Computer Vision-IT416

Dinesh Naik

Department of Information Technology,
National Institute of Technology Karnataka, India
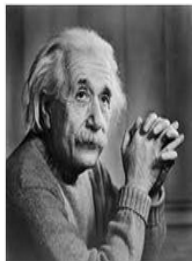
September 7, 2021

Concept of Histogram.

Histogram of an image

Histogram of an image, like other histograms also shows frequency. But an image histogram, shows frequency of pixels intensity values. In an image histogram, the x axis shows the gray level intensities and the y axis shows the frequency of these intensities.

For example

The histogram of the above picture of the Einstein would be something like this
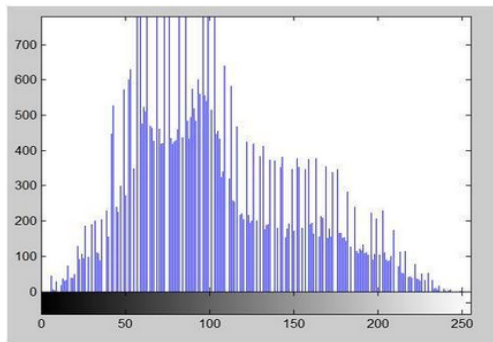
The x axis of the histogram shows the range of pixel values. Since its an 8 bpp image, that means it has 256 levels of gray or shades of gray in it. Thats why the range of x axis starts from 0 and end at 255 with a gap of 50. Whereas on the y axis, is the count of these intensities.

As you can see from the graph, that most of the bars that have high frequency lies in the first half portion which is the darker portion. That means that the image we have got is darker. And this can be proved from the image too.

Applications of Histograms

Histograms has many uses in image processing. The first use as it has also been discussed above is the analysis of the image. We can predict about an image by just looking at its histogram. Its like looking an x ray of a bone of a body.

The second use of histogram is for brightness purposes. The histograms has wide application in image brightness. Not only in brightness, but histograms are also used in adjusting contrast of an image.

Another important use of histogram is to equalize an image.

And last but not the least, histogram has wide use in thresholding. This is mostly used in computer vision.

Brightness

Brightness is a relative term. It depends on your visual perception. Since brightness is a relative term, so brightness can be defined as the amount of energy output by a source of light relative to the source we are comparing it to. In some cases we can easily say that the image is bright, and in some cases, its not easy to perceive.

For example

Just have a look at both of these images, and compare which one is brighter.
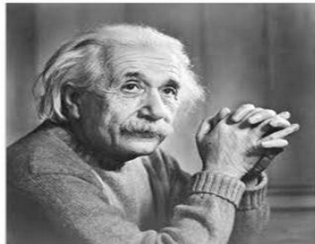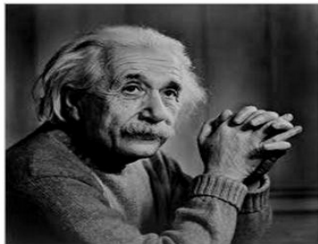
How to make an image brighter.

Brightness can be simply increased or decreased by simple addition or subtraction, to the image matrix.

Consider this black image of 5 rows and 5 columns

Since we already know, that each image has a matrix at its behind that contains the pixel values. This image matrix is given below.

0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

What we will do is, that we will simply add a value of 1 to each of the matrix value of image 1. After adding the image 1 would something like this.
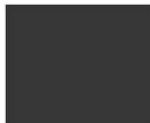

Now we will again compare it with image 2, and see any difference.

We see, that still we cannot tell which image is brighter as both images looks the same.

Now what we will do, is that we will add 50 to each of the matrix value of the image 1 and see what the image has become.

The output is given below.

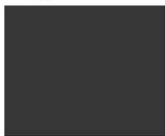Now again, we will compare it with image 2.

Image 1

Image 2

Image 1

Image 2

Now when you compare it, you can see that this image1 is clearly brighter then the image 2.

Even it is brighter then the old image1. At this point the matrix of the image1 contains 100 at each index as first add 5, then 50, then 45. So 5 + 50 + 45 = 100.