Computer Vision-IT416

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Low Leve Image feature Discussion.

Different color codes

All the colors here are of the 24 bit format, that means each color has 8 bits of red, 8 bits of green, 8 bits of blue, in it. Or we can say each color has three different portions. You just have to change the quantity of these three portions to make any color.

Binary color format

Color:Black

Image:

Decimal Code:

(0,0,0)

Color:White

Image:

Decimal Code:

(255,255,255)

Explanation:

Since each portion of R, G, B is an 8 bit portion. So in 8-bit, the white color is formed by 255. It is explained in the tutorial of pixel. So in order to make a white color we set each portion to 255 and thats how we got a white color. By setting each of the value to 255, we get overall value of 255, thats make the color white.

RGB color model:

Color:Red

Image:

Decimal Code:

(255,0,0)

Explanation:

Since we need only red color, so we zero out the rest of the two portions which are green and blue, and we set the red portion to its maximum which is 255.

Color:Green

Image:

Decimal Code:

(0,255,0)

Explanation:

Since we need only green color, so we zero out the rest of the two portions which are red and blue, and we set the green portion to its maximum which is 255.

Color: Blue

Image:

Decimal Code:

(0,0,255)

Explanation:

Since we need only blue color, so we zero out the rest of the two portions which are red and green, and we set the blue portion to its maximum which is 255

Gray color:

Color: Gray

Image:

Decimal Code:

(128,128,128)

Explanation

As we have already defined in our tutorial of pixel, that gray color Is actually the mid point. In an 8-bit format, the mid point is 128 or 127. In this case we choose 128. So we set each of the portion to its mid point which is 128, and that results in overall mid value and we got gray color.

CMYK color model:

CMYK is another color model where c stands for cyan, m stands for magenta, y stands for yellow, and k for black. CMYK model is commonly used in color printers in which there are two carters of color is used. One consist of CMY and other consist of black color.

The colors of CMY can also made from changing the quantity or portion of red, green and blue.

Color: Cyan

Image:

Decimal Code:

(0,255,255)

Explanation:

Cyan color is formed from the combination of two different colors which are Green and blue. So we set those two to maximum and we zero out the portion of red. And we get cyan color.

Color: Magenta

Image:

Decimal Code:

(255,0,255)

Explanation:

Magenta color is formed from the combination of two different colors which are Red and Blue. So we set those two to maximum and we zero out the portion of green. And we get magenta color.

Color: Yellow

Image:

Decimal Code:

(255,255,0)

Explanation:

Yellow color is formed from the combination of two different colors which are Red and Green. So we set those two to maximum and we zero out the portion of blue. And we get yellow color.

Average method

Average method is the most simple one. You just have to take the average of three colors. Since its an RGB image, so it means that you have add r with g with b and then divide it by 3 to get your desired grayscale image.

Its done in this way.

Grayscale = (R + G + B / 3)

For example:

If you have an color image like the image shown above and you want to convert it into grayscale using average method. The following result would appear.

Explanation

There is one thing to be sure, that something happens to the original works. It means that our average method works. But the results were not as expected. We wanted to convert the image into a grayscale, but this turned out to be a rather black image.

Problem

This problem arise due to the fact, that we take average of the three colors. Since the three different colors have three different wavelength and have their own contribution in the formation of image, so we have to take average according to their contribution, not done it averagely using average method. Right now what we are doing is this,

33% of Red, 33% of Green, 33% of Blue

We are taking 33% of each, that means, each of the portion has same contribution in the image. But in reality thats not the case. The solution to this has been given by luminosity method.

Weighted method or luminosity method

You have seen the problem that occur in the average method. Weighted method has a solution to that problem. Since red color has more wavelength of all the three colors, and green is the color that has not only less wavelength then red color but also green is the color that gives more soothing effect to the eyes.

It means that we have to decrease the contribution of red color, and increase the contribution of the green color, and put blue color contribution in between these two.

So the new equation that form is:

New grayscale image = ((0.3 * R) + (0.59 * G) + (0.11 * B)).

According to this equation, Red has contribute 30%, Green has contributed 59% which is greater in all three colors and Blue has contributed 11%.

Applying this equation to the image, we get this

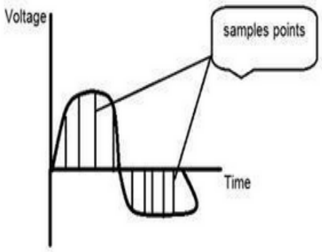
Original Image:

Grayscale Image:

Digitizing a signal

As we have seen in the previous tutorials, that digitizing an analog signal into a digital, requires two basic steps. Sampling and quantization. Sampling is done on x axis. It is the conversion of x axis (infinite values) to digital values.

The below figure shows sampling of a signal.



If you will look at the above figure, you will see that there are some random variations in the signal. These variations are due to noise. In sampling we reduce this noise by taking samples. It is obvious that more samples we take, the quality of the image would be more better, the noise would be more removed and same happens vice versa.

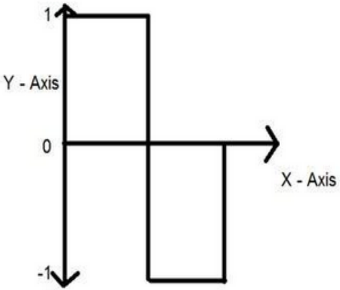
However, if you take sampling on the x axis, the signal is not converted to digital format, unless you take sampling of the y-axis too which is known as quantization. The more samples eventually means you are collecting more data, and in case of image, it means more pixels.

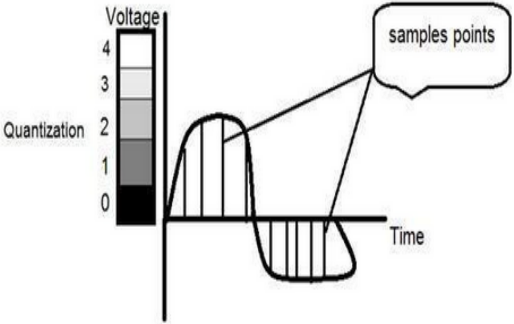
What is quantization

Quantization is opposite to sampling. It is done on y axis. When you are quantizing an image, you are actually dividing a signal into quanta(partitions).

On the x axis of the signal, are the co-ordinate values, and on the y axis, we have amplitudes. So digitizing the amplitudes is known as Quantization.

Here how it is done





In the figure shown in sampling, although the samples has been taken, but they were still spanning vertically to a continuous range of gray level values. In the figure shown above, these vertically ranging values have been quantized into 5 different levels or partitions. Ranging from 0 black to 4 white. This level could vary according to the type of image you want.

Pixel

We have already defined a pixel in our tutorial of concept of pixel, in which we define a pixel as the smallest element of an image. We also defined that a pixel can store a value proportional to the light intensity at that particular location.

Now since we have defined a pixel, we are going to define what is resolution.

Resolution

The resolution can be defined in many ways. Such as pixel resolution, spatial resolution, temporal resolution, spectral resolution. Out of which we are going to discuss pixel resolution.

You have probably seen that in your own computer settings, you have monitor resolution of 800 x 600, 640 x 480 e.t.c

In pixel resolution, the term resolution refers to the total number of count of pixels in an digital image. For example. If an image has M rows and N columns, then its resolution can be defined as M X N.

If we define resolution as the total number of pixels, then pixel resolution can be defined with set of two numbers. The first number the width of the picture, or the pixels across columns, and the second number is height of the picture, or the pixels across its width.

We can say that the higher is the pixel resolution, the higher is the quality of the image.

We can define pixel resolution of an image as 4500 X 5500.