



A Review on Image Enhancement Techniques for Noisy Image

Neeti

Research Scholar, AIET, Jaipur
India

Himanshu Arora

Associate Professor, AIET, Jaipur
India

Abstract- Image enhancement is a technique to improve not only visual perception of given images but also quality metrics of a distorted or noisy image. The alteration usually requires interpretation and feedback from a human evaluator of the output resulting image. Sometimes often elementary and heuristic methods are used to enhance images in some sense. There are numbers of way to enhance the image. Image enhancement in spatial domain only deals with pixel to pixel relation. Image enhancement in frequency domain firstly convert the image in frequency domain with the help of Fourier transform and done the operations on it. After finishing the required operation, the operated image reverts to spatial domain by inverse Fourier transform.

Keywords- Image Enhancement, Fourier Transform, Frequency Domain, Spatial Domain, Noisy Image

I. INTRODUCTION

Digital image processing is use of computer algorithms to perform image processing on digital images. The digital image processing typically is executed by special software programs that can manipulate the images in many ways. Many scientists use image processing technology to enhance images of mars, venus or other planets. Image enhancement is one of part of the image processing. It is an improvement of digital image quality, without prior knowledge of source of degradation. The objective of Image Enhancement is to reduce the noise of given input noisy image. It is to improve the image quality so that the resultant image is better than the original image for a specific application. Image Enhancement deals with the improvement of visual appearance of an input to improve the delectability of objects to be used by either a machine vision system or a human observer [1]. Whenever an image is converted from one form to other such as digitizing the image some form of degradation occurs at output.

The simplest and most appealing area of digital image processing is image enhancement. Mainly, the initiative after enhancement techniques is to take out detail that is concealed [2]. Enhancement may be used to reinstate an image that has suffered some kind of corrosion due to the optics, electronics and/or environment. The aim of image enhancement is reliant on the application outline, and the criteria for enhancement are frequently subjective or too difficult to be easily converted to useful objective measures. It is not necessary that an image enhancement algorithm that performs well for one class of images for any given application also perform well for other classes [3]. The transform domain techniques are based on the manipulation of the orthogonal transform of the image rather than the image itself [4] whereas spatial domain techniques only deal with pixel to pixel relation.

II. REVIEW OF ASSOCIATED WORK

Image enhancement is a technique to improve not only visual perception of given images but also quality metrics of a distorted or noisy image. The primary aim of image enhancement is to change attributes of an image to make it more appropriate for a given task and a precise observer. One or more attributes of the image are modified during this process. Digital Image enhancement techniques provide a considerable amount of choices to improve the visual quality of images. Proper choice of such techniques is greatly inclined by the imaging modality, task at hand and viewing conditions [5]. A common example of enhancement is shown in Fig.1. In fig 1 when we amplify the contrast of an image and filter it to remove the noise "it looks enhanced". To improve the quality of the degraded images we use various enhancement algorithms [2].



Fig.1: (a)Noisy Image

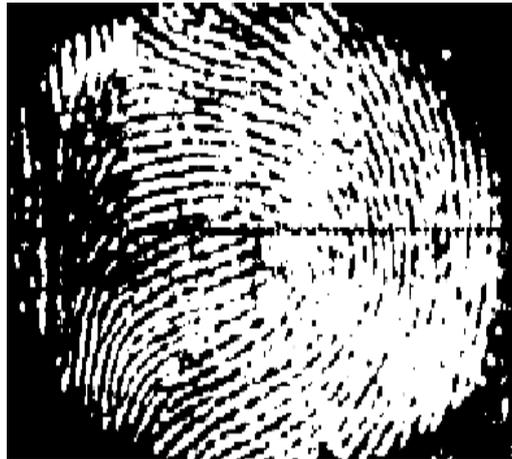


Fig.1(b): Image enhancement

Given below is the work done by many researchers for Image Enhancement.

Madhu [4] suggested that the Adaptive histogram produces washed out and hazy images particularly at edges.

It has poor sharpness and contrast. The plane as well as the background information is still fogged. Alpha rooting rendered the entire image in a dark tone. Even the outline of the clouds which was visible in case of histogram equalization is lost.

Agaian [6] suggested that the common no transform-based enhancement technique is global histogram equalization, which attempts to change the spatial histogram of an image to closely match a uniform distribution. Histogram equalization suffers from the problem of being poorly suited for retaining local detail due to its global treatment of the image. It is also common that the equalization will over enhance the image, resulting in an undesired loss of visual data, of quality, and of intensity scale.

Tang [7] suggested global histogram equalization, which adjusts the intensity histogram to approximate uniform distribution. The global histogram equalization is that the global image properties may not be appropriately applied in a local context. In this, all regions of the images are treated equally and, so, often give up poor local performance in terms of detail preservation. As a result, numerous local image enhancement algorithms have been developed to improve enhancement.

III. IMAGE ENHANCEMENT TECHNIQUES

Image enhancement techniques are divided into two large categories:-

3.1 Spatial Domain Techniques:

The term spatial domain only deals with pixel to pixel relation. Spatial Domain processes are denoted by the expression:

$$g(a,b) = T[f(a,b)]$$

Where $g(a,b)$ denote an output image, $f(a,b)$ denote an input image and T is an operator on f defined over neighbourhood of (a,b) .

To achieve desired enhancement the pixel values are manipulated. Power law transforms, logarithmic transforms and histogram equalization are few spatial domain techniques which are based on the direct manipulation of the pixels in the image. These techniques are mainly useful for directly changing the gray level values of individual pixels and consequently the overall contrast of the entire image. But the whole image is enhanced in a uniform manner which in many cases produces adverse results [4]. Histogram equalization is efficient in many images.

3.2 Frequency Domain Techniques

Image enhancement in frequency domain firstly convert the image in frequency domain with the help of Fourier transform and done the operations on it. After finishing the required operation, the operated image reverts to spatial domain by inverse Fourier transform. These enhancement operations are performed in order to alter the image clarity, contrast or the distribution of the grey levels. Here input is image which is two dimensional light intensity functions. The first step of image enhancement in frequency domain is converting the image from spatial domain to frequency domain after doing basic preprocessing i.e we did the fast fourier transform, after that everything deal with frequency component of the input. In this we manipulate orthogonal transform of image rather than the image itself.

Magnitude and phase are two components of the orthogonal transform of the image. The frequency content of the image is represented by magnitude. The phase is used to restore the image back to the spatial domain [4]. The standard orthogonal transforms are discrete Fourier transform, discrete cosine transform, Hartley Transform etc. It is easy to perform operation on the frequency content of the image, and so high frequency content such as edges and other fine information can easily be enhanced.

IV. APPLICATIONS

The objective of Image Enhancement is to reduce the noise of given input noisy image and to improve the image quality to make it better than the original image for a specific application. Satellite imaging, Digital camera application, remote sensing, Aerial imaging and Medical imaging are few applications areas of image enhancement.

V. CONCLUSION

These techniques are mainly useful for directly changing the gray level values of individual pixels and consequently the overall contrast of the entire image. But the whole image is enhanced in a uniform manner which in many cases produces adverse results. There are various techniques available which produce highly balanced and visually appealing results for a diversity of images with different qualities of contrast and edge information and it will produce satisfactory result.

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