Content Based Image Retrieval Using Image Preprocessing Techniques

Dr. Aziz Makandar
Professor
Dept. of Computer Science,
Karnataka State Akkamahadevi Women's University, Vijayapura.
Mrs. Wangi Kanchan Mallinath*
Research Scholar
Dept. of Computer Science,
Karnataka State Akkamahadevi Women's University, Vijayapura.

ABSTRACT:

Image retrieval is very fatten epidemic on daily basis growing area of the computer vision applications. The digital images are constitute, the major role in retrieval of the image and multimedia dataset. The content based image retrieval (CBIR) is the one technique of image retrieval which used for feature like the color, shape and texture in order to search the image from the huge amount of the digital image processing dataset. The CBIR is rest on the features of images which are pictorial features are learn by the deep learning automatically. The research shows that there the image preprocessing representation by human understanding the visually of images. Image preprocessing is used to improve the quality of the image and remove the unsolicited distortions from the image or enhanced the significant feature in image. The paper is focused on performance of three preprocessing methods are compared namely Contrast adjustment, Intensity adjustment and Histogram equalization.

Keywords: Image processing, Preprocessing, Image enhancement, Content based image retrieval.

I. INTRODUCTION:

In last couple of years the entanglement of image retrieval, principally the images, has the grown day by day, and more than millions of images are uploaded at divergent accounts like WhatsApp, Twitter, Instagram and Facebook. To Search for applicable images from the divergent is the demanding and challenging research task. Primarily the search engines retrieve images on the basis of old traditional text based and query based approaches that depend on the caption and metadata. In last two decades, substantial research is reported for CBIR image classification and analysis. CBIR is depends on the feature extraction of the image which are the visual features. To improve the quality of image and enhanced noteworthy feature of image and remove unwanted distortion from image using image preprocessing techniques.

The image processing is basely used to process the digital images form large amount of the database. Processing the images means removing noise and unsolicited distortion from the images. Preprocessing methods can improve the performance of image processing like Image segmentation, transform, feature extraction and finally fault detection from the images. The figure. 1 shows image preprocessing steps:

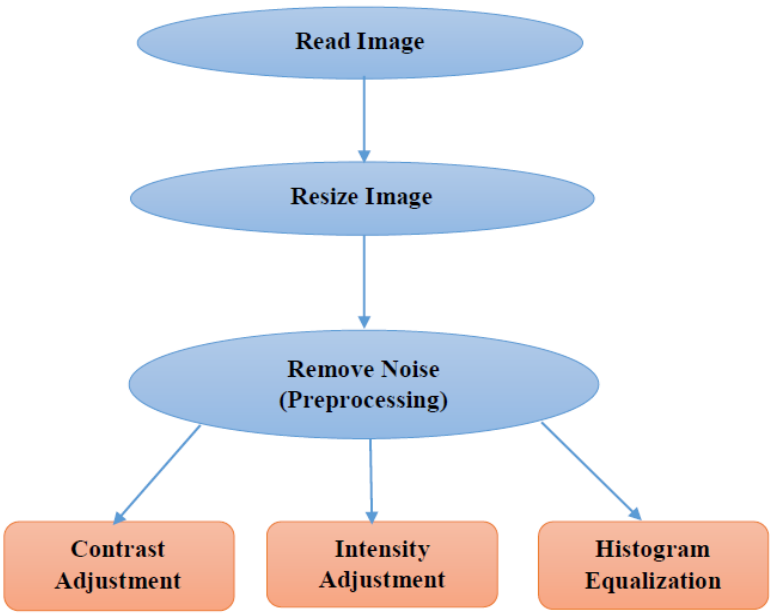

Figure 1. Image Processing Steps

A preliminary processing of data from the image in sequence to prepare it for the processing or future analysis. In this paper, basely used preprocessing techniques are Contrast adjustment, Intensity adjustment and Histogram equalization.

II. NEED FOR PREPROCESSING:

Image acquisition is very imperative step for supervisory the input data for comprehensive process. The digital image acquisition is creation of the encoded representation of the visual characteristics of the object such as interior structure of the object. Acquisition of image is directly connected to the quality of local illumination variances of the images.

Due to the image preprocessing, quality and contrast of image pixel will improved and gives the better resolution superiority of image. Good quality of image given decent results in image visualization process such as computer vision, image retrieval from large amount of database.

III. PREPROCESSING METHODS FOR COLOR FEATURE IN CBIR:

Preprocessing is very significant factor of the image processing system, it gives the relevant quality of the image for future processing of the image data. CBIR is based on the feature of the image such as shape, color and texture of the image [3]. The following are preprocessing methods under study for color feature from image:

a) Contrast adjustment
b) Intensity adjustment
c) Histogram equalization

a) Contrast adjustment:

The contrast of a picture is the circulation of its dark and light pixels. A low-contrast picture shows little contrasts between its light and dull pixel esteems. The histogram of a low-contrast picture is thin. Since the natural sense is delicate to differentiate instead of supreme

pixel forces, a perceptually better picture could be acquired by extending the histogram of a picture with the goal that the full powerful scope of the picture is filled. Figure. 2 (a) shows the original image and figure. 2 (b) shows image after contrast adjustment.

Figure 2(a) Original Image **Figure 2(b) Contrast adjustment image**

b) Intensity adjustment:

Image upgrade methods are utilized to improve a picture, where "improve" is in some cases characterized unbiasedly (e.g., increment the sign to-noise proportion), and now and then abstractly (e.g., make certain highlights simpler to see by changing the tones or intensities). Intensity change is a picture upgrade procedure that maps the picture force esteems to another reach. The low-balance picture with its histogram and all the qualities accumulate in the focal point of the force range. Figure. 3 (a) shows the original image and figure. 3 (b) shows image after intensity adjustment.

Figure 3(a) Original Image **Figure 3(b) Intensity adjustment image**

c) Histogram equalization:

The histogram equalization uniformly circulates the event of pixel forces with the goal that the whole scope of powers is thought of. This technique typically expands the worldwide difference of pictures, particularly when the usable information of the picture is spoken to by close differentiation esteems.

Through this change, the forces can be better circulated on the histogram. This takes into account zones of lower neighborhood difference to increase a higher differentiation. Histogram leveling achieves this by adequately spreading out the most continuous force regards. At that point likelihood thickness work is determined for the histogram. Figure. 4 (a) shows the original image and figure. 4 (b) shows image after histogram equalization.

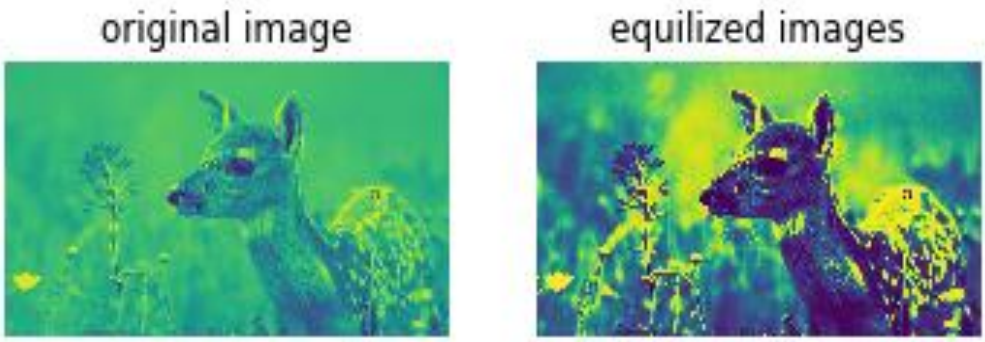

Figure 4(a) Original Image **Figure 4(b) Histogram equalization image**

IV. EXPERIMENTAL ASSESSMENT:

To test the exactness of preprocessing calculations, the accompanying three stages are utilized.

- A color image is taken as input.
- Preprocessing algorithm is applied for color image.
- The MSE and PSNR esteem is determined for various algorithm.

The PSNR and MSE esteems display the presentation of preprocessing calculation. To assess the nature of the reproduced images, following boundaries are utilized.

1. Peak signal to noise ratio [PSNR]
2. Mean square error [MSE]

1. Peak Signal to Noise Ratio

The PSNR matric is defined by formula,

$$PSNR = 10 \cdot \log_{10}\left(\frac{MAX_I^2}{MSE}\right)$$
$$= 20 \cdot \log_{10}\left(\frac{MAX_I}{\sqrt{MSE}}\right)$$

The PSNR is characterized in logarithmic scale, in dB. It is the proportion of pinnacle signal capacity to clamor power. Since the MSE speaks to the commotion power and the pinnacle signal force, it is solidarity if there should arise an occurrence of standardized image signal.

The Max (i) values of peak signal to noise ratio with different preprocessing algorithm is analyzed in following figure. 5.

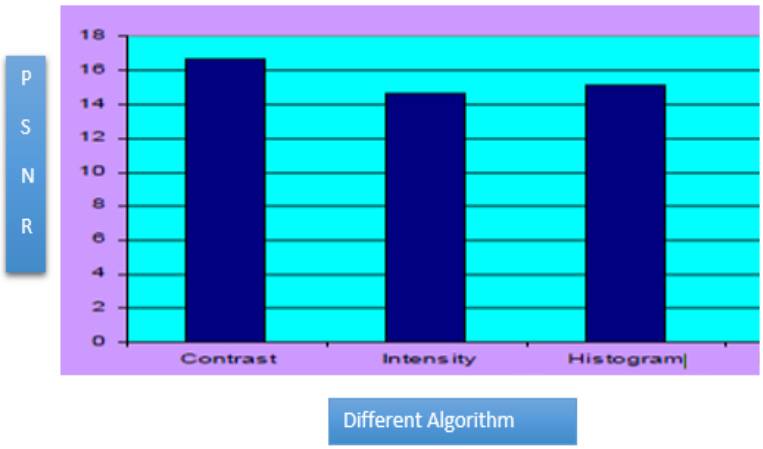

Figure 5. Analysis of different algorithm with PSNR value

The figure. 5 shows the different preprocessing analysis of different PSNR values. In figure it is clearly, express that contrast adjustment is having the good PSNR value compare to other preprocessing algorithm.

2. Mean Square Error [MSE]

The MSE matric is defined by formula,

$$MSE = \frac{1}{mn}\sum_{i=0}^{m-1}\sum_{j=0}^{n-1}||I(i,j) - K(i,j)||^2$$

For two m×n monochrome pictures I and K, one of the pictures is viewed as noisy approximation of the other. Different measurements like Root Mean Square Deviation (RMSE), Mean Absolute Error MAE and PSNR are characterized utilizing MSE.

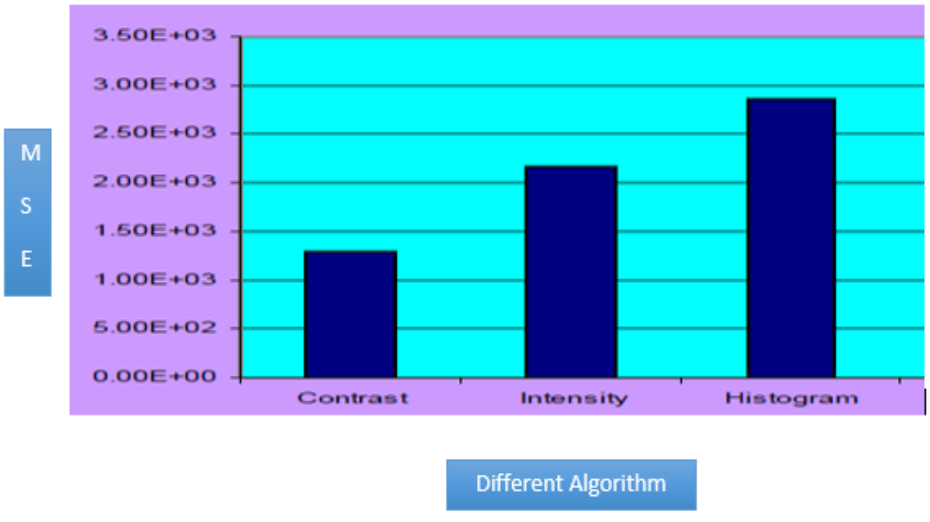

Figure 6. Analysis of different algorithm with MSE Values

The figure. 6 shows the different preprocessing algorithm with different MSE values. In figure it is clearly, express that contrast adjustment is having the minimum error value compare to other preprocessing algorithm.

Image	Metric(dB)	Preprocessing Algorithms		
		Contrast adjustment	Intensity adjustment	Histogram equalization
Deer	PSNR	16.56	14.29	14.67
	MSE	1.74	2.04	2.83
Flower	PSNR	16.98	13.89	14.52
	MSE	1.49	2.12	2.71
Dog	PSNR	17.04	15.64	15.94
	MSE	1.32	2.28	2.90
Car	PSNR	16.76	14.92	15.65
	MSE	1.57	1.96	2.19
Bird	PSNR	18.23	17.87	18.05
	MSE	1.62	1.95	2.47

Table 1. Comparison of PSNR and MSE values on different preprocessing algorithms

Based on the different matric values of PSNR and MSE is tested on different preprocessing algorithm such as contrast adjustment, intensity adjustment and histogram equalization to different set of images. The contrast adjustment is having comparable worthy result compare to other preprocessing techniques. From table. 1 it is concluded that, contrast adjustment is having grater PSNR and least MSE matric values. This technique is very helpful for retrieving significant quality of the image from the larger database though CBIR method.

V. CONCLUSION:

In CBIR, programmed continuous quality control so as to order finished results deserts in a brisk and proficient way. Manual control is not efficient, for searching large amount of data is missed. On other hand programmed quality control is substantially more productive, in light of the fact that it is constant and autonomous from manual proficiency. For searching or retrieving data for images it is very helpful for content based image retrieval for extracting color feature from the image. Really, even great quality cameras are utilized with a sufficient counterfeit brightening it is important to pre-measure those images prior to applying image preparing strategies. The diverse preprocessing procedures like contrast adjustment, intensity adjustment and histogram balance are applied. These algorithms are assessed utilizing Peak Signal to Noise Ratio and Mean Square Error. The contrast adjustment gives reasonable outcomes and contrast adjustment is found to better with high PSNR and low MSE esteems.

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