Digital Image Quality Enhancement Using Compound Contrast Enhancement Process

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Abstract - Image contrast and quality enhancement and formation, mainly for visual reason, are tasks for the use of interactive evolutionary algorithms would appear to be well suited. Previous work has focused on the development of varied aspects of the interactive evolutionary algorithms and their application to varied image improvement and formation issues. Robust evaluation of algorithmic design options in interactive evolutionary algorithms and the comparison of interactive evolutionary algorithms to alternative move towards to achieving the same goals is generally less well addressed.

Key words - Adaptive directional elevation, reinstatement process, Gaussian noise

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Introduction

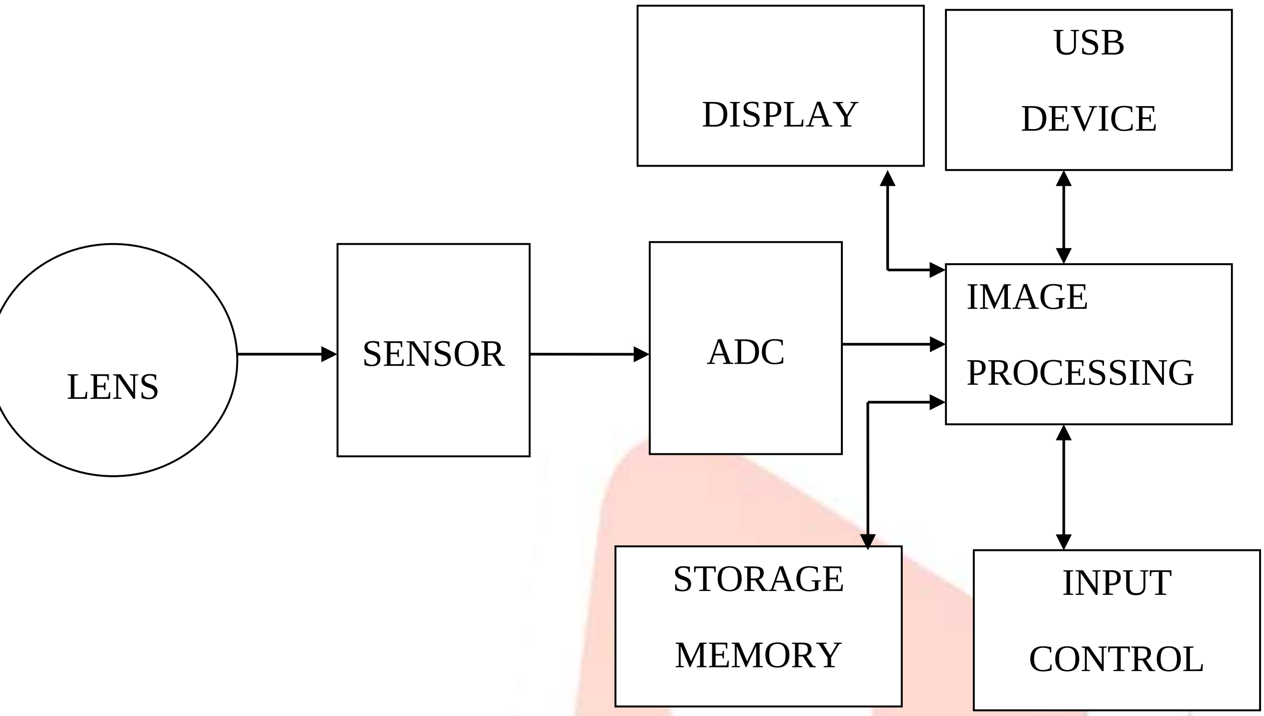
The idea is the mainly superior of the human senses, so it is not surprising that images play the single most significant role in our observation. However, unlike humans, who are restrained to the visual spectrum band of the electromagnetic (EM) imaging machines cover most of the EM spectrum, ranging from gamma to radio waves. They can operate in images generated by human sources that are not familiar to correlate with images. These include ultrasonic, electron microscopy and computer-generated images. And digital image dealing out covers a wide range and variety of applications. Active research in image processing is noise. If we think of the damaged images, then the analysis is stained by random variations in intensity values, which is the noise. It is due to the data acquisition procedure. The main objective of the methods of image noise removal is to recuperate the original image or fetch the best image quality after dropping a noisy one, in order to execute, in an easier way and a more semantics to a task that is part of image processing and image segmentation. In this context, several studies be relevant to your work in this direction. Adaptive directional elevation (ADL) is one of the image compressions due to the characteristics representing the edges and textures in images efficiently [1-2]. Research has shown that the application of image noise exclusion can also benefit from this technique [3-4].Because of this, it can effectively de-correlate dependencies discontinuities originate more compact image and high-frequency components induced by features of the image at the lowest or low level band pass. If we think of the wavelet transform, then it can be effectively capture singular points to two dimensions means that includes a dimension, but it is wrong inexpressive the main features such as edge, colour, contour and so on. There are several directional and non-directional transformations laid off explored in various research projects, including curve let, contour let, wedge let, and the airship band let wavelet [4-6]. Image processing is a technique to improve the quality of symbolic information in raw images taken from cameras or sensors. Image dealing out systems are widely used in various applications due to easy access to powerful computers, large size memory devices and graphical software.

IMAGE DENOISNG VERSUS IMAGE ENHANCEMENT

De-noising image is dissimilar from the image enhancement. As Gonzalez and Woods explained, image enhancement is an intention process, while eliminating image noise is a subjective process. Removing image noise is a reinstatement process, which attempts to retrieve an image that has been degraded by the use of prior knowledge of the dilapidation process. Image enhancement, on the other hand, involves manipulating the image characteristics to make it more attractive to the human eye. There is some extend beyond between the two processes.

SOURCES OF NOISE

The block diagram of a digital camera is shown in Figure. 1.1. lens focuses light from the regions of curiosity in a sensor. The sensor measures the colour and intensity of light. Analog to digital converter (ADC) converts the image to digital signal. A block of image processing improves the image and compensates some of the shortcomings of the otherblocks of the camera. This memory is to stock up the image, while a screen can be used top review. There are some blocks for the reason of user control. The noise is supplementary to the image in the lens, sensor, and ADC and the own block image processing. The sensor is made of millions of tiny light-sensitive components. They differ in their physical, electrical and optical properties, which adds a separate noise signal (referred to as the dark current shot noise) to the acquired image. Another shot noise constituent is the photon shot noise. This is because the number of photons detected varies across different parts of the sensor. The amplified sensor signal adds noise amplification, which is Gaussian in nature. The ADC adds thermal noise and quantization in the scanning process. The image processing block of the noise amplifies and adds its own noise to rounding. Rounding out the noise because there are only a finite number of bits to stand for floating point intermediate results during calculations [10].Most noise subtraction algorithms assume zero mean white Gaussian noise (AWGN) because it is symmetrical, incessant, and have a uniform density distribution. However so many other catagory of noises in practice. Correlated noise with a Gaussian distribution is an example. Noise can also have different distributions such as Poisson, Laplace, additive noise or no salt and pepper. Salt and pepper noise is caused by bit errors in transmission and retrieval, as well as the analog to digital converters. A zero in a picture is a catagory of noise. The noise signal can be dependent or self-determining of the signal. For example, the quantization process (dividing acontinuous signal into discrete levels) adds the signal dependent noise. In digital image processing, some random noise is intentionally introduced to avoid false contouring orpasteurisation. This is called dithering. Discredited one continuously variable tone can make it look isolated, resulting in pasteurisation. These facts suggest that it is not easy to model all categories of practical noise model



LITERATURE REVIEW

Kaur, Manpreet, Jasdeep Kaur, Jaspreet Kaur. "Survey of Contrast Enhancement Techniques based on Histogram Equalization", International Journal of Advanced Computer Science and Applications, Vol.2, No. 7, 2011.

The technique of Contrast enhancement is discussed in this paper. This particular technique is frequently referred to as one of the most important issues in image processing. Histogram equalization (HE) is one of the common methods used for improving contrast in digital images.

Langis Gagnon, "Wavelet Filtering of Speckle Noise-Some Numerical Results," Proceedings of the Conference Vision Interface, Trois-Riveres, 1999.

In this paper ongoing study addressing the comparison of various speckle reduction filters. In a previous work is presented by the author, the author concentrated on the best Signal-to-Mean-Square-Error (S/MSE) ratio provided by a complex Wavelet Coefficient Shrinkage (WCS) filter and several standard speckle filters.

APPLIED METHODOLOGY

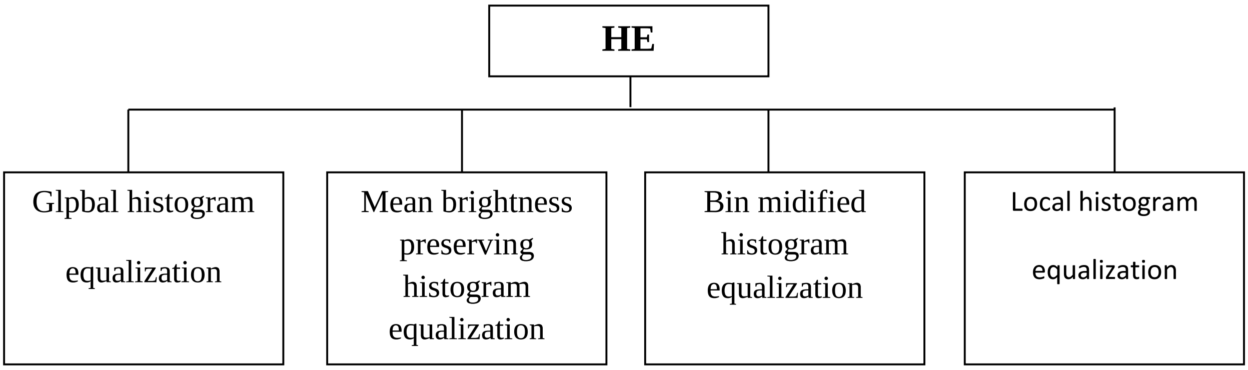
Histograms play an significant role in contrast enhancement as well as other image processing applications [3, 4]. The histogram is used to stand for image statistics in an easily interpreted visual format. In order to describe a histogram, first, assume that **X** $=\{X(i, j)\}$ is a digital image with L discrete gray levels in the intensity range of $\{X_0, X_1, ..., X_{L-1}\}$.$X(i, j)$ represents the intensity of the image at spatial location (i, j) with the condition that $X(i, j) \in \{X_0, X_1, ..., X_{L-1}\}$. The histogram of a digital image is a discrete function as all the intensities are in discrete values. Thus, the histogram h is defined as:

$$H(X_K) = n_k, \quad \text{for } k = 0, 1, 2, ...L - 1$$

WhereX_k is the k -th gray level and n_k shows the number of pixels in the imagehaving gray level X_k . In general, histogram depicts the frequency of the intensityvalues that occur in an image [6, 7]. The histogram providesmore insight about image contrast and brightness, but it is unable to convey anyinformation regarding spatial relationships between pixels [10].Usually, the histogram of an image **X** is presented as a graph plots of $h(X_k)$ versusX_k . Shown in Figure 2.5 are some examples of images and their respectivehistograms.

HEExtensions

There are a variety of extensions of HE method. Generally, these variations of HE can beclassified into four groups as shown in Figure 1.2. These extensions are GlobalHistogram Equalization, Mean Brightness Preserving Histogram Equalization, BinModified Histogram Equalization and Local Histogram Equalization



PROPOSED METHODOLOGY

There are several categories of image enhancement methods. Nonetheless, only severalcategories of image enhancement methods are discussed such as image negative, logtransformation, power law transformation, linear spatial filter, non-linear spatial filterand histogram processing.

The negative transformation inverses the intensity of an image in the range. $[0, L-1]$.

The negative transformation function is given by

:

$$Y(i,j)=L-1 - X(i,j)$$

Where$X(i, j)$ is the input image and $Y(i, j)$ is the output image. A photographicnegative image is obtained by reversing the intensity levels of an image. Negative images are useful in producing negative prints of medical images.

The log transformation is used to spread out a narrow range of low intensitylevels in the input image into a wider range of output levels. The log transformationis defined as:

$$Y(i, j) =c\log(1+X(i, j))$$

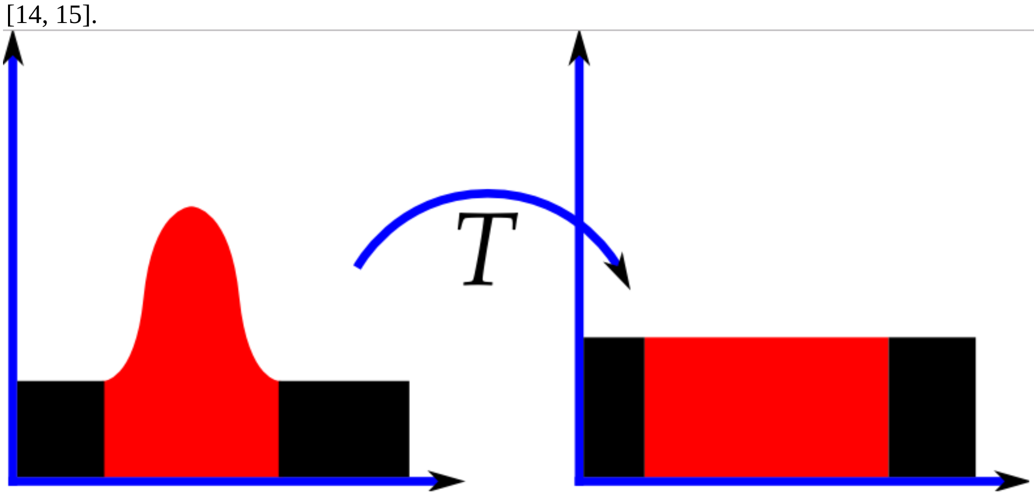
Where c is a constant. For example, this transformation function spreads the values of dark pixels while compressing the higher values. The opposite is true for the inverse log transformation whereby the transformation function maps the narrow range of high intensity levels in the input image into a wider range of output levels.

The intensity of light generated by cathode ray tube monitors has anintensity-to-voltage response that is not linear. Hence, this non-linearity must becompensated by a power law function to achieve correct reproduction of intensity.The power law transformation is

obtained as:

$$Y(i, j) =c(X(i, j))\gamma$$

Where$c$ and γ is a constant. The power law transformation function is the same as the log transformation albeit it is much more versatile and a family of possible transformation can be obtained by varying the γvalue. For $\gamma<1$, the low intensity levels in the input image are spread out and the opposite is true for $\gamma>1$. Spatial filtering involves neighbourhood operation. This process is employed by simply sliding the filter from one pixel to another pixel of an image. The response of the filter at each point (i, j) is calculated using a predefined relationship. For linear spatial filter, each pixel value in the output image is the average of the pixels in the neighbourhood of the corresponding pixel in the input image. This filter sometimes is called the mean filter. On the other hand, non-linear spatial filter replaces each pixel with the ranking result based on the pixels enclose by the filter. An example of this kind of filter is the median filter which reduces impulse noise in an image. Besides the image enhancement methods mentioned above, the visual quality of an image can be improved by manipulating the histogram of an input image. The following sections give the idea about histogram and the histogram equalization techniques used to enhance the quality of an image [14, 15].



CONCLUSION & FUTURE SCOPE

The subjective outputs depend on the input image, and each transformation works superior for a category of image and worse for others category . So for dark images with low contrast the improved results will be obtained with the help logarithm and the power law transformations using in the second one gamma values lower than 1. For small or light images it would be use the power law transformation with gamma higher than 1. For image with low contrast in gray scale the better methods are histogram equalization and contrast stretching. The second one works better if the middle gray levels have to be enhanced more than the black and white areas. Finally if the image has dark and light areas with low contrast and the objective is increase the contrast in that area instead the all image it will be use the local enhancement .Also it has to be measurement the human effort in the different algorithms. The only two that do not need human help are logarithm and histogram equalization. In power law transformation it has to be specified by the user the gamma value. In contrast stretching the m gray scale value and the slope of the transformation and local enhancement is the most hardworking function because it has to be calculate the limit values for the local deviation and local mean, and the size of the neighbourhood. Classify by time of execution