

Image Enhancement Techniques Using Matlab Functions

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Abstract: *In image processing one of the most frequently used techniques is image enhancement. In order to obtain a good quality image, these techniques can improve the graphical appearance and image features. In real life, various images such as aerial images, medical images of different categories may suffer from the drawbacks of noises and poor contrast. To enhance the visibility of an image by removing all these drawbacks, image enhancement techniques are utilized. The improved picture results in better vision to the human eye. The image enhancement techniques are based on objective or application. In this work, to judge the effectiveness of image enhancement techniques, many techniques such as contrast enhancement, histogram equalization, and filtering, etc. have been applied on various images using Matlab.*

Keywords: Image, Contrast, Matlab, Pixels

1. Introduction

By using image enhancement, images can be improved the appearance and features of graphics or provide an improved revamp image for approaching computerized image processing. The main aim of image enhancement is to increase the visibility of images to offer enhanced human visual perception. There are more than one part of the images that improve details and sharpness through the elucidation and visual analysis by using enhancement. The image picked up from the usual atmosphere with vigorous range contains mutually regions of dark and bright. Because of exceeding in the vigorous range of sensing and human eyes, human eyes are hard to recognize those types of images. The quality of image improves by using enhancement techniques so that extract the meaningful information from the image. The Image enhancement mainly recovers features of image such as contrast, edges boundaries and decreases the ringing artifacts. Apart from illumination conditions, environmental disturbances such as temperature fluctuations, ambient pressure and external noises affects the image quality

2. Techniques of Image Enhancement

Image enhancement having a great challenge for measuring the criterion for quality of image and due to this; the various techniques of image enhancement are available. By using image enhancement technique, image can be change with edge enhancement, gray level slicing, saturation transformation, hue, intensity and contrast.

1) Contrast Enhancement

Image enhancement techniques play a significant role in digital image processing applications where the image quality in terms of visual appearance and contrast is necessary by visualization of human. Essential stage of image processing is contrast enhancement. The image quality can be enhanced to raise the luminance between backgrounds and foreground by contrast enhancement. To manage the contrast for any application is the main objective

of contrast enhancement technique. Application can be such as remote sensing, television and medical image etc. If an image have poor quality than it is difficult to find information, such type of problem can be eliminate by increasing the range of pixels value using contrast enhancement. This technique helps to rise or reduction the contrast of an img consequently

2) Adaptive Histogram

In the AHE (Adaptive Histogram Equalization), the image contrast is not enhanced adequately. In adaptive histograms equalization, the contrast of each pixel is enhanced by a transformation function. This technique also eradicates the errors by linear min - max method. Thus the noise is being reduced in different areas of image. And AHE also have the capacity of restoration the contrast of gray scale and color image.

3) CLAHE

Image contrast is increased by using CLAHE. Instead of the whole image, this technique applies on sub parts of the img, called tiles. By using bilinear interpolation, the neighboring tiles are finally combined in directive to eradicate artificially tempted confines. The enhanced output is displayed in Fig. 4. by CLAHE.



Figure 1: (a): Image

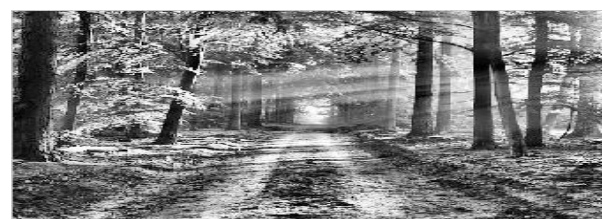


Figure 1: (b): Image enhanced by CLAHE

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4) Histogram Equalization

This is a popular technique of image enhancement for better contrast and images visualizations. Suppose there is a primarily dark image, then histogram of this image would be slanted near the lowest value of the gray scale and all the detail of image is compacted into the dark end of the histogram. Uniformly distributed histogram is used to become clear image. This technique is used to calculate the intensity values and make them uniform distribution of pixels to get an enhanced image [15]. Thus HE grows the pixels range for the appearance of an image. Figure shows the dull gray img with histogram and Fig shows the contrast enhanced img with histogram by using HE

5) Contrast Enhancement by Intensity Adjustment

This methodology is an image enhancement technique that plots the values adjustment in an image can be done by applying the imadjust function, where the intensity values can specify in the produce image. Imadjust function calculates the Simulation studies shows the contrast is increased in the image, and histogram of the image and automatically determines the adjustment limits [16]. Intensity adjustment method plots the revise intensity values to the full display range of the data type.



Figure 2: (a): Creative Image



Figure 2: (b): Creative image enhanced by Intensity Adjustment

6) RGB to Gray Scale Conversion

The main advantage of gray scale conversion is it takes less space compared to colored image the value of RGB colors are denoted by three dimensions i. e. X, Y and Z. X indicates brightness indicates chrome and Z indicates the Hue. Gray scale image uses the 8 bits; RGB conversion converts 24 bits in to 8 bits of luminance.

3. Result Analysis

Image enhanced by techniques which are clear visible to human eye. First technique to get clear image is RGB - Gray technique. Contrast techniques such as Intensity adjustment, histogram equalization, adaptive histogram equalization and CLAHE are used frequently to get enhanced image with low entropy value, which gives best result in optimized conditions.

MATLAB functions	
Imwrite ()	To write file from local storage
Imshow ()	To Show the image
imadjust ()	For Contrast Enhancement
Medfilt2 ()	Apply Median filter
filter2 (fspecial ('average'))	Apply Average Filter
imnoise (img, 'poisson')	Add poisson noise
imnoise (img, 'gaussian')	Add Gaussian noise
imnoise (img, 'speckle')	Add Speckle Noise
imnoise (img, 'salt & pepper')	Add Salt n Pepper Noise
Subplot ()	Multiple images in 1 output

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