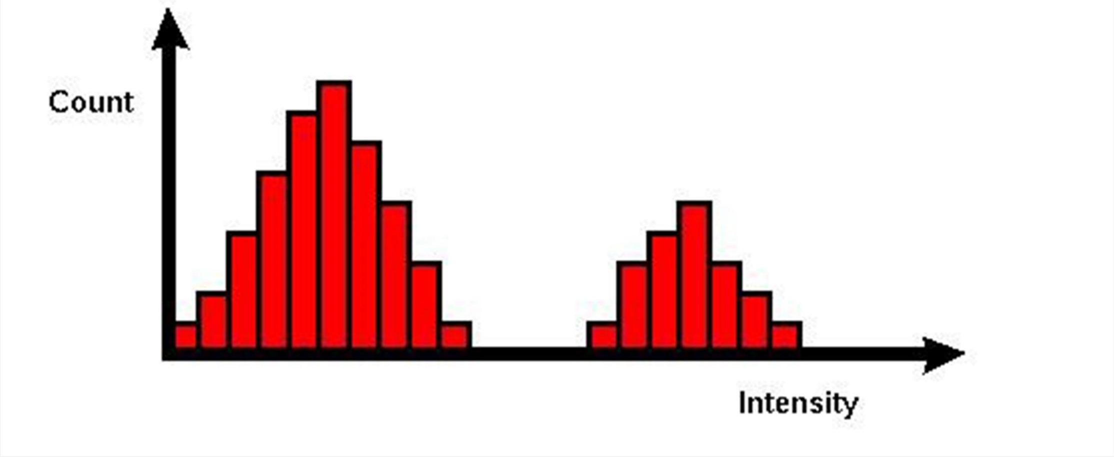
Theory:

Histogram equalization is a method in image processing of contrast adjustment using the image's histogram.

This method usually increases the global contrast of many images, especially when the usable data of the image is represented by close contrast values. Through this adjustment, the intensities can be better distributed on the histogram. This allows for areas of lower local contrast to gain a higher contrast. Histogram equalization accomplishes this by effectively spreading out the most frequent intensity values. The method is useful in images with backgrounds and foregrounds that are both bright or both dark.

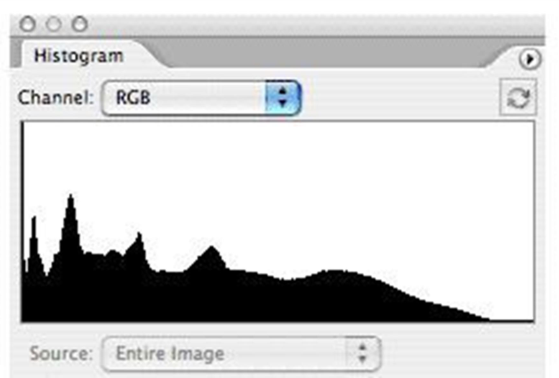
What is a Histogram of An Image?

A histogram of an image is the graphical interpretation of the image's pixel intensity values. It can be interpreted as the data structure that stores the frequencies of all the pixel intensity levels in the image.

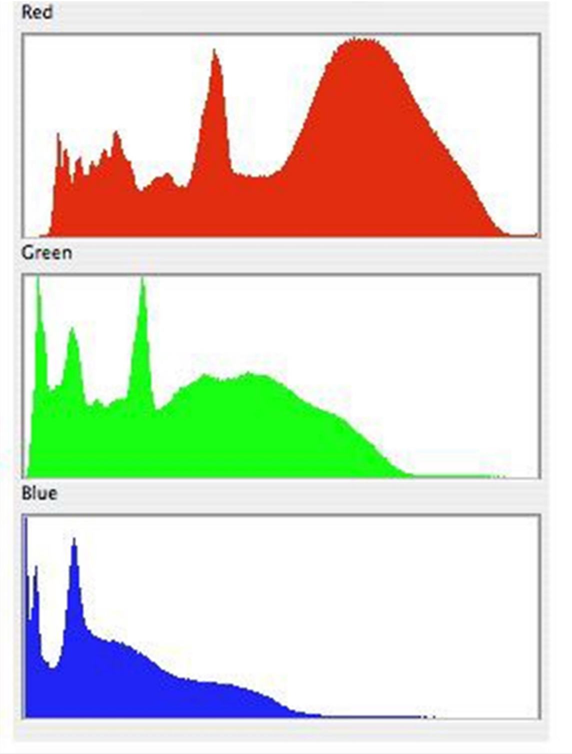


Histogram of an Image

As we can see in the image above, the X-axis represents the pixel intensity levels of the image. The intensity level usually ranges from 0 to 255. For a gray-scale image, there is only one histogram, whereas an RGB colored image will have three 2-D histograms — one for each color. The Y-axis of the histogram indicates the frequency or the number of pixels that have specific intensity values.



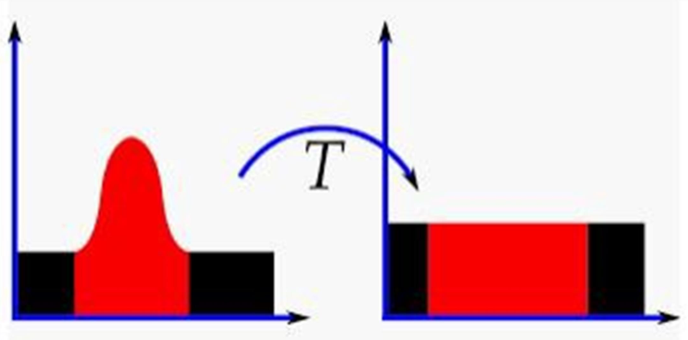
Histogram of a Gray-Scale Image



Histogram of an RGB Image

What is Histogram Equalization?

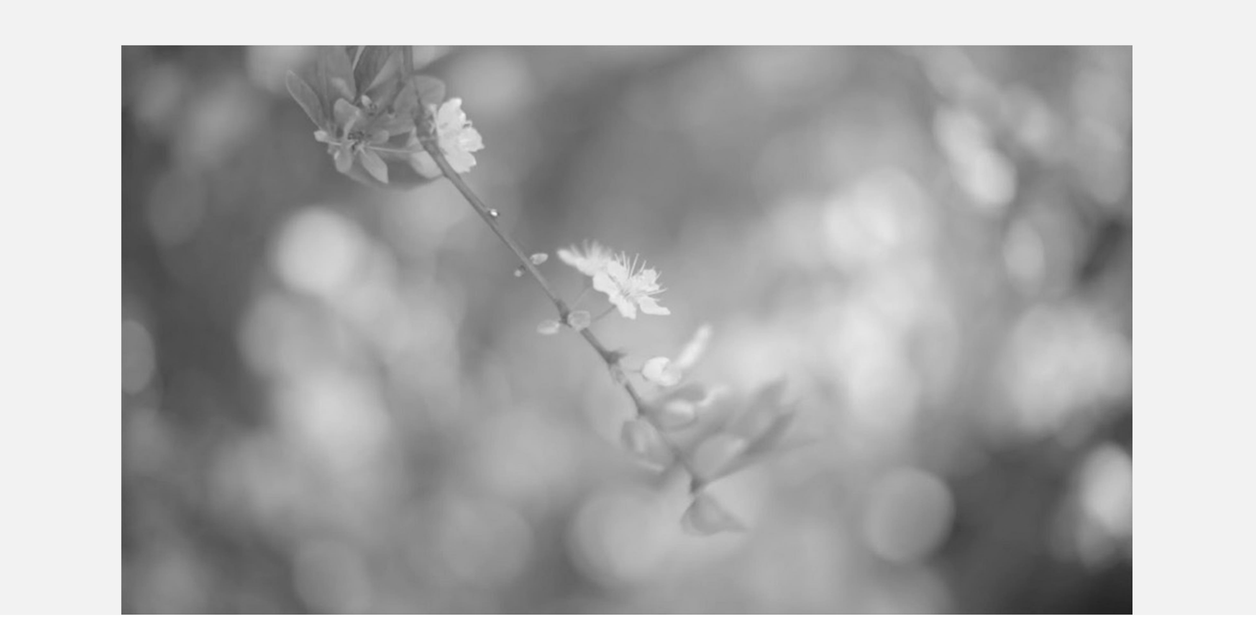
Histogram Equalization is an image processing technique that adjusts the contrast of an image by using its histogram. To enhance the image's contrast, it spreads out the most frequent pixel intensity values or stretches out the intensity range of the image. By accomplishing this, histogram equalization allows the image's areas with lower contrast to gain a higher contrast.



Graphical Representation of Histogram Equalization

Why Do You Use Histogram Equalization?

Histogram Equalization can be used when you have images that look washed out because they do not have sufficient contrast. In such photographs, the light and dark areas blend together creating a flatter image that lacks highlights and shadows. Let’s take a look at an example -



Low Contrast Photograph

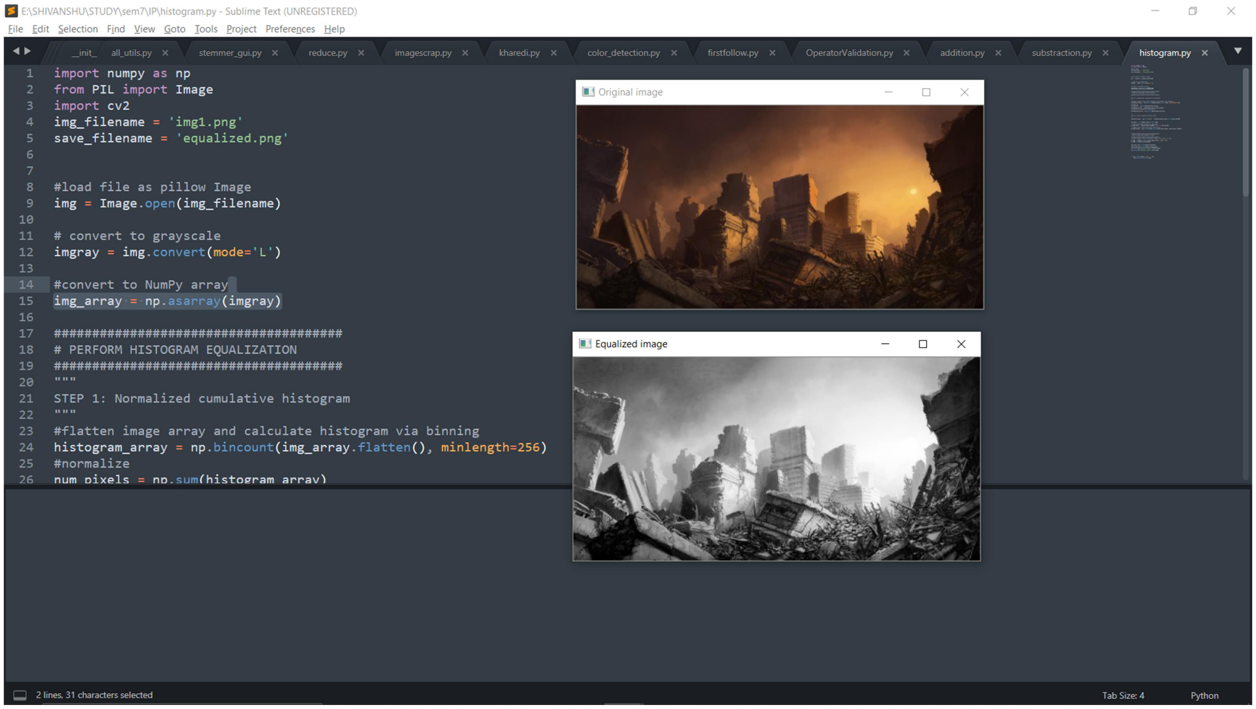
In terms of Photography, this image is, without a doubt, a beautiful bokeh shot of a flower. However, for computer vision and image processing tasks, this photograph doesn’t provide much information since most of its areas are blurry due to lack of contrast.

Requirements:

- Open CV
- Pillow

- numpy

Output:


E:\SHIVANSHU\STUDY\sem7\IP\histogram.py - Sublime Text (UNREGISTERED)
File Edit Selection Find View Goto Tools Project Preferences Help
__init__ all_utils.py stemmer_gui.py reduce.py imagescrap.py kharedi.py color_detection.py firstfollow.py OperatorValidation.py addition.py substraction.py histogram.py
Original image
Equalized image
2 lines, 31 characters selected
Tab Size: 4
Python

```python
import numpy as np
from PIL import Image
import cv2
img_filename = 'img1.png'
save_filename = 'equalized.png'


#load file as pillow Image
img = Image.open(img_filename)

# convert to grayscale
imgray = img.convert(mode='L')

#convert to NumPy array
img_array = np.asarray(imgray)

######################################
# PERFORM HISTOGRAM EQUALIZATION
######################################
"""
STEP 1: Normalized cumulative histogram
"""
#flatten image array and calculate histogram via binning
histogram_array = np.bincount(img_array.flatten(), minlength=256)
#normalize
num_pixels = np.sum(histogram_array)
```

Conclusion:

In this Program we have learnt image enhancement using histogram equalization in python