CONTRAST ENHANCEMENT IN DIGITAL IMAGE QUALITY BY FUSION TECHNOLOGY

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ABSTRACT

Mammography is currently regarded as one of the best ways to detect breast cancer in the early stage. However, due to the limitation in imaging condition and the subtleness of the difference between normal and abnormal features, it is generally difficult to interpret the mammograms. Thus, image enhancement techniques have been widely used in screening mammograms. In this paper, a multiscale contrast enhanceent algorithm based on Laplacian Pyramid is developed to enhance the contrast of the mammograms and improve the discernibility of the abnormal features. In the proposed algorithm, an image is first decomposed into a multilevel Laplacian Pyramid and then the enhancement is performed in the reconstruction stage.

In the proposed algorithm, an image is first decomposed into a multilevel Laplacian Pyramid and then the enhancement is performed in the reconstruction stage. A multiscale contrast measure is used to modify the coefficients iteratively level by level and the enhanced image is obtained at the lowest level. Experiments proved the effectiveness of the proposed algorithm. The objective of this report is to implement the concept of fusion based image enhancement to gray scale images using different enhancement techniques.

The aim of image fusion is to combine relevant information from two or more source images into one single image such that the single image contains most of the information from all the source images.

Fusion algorithms are categorized as the basic function algorithm and pyramid (Laplacian and Gaussian pyramid) based algorithm. Here Pyramid based algorithm means that Laplacian and Gaussian pyramid viii decomposition. The need of image fusion is to improve the quality of images for an object taken by different sensors.

1.1INTRODUCTION

In electrical engineering and computer science, image processing is any form of signal processing for which the input is an image, such as a photograph or video frame; output of image processing may be either an image or a set of characteristics or parameters related to the image. Most image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal-processing techniques to it. There are very often some issues that have to be dealt with before the fusion can be performed.

Most of the time the images are misaligned. Registration is used to establish a spatial correspondence between the sensor images and to determine a spatial geometric transformation, called warping, which aligns the images. Misalignment of image features is caused by several factors including the geometries of the sensors, different spatial positions of the sensors, different temporal capture rates of the sensors and the inherent misalignment of the sensing elements. Registration techniques align the images by exploiting the similarities between sensor images. The mismatch of image features in multisensory images reduces the similarities between the images and makes it difficult to establish the correspondence

between the images. This problem was found later in the investigation[1].

1.2ImageProcessing

Image Processing is a technique to enhance raw images received from cameras/sensors placed on satellites, space probes and aircrafts or pictures taken in normal day-to-day life for various applications.The common steps in image processing are image scanning, storing, enhancing and interpretation. The schematic diagram of image scanner-digitizer diagram is shown in figure 1.1.

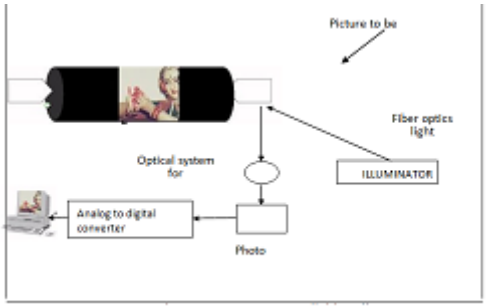

Figure 1.1 Image scanner-digitizer diagram

1.2Digital Image processing

In this case, digital computers are used to process the image. The image will be converted to digital form using a scanner – digitizer (as shown in Figure 1) and then process it. It is defined as the subjecting numerical representations of objects to a series of operations in order to obtain a desired result. It starts with one image and produces a modified version of the same. It is a digital image is arrays of real numbers represented by a finite number of bits. Low level processes involve primitive operations, such as image preprocessing to reduce noise, contrast enhancement and image sharpening. A low-level process is characterized by the fact that both its inputs and outputs typically are images. Mid-level processes on image involve tasks such as segmentation (partitioning an image into regions or objects), description of those objects to reduce them to a form suitable for computer processing and classification of individual objects. A mid-level process is characterized by the fact that its inputs generally are image, but its outputs are attributes extracted from those images.

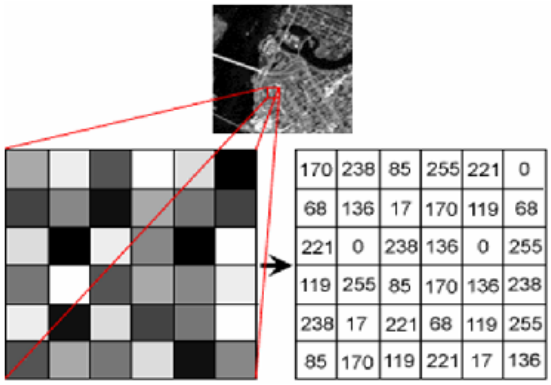

Figure 1.2 Effect of digitization

CHAPTER II

2.1 Proposed Algorithm

The main idea developed here is to use image fusion to combine the useful properties and suppress the disadvantages of the various local and global contrast enhancement techniques. The fusion-based contrast enhancement scheme is summarized in Figure below .Image fusion generally involves selecting the most informative areas from the source images and blending these local areas to get the fused output images.

2.2Laplacianpyramid

Image pyramids have been initially described for a multi-resolution image analysis and as a model for the binocular fusion in human vision. An image pyramid can be described as collection of this research, only the Laplacian pyramid and Gaussian pyramid will be described.Several low or band pass copies of an original image in which both the band limit and sample density are reduced in regular steps. There are several pyramid-based transform schemes but in approaches to Laplacian fusion techniques have been documented since Burt and Andelson introduced this transform back in 1983. The Laplacian Pyramid implements a “pattern selective” approach to image fusion, so that the composite image is constructed not a pixel at a time, but a feature at a time. The basic idea is to perform a pyramid decomposition on each source image, then integrate all these decompositions to form a composite representation, and finally reconstruct the fused image by performing an Laplacian pyramid reconstruction

2.3Threshold Transformation

From a grayscale image, thresholding can be used to create binary images. Threshold transformations are particularly useful for segmentation in which we want to isolate an object of interest from a background as shown

in figure.

Figure 2.4 Threshold transformation

CHAPTER III

Result Analysis

The proposed algorithm is coded with the MATLAB programming language. The algorithm steps behind the MATLAB fusion process are shown in fig. 3.1 So the proposed program can be interpreted as a function to carry out image enhancement using fusion technique inMATLAB.

Figure 3.1 Lena.jpg (a) colour image (b) grey scale image (c) histogram equalization image(d) Imadjust image (e) CLAHE image

The experimental result is shown on coloured picture Lena. Figure (a) is original coloured image which will go through our fusion process. Figure (b) is gray scale image of coloured picture achieved from rbg2gray conversion in MATLAB. Figure (c) is the histogram equalization of gray image. Figure (d) is automatically adjusted image from MATLAB and figure (e) is image achived from clahe program.

3.2 Visual Results–

For Mandril image – When we talk about the image processing the outcome or the result of proposed method we cannot say who's better on the basic of different quality check parameter like entropy. For image processing based result we also check our result on the basic of visual quality that is also known as the Human and visual perception. In the figure (a) shows the original image figure (b) shows a grey scale image histogram equalization (HE) image is shown in figure (c), contrast adjusted image is shown in fig (e), CLAHE image shown in fig(f). The final contrast enhanced proposed image is shown in fig (g). In all the figure (b) to (f) shows the different contrast enhancement technique shows in it but the good contrast enhanced natural image is shows by our proposed method all method are done by complex color structured 'Mandril'image.

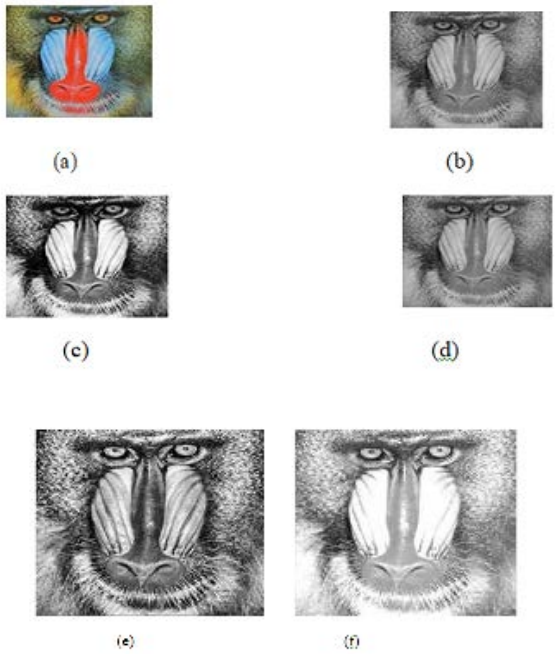

Figure 3.2 Set (a) colour image (b) grey scale image (c) histogram equalization image (d) imadjust image (e) CLAHE image (f) Proposed method

For Lena image - In the Figure 3.2 (a) shows the original image , Figure 3.2 (b) shows a grey scale image histogram equalization (HE) image is shown in Figure 3.2 (c), contrast adjusted image is shown in Figure 3.2 (e), CLAHE image shown in Figure 3.2 (f). The final contrast enhanced proposed image is shown in Figure 3.2 (g). In all the Figure 3.2 (b) to Figure 3.2 (f) shows the different contrast enhancement technique shows in it but the good contrast enhanced natural image.

Conclusion and Future Scope

This report presents a new method of fusion based contrast enhancement for grayscale and

color images. All the methods using MATLAB programming are implemented to get the optimal response. Image fusion provides the way to integrate disparate and complementary data to enhance the information apparent in the images as well as to increase the reliability of the interpretation. The analysis of fused images and original image gives us an idea about the fusion algorithms and their different impacts on original data and their relevance to extract the infrastructure information. The fused images were verified for their quality based on a perfect image in each their sets. It has good noise optimization capability as the technique used for enhancing the contrast of image. This methodology is well suited for many applications in medical imaging. For this purpose some psycho visual tests were carried out, where a group of individuals express their subjective preferences between couples of images obtained with different fusion methods. The results are promising and image fusion techniques open a new perspective for contrast and quality enhancement in different imaging applications. Image fusion method is tested and comparison is shown to justify the image quality of different images with its entropy levels.

4.1 Future Scope

There are some likely extensions to this research, apart from the necessary improvement of the fusion technique already mentioned in chapter 3. The number of decomposition levels in the multi resolution approaches, was found to influence image fusion performance. However, using more decomposition levels do not necessarily implies better results. Methods to choose the appropriate number of levels should be studied. All the fusion techniques use the absolute value of the image transform coefficients as an activity measure. The final fusion images acquired from different sensors is great important in many applications such as medical computer vision and robotics etc. In this paper, we applied this fact technique to enhance the contrast of the images that improves the quality of visible image without introducing unrealistic visual appearances. Contrast Enhancement technique is useful for improving quality of image with the modification of brightness.

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