Brightness Preserving Contrast Enhancement Of Medical Images Using Homomorphic Filtering and DC Adjustment

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Abstract*— *image enhancement is a usual object using for getting better results from premature imagery. This technique is not only used by us but also used in many fields. such as used in the medical field, military field, industrial field and much more. in this paper we are focusing to propose an efficient technique to contrast of the medical images. Image contrast enhancement is not a highly processing step rather it is pre-processing step that helps to improves efficiency of other images such as pattern identification and computer vision. the proposed technique enhances contrast and preserves brightness as well of given image using homomorphic filtering and DC- adjustment

Keywords*— *Image enhancement, Spatial domain method, Frequency domain methods etc.

I. INTRODUCTION

The basic principle of image enhancement is to process an image so that the result is more appropriate to a particular application than the original image. The word applies in particular to a particular application. As we know, hot research has been done on various image processing methods and techniques to improve image [1]. There is no specific theory for image enhancement. When the image is processed, the viewer is the final judge of how well a particular method works. For example, see Figure (1) and Figure (2). Figure (1) shows the image with weak contrast and Figure (2) shows the enhanced image. Some recent articles on image enhancement techniques are described below [2].

Figure1. Image

There are basically two types of image enhancement techniques,
a) Spatial Domain Technique.
b) Frequency Domain Technique.

Figure 2. Enhanced image

1) Spatial Domain Techniques:

The spatial domain method is a method that deals with pixels of the input images. The values of the pixel are manipulated to achieve the desired improvement. Spatial domain techniques such as logarithmic transformations, power law transformations and histogram compensation are based on the direct manipulation of the pixels in the image. Spatial techniques are particularly useful for directly changing the grayscale values of individual pixels and thus the overall contrast of the entire image. As a rule, however, they improve the overall picture in a uniform manner, which in many cases leads to undesirable results [3]. It is not pragmatic to selectively improve edges or other required information effectively. Techniques such as histogram compensation are effective in many images. The perspective can be divided into two categories: spatial filtering operations and point processing operations. Here we are discussing about some of the well known methods and also having overview of the methods. The pixel values of the processed image rests on the pixel values of the original image. It can be given by the expression g (x, y) = T [f (x, y)], where T is a grayscale transformation in point processing. Point processing technology can be divided into four categories as an image negative. If we consider an 8-bit digital image with a size of M × N, each pixel value is subtracted from the original image 255 as g (x, y) = 255-f (x, y) for 0 ⩽ x <M and 0 ⩽ x <N. In a normalized gray scale, s = 1.0 - r. Negative images are useful for enhancing gray or white details embedded in dark areas of an image [4].

2) Frequency Domain Techniques:

The frequency domain methods are based on the functioning of the orthogonal transformation of the image preferable to the image itself. Frequency domain methods are useful for processing the image in the form of frequency content. The orthogonal transformation of the image has two components, magnitude and phase [5]. The intensity depends on the frequency content of the image. The phase is used to renew the image in the spatial domain. Fourier transformation, Hartley transformation, etc. The transformation domain allows you to operate on the frequency content of the image with poor contrast, and therefore the high frequency content such as edges and other subtle insights can simply be improved. Frequency domain that works by the Fourier transform of an image

- Edges and sharp transitions (e.g. noise) in an image contribute greatly to the high-frequency content of the Fourier transform.
- Low frequency content in Fourier transform is responsible for the common appearance of the image over smooth distances. The cleaning scheme is easier to visualize in the frequency domain. Thus the image f (x, y) is improved in the frequency domain based on DFT. This is especially useful when returning, if the spatial expansion of the point spread sequence h (x, y) is large, then the folding theory [6]. g (x, y) = h (x, y) * f (x, y) where g (x, y) is an improved picture

II. LITERATURE SURVEY

Mohammad Shamim et al. [7] This paper presents a method for image enhancement and spatial color rendering based on the adaptive sigmoid function for endoscopic images. First, the color image is divided into luminance and chrominance components using the YC CB R conversion matrix. The adaptive sigmoid function with two control parameters is applied to the evenly distributed luminance pixels. The color variant of the room variant creates new chrominance components by transferring and changing old chrominance based on texture information. Finally, new luminance and chrominance components are converted to an RGB color image. The proposed procedure illustrates some of the tissue and vascular functions as well as groove patterns in lesions and polyps. The performance of the proposed schema is compared to other related methods in terms of image quality, focus value, color rendering efficiency and visual representation statistics.

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Viacheslav Voronin et al. [8] This paper presents a new algorithm for improving thermal images, which is based on combined local and global image processing in the frequency domain. The stated approach utilizes the fact that the relationship between stimulation and perception is logarithmic. The basic idea is to apply a logarithmic transformation histogram adjustment with a spatial compensation method for different image blocks. The resulting image is a weighted average of all treatment blocks. The weights for each local and global improved image are determined by optimizing the improvement measure (EME). Some experimental results presented illustrate the performance of the proposed algorithm on real thermal images compared to conventional methods.

. Kambam Bijen Singh et al. [9] In this paper, image enhancement is a technique that achieves better image quality in terms of clarity and brightness and can be conveniently seen by the human eye. There are different types of techniques to achieve good image quality. Improving the global image contrast is one of the most common techniques used to improve image quality. However, it has some drawbacks because the local details of an image are not taken into account. Local details of an image are very important when analyzing an image, ie the scientific examination of an image such as the image of planetary, satellite and medical images. Local details of an image are very important for the diagnosis of a specific disease. If either local contrast enhancement or global contrast enhancement is used alone, the image loses brightness. In order to correct and reduce this difference between individual improvement methods, this document introduces a new method that uses both local and global improvement methods for the same image. First, the image is enhanced locally and the output processed through the global enhancement process, thereby providing a properly enhanced image without losing the brightness of the image. This improvement method is simulated in MATLAB and the results are checked against the parameters for the image quality

Zhuang Feng et al. [10] In this paper, we propose a single method of improvement in low light conditions by combining multiple sources, including the original image and its intermediate improvements generated by a simplified Retinex model. We combine these sources into a mid-level image representation based on a patch-based decomposition model. Compared to other avant-garde methods, the visual and quantitative results show that our method effectively improves the visual effects in terms of clarity, color harmony and vividness.

Jianning Chi et al. [11] this paper proposes a novel colour image enhancement method which uses wavelet-based texture characteristic morphological component analysis (WT-TC-MCA) to enhance the textural differences in the luminance channel of the colour image. The image enhancement method is intended to be the preprocessing method prior to the use of the colour image segmentation. The input colour image is firstly transformed to CIELab colour space to separate the luminance channel from the chromatic channels. Then only the luminance channel is enhanced by the WT-TC-MCA method to enhance the textural differences between different textures. Therefore, the colour image is enhanced with more differentiate textures while preserving the chromatic information. The experimental results show that the proposed method can enhance different colour image segmentation algorithms more than the state-of-the-art colour image enhancement method.

Soohwan Yu et al. [12] In this paper, existing low light improvement methods provide better improvement results and cannot be implemented in real-time processing due to computational load. In addition, these methods generate unnatural artifacts such as noise amplification, color distortion and the saturation problem. To address this problem, this document introduces a rapid adaptive clustering method that uses a local amplification ratio map and an improved cumulative density (CDF) function. Experimental results show that the proposed method provides significantly better results than existing methods and can be adapted to consumer devices using a finite impulse response (FIR) structure.

III. PROPOSED WORK

In this paper we propose an efficient method to improve the contrast of medical images. Enhancing image contrast is a preprocessing step that improves the efficiency of other imaging applications, such as pattern recognition and computer vision. The proposed method improves contrast and preserves the brightness of the given image by means of homomorphic filtering and DC regulation.

IV. RESULT ANALYSIS

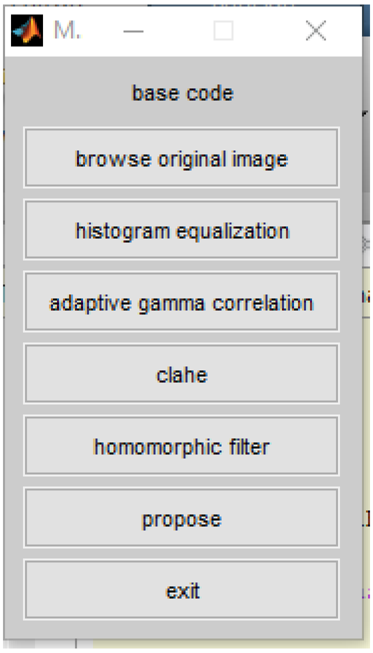

Figure3. First run the code then obtain this type of menu bar.

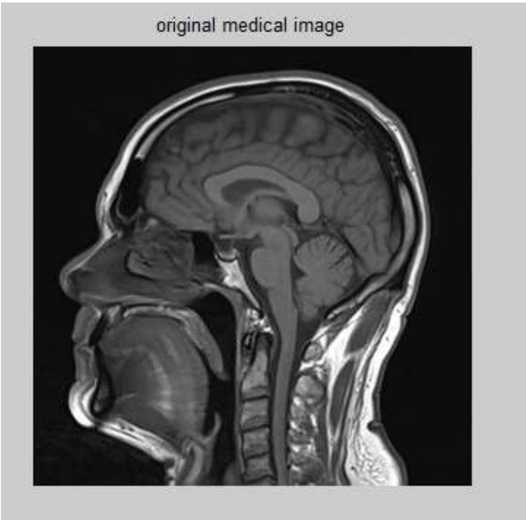

Figure4. Now select the browse button and browse the image.

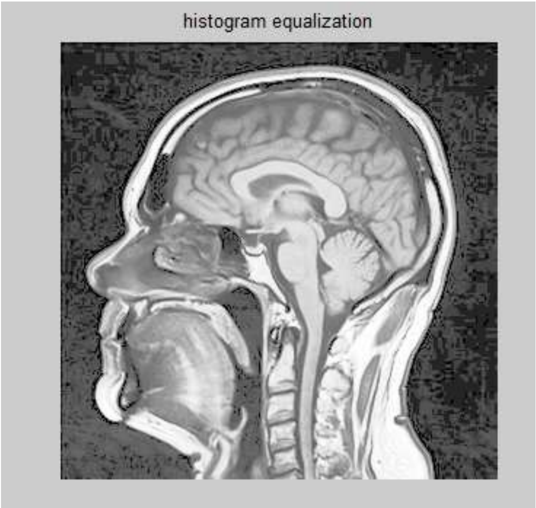

Figure5. Now apply histogram equalization to enhance the original image.

psnr_hist	mse_hist	ssim_hist
9.9873	.5215e+03	0.4673

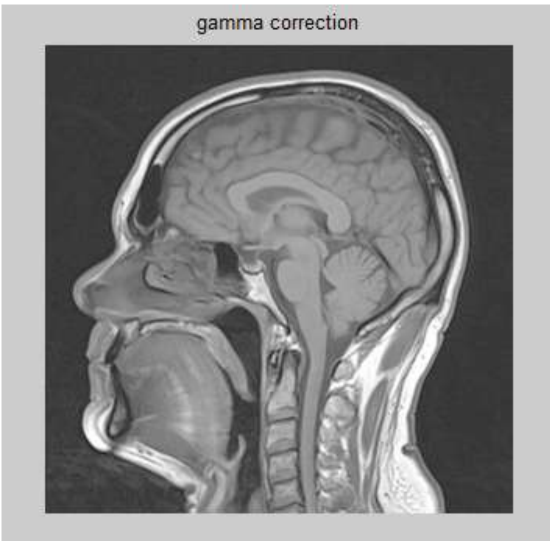

Figure6. Now apply the adaptive gamma correlation .

mse_gamma	ambe_gamma	ssim_gamma
2.8817e+03	52.4338	0.6875

Figure7.Apply the CLAHE .

mse _ clahe	ambe _ clahe	ssim_ clahe
1.5556e-04	50.7931	0.0604

Figure 8. Apply homomorphic filter to enhance the image.

mse_homo	ambe_homo	ssim_ homo
0.0017	56.9555	0.0644

Figure 9. Now Apply my propose technique to get better result compare base paper.

mse_msr	ambe_msr	ssim_ msr
1.1111e-04	37.1910	0.4554

CONCLUSION

. In this paper we propose an efficient method to improve the contrast of medical images. Enhancing image contrast is a preprocessing step that improves the efficiency of other imaging applications, such as pattern recognition and computer vision. The proposed method improves contrast and preserves the brightness of the given image by means of homomorphic filtering and DC regulation.

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