A Review on Image Enhancement Techniques

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Abstract-

Now a day's applications require various kinds of images as sources of information for interpretation and inspection. Image enhancement is method of applying different alterations to an input image to make the resultant image more pleasing or to provide a better transform presentation for future automated image processing techniques. Many images like medical images, images of satellites, and even real life photographs suffer from poor sharpness and noisy effects. This is essential to enhance the contrast and remove the noise to increase picture standard. One is presenting a review on various image enhancement techniques for sharpening enhancement. However, these techniques are able to bring noticeable changes in the images and sometimes also produce unwanted artifacts in many cases. These problems need to be resolved so that better enhancement may be performed in future work. This paper proposes a new work for enhancement by using artificial intelligenceSchemes.

Keywords:*Medical images, Image enhancement techniques, spatial domain techniques, Frequency domain techniques, Artificial Intelligence*.

1. Introduction

Digital image processing is the field which is used for large scale experimental work by using differentTechniques and algorithms. In digital image processing, wide variety of algorithms can be applied to the input image and output image can be made more pleasing for viewers by using image processing techniques. Image enhancement is the one part of image processing. [1], [8] Image enhancement allows the techniques for upgrading the quality of image to make the resultant image more effective than the original image. The basis of image enhancement is to highlight the hidden details in an image and increase the contrast in a low contrast image. While the conversion of image from one form to another such as digitization of image can cause some form of degradation at output so there is requirement of some technique to be used to remove that degradation. Medical image enhancement technologies have cached much consideration as advanced medical instruments are being used in medical applications or fields. Medical practitioner also desires the enhancement in medical images as it would be easy for them to examine and interpret the medical images, that are pleasant than the images that are distorted due to poor contrast and noisy factors. One should mainly emphasize on the issues like poor contrast and higher level noise in medical images. Image enhancement is one of the basic and most promising fields of digital image processing. Fundamentally, the key idea behind the enhancement techniques is to show out the details that are not visible to viewers. Enhancement is primarily done to restore an image that was deteriorated while converting it from one form to other. The main objective of image enhancement depends on the application context and the norms for image enhancement are very cumbersome to be easily changed to meet objective measures, image enhancement algorithms must be easy to understand and qualitative. However, in any application one algorithm which is performing well for one class of the images may not perform as well for some other classes. The techniques are of two types that are spatial domain techniques and transform domain techniques.

2. Related Work

Image enhancement process is composed of number of techniques that are used for improving the visual appearance of a picture or to transform it for better representation by a human or machine. Digital image enhancement techniques has number of choices for making the images more approachable. An exampleis shown below in fig. 1 when we increase the sharpness of the image and enhance it starts lookingmuch better. Enhancement is a very good area for research and by using techniques of image enhancement, image standard can be upgraded. Image enhancement has a number of techniques that are used to enhance the occurrence of a picture or to transform the image to a form which is better suitable for analysis by a person and instrument. Digital image enhancement techniques have many options for the improvement of image quality. One must choose appropriate technique by the imaging modality and viewing conditions.[6]. An illustration of enhancement is presented in Fig. 1 when we increase the contrast of the picture and uses filter for removing the noise effect then it looks much better. By using different enhancement techniques, improvement in the image quality can be attained.Contrast enhancement has considerable importance in digital image processing.

A. Histogram Equalization (HE)

Histogram Equalization has a sophisticated method for redistributing the dynamic intensity range and contrast of an image by changing that image such that its intensity histogram can have a desired shape. Even contrast stretching, histogram modelling operators use non-*linear* and *non-monotonic* transfer functions to map between pixel intensity values in the input and output images. HE a monotonic, non-linear mapping which re-assigns the gray level values of pixels in the input image such that the output image contains a uniform distribution of intensities. This technique is used in image comparison processes and in the correction of non-linear effects introduced by digitizer or display system. HE has an effect of stretching the dynamic range of a given histogram since HE flattens the density distribution of the image.

B. Brightness Bi-Histogram Equalization (BBHE)

In order to optimise the drawback introduced by the HE methodbrightness preserving Bi-HE (BBHE) method has been proposed in [2]. The essence of the BBHE method is to separate the original image into two sub-images, on the basis of mean gray-level, and then apply the HE method on both the sub-images. In [2], it is mathematically shown that the BBHE method produces an output image with the value of brightness (the mean gray-level) located in the middle of the mean of the input image and the middle gray-level (i.e., L/2).

C. Dualistic Sub-Image Histogram Equalization (DSIHE)

Dualistic sub-image histogram equalization (DSIHE) [3] also divides the input histogram into two subsections. Both DSIHE and BBHE are similar only difference is that DSIHE separate the histogram on the basis of gray level with cumulative probability density equal to 0.5 instead of the mean as in BBHE, i.e. instead of decomposing the image based on its mean gray level.

D. Recursive Mean-Separate HE Method (RMSHE)

In Recursive mean-separate histogram equalization (RMSHE) [4] method, image is divide in to many subdivision and then apply HE in each of the sub-images and the separation is on the basis of the recursive manner and scale up to r which generating 2^r sub-images and thereafter these sub-images are independently enhanced using the Histogram Equalization (HE) method. When r = 0 (no sub-images are generated) and r =1, the RMSHE method is equivalent to the HE and BBHE methods, respectively. In this method, the preservation of the output image increases as r (separation level) increases.

E. Brightness Preserving Dynamic Histogram Equalization

(BPDHE)

In BPDHE [5] method the original image is decomposed into multiple sub images according to their local maxima, then the dynamic histogram equalization is applied to each sub image and finally, the sub images are combined. It divides the histogram based on the local maxima. It produces the output image with the mean intensity almost equal to the mean intensity of the input, thus fulfils the requirement of maintaining the mean brightness of the image. This method smoothes the input histograms with one dimensional Gaussian filter, and then partitions the smoothed histogram based on its local maxima. After that it assigns new dynamic range to each partition. Then, the histogram equalization process is applied independently to these partitions, based on this new dynamic range and the output image is normalized to the input mean brightness.

3. CONCLUSIONS

This paper we have reviewed the different type of algorithm for contrast enhancement of digital images. In we have seen the Recursive Mean Separate Histogram Equalization method (RMSHE) and Brightness preserving Dynamic Histogram Equalization (BPDHE) is the best method because it preserves the brightness of the original image and sufficiently enhance the contrast the image which is best for human interpretation.We have also seen that if contrast of image increases then it is difficult to preserve the brightness. Although the techniques preserve the brightness of any image then it is hard to enhance the contrast of an image. Hence it is require to implement the techniques [6],[7] which enhance contrast as well as preserve the brightness.

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