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Survey on Digital Image Forensics Using Different Contrast Enhancement Techniques

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Abstract: Nowadays use of Contrast Enhancement in Digital Images is on the verge of rise and the issue of current research. Many techniques under Image contrast enhancement have come into existence in previous years, but there is need of some techniques which must be very efficient and removes the drawbacks of previously used methods. As digital images or photos have been widely used as evidence in investigation field, medical, historical records, reports of journalist etc. Also with this the availability of most powerful tools which are capable of easy modification, manipulation, forgeries to image becoming quite easier. This paper is based on the study of different contrast enhancement techniques used in previous years and the methods they used. Also it explains the proposed methodology which uses non linear pixel mapping that introduce artifacts into an image histogram, and then detecting locally applied contrast enhancement in image, detecting histogram equalization in image and one image security algorithm is also used to add more security.

Keywords: Contrast Enhancement, Histogram Equalization, Peak-gap, encryption.

I. INTRODUCTION

Image processing is a rapidly developing field based both on mathematics and computer science. It is naturally connected to and strongly influenced by image acquisition. Not only common customers but astronomer's investigators journalist and also the people related to the field of medical science (MRI, CT Scan etc) and many biologist are wide variety of users involved. Enhancement may be the technique of improving the superiority of an electrically stored image. To produce a picture lighter or darker or to increase or decrease contrast. One can make an unauthorized copy of images and manipulate images such that that could lead to financial issue or even loss of human lives. Digital Image Forensics is a relatively new research field.

Various operations under image processing include modification of the pixel values, but image content is unaltered. Other operations may also include quantization, compression, geometrical transformations like rotation, scaling etc. An effective and famous technique for image enhancement is histogram equalization .This technique works on remapping the gray levels of the image based on the probability distribution of the input gray levels. This technique is powerful enough in highlighting the borders and edges between different objects but it may reduce the local details within these objects, especially smooth and small ones.

Some other techniques under Histogram equalization are Mean Brightness Preserving Equalization Histogram (MBPHE), multilevel component based histogram equalization (MCBHE), and Brightness preserving dynamic histogram equalization (BPDHE) weighting means separated sub histogram equalization (WMSHE). The field of image restoration (sometimes referred to as image desharpnessring or image deconvolution) is concerned with the reconstruction or estimation of the uncorrupted image from a sharpnessed and noisy one. Though considerable research is done in such areas, as contrast enhancement is subjective in nature and is dependent on the nature of the original images, generalized contrast enhancement technique is not yet developed.

II. LITERATURE SURVEY

A. Global Contrast Enhancement Detection

Previous algorithms work well under the assumption that gray level histogram of unaltered images shows smoothness while that of contrastly enhanced images shows peak/gap artifacts. In real applications, digital images are stored in JPEG format and are compressed with middle/low quality factor. It is well known that, low quality lossy compression usually generates blocking artifacts. So, prior approaches fail to detect the contrast enhancement in previously middle/low quality JPEG (lossy) compressed images. Algorithm proposed in the proposed method solves this problem. Algorithm detects the contrast based enhancement not only in uncompressed or high quality JPEG compressed images but also in middle/low quality ones. The main identifying feature of gray level histogram used is zero-height gap bin.

B. Local Contrast Enhancement Detection

The global contrast enhancement detection method is applied to image blocks for detecting local enhancement. In practice, the two source images used for creating a composite image may have different color temperature or luminance contrast. In order to make the composite image more realistic, contrast enhancement is typically performed in one or both source regions. In such scenarios, the composite image created by applying contrast enhancement to a single source region can be detected by the prior

method. However, if contrast enhancement is enforced in both regions, such a method may fail since all bocks are detected as enhanced ones.

C. Dualistic Sub-Image Histogram equalization

This technique separates the input image histogram into two subsections. It decomposes the image aiming at the maximization of Shannon's entropy of the output image. For that decompose the image into two sub image. One is dark another one is bright, according to the equal area property. This method use entropy value for histogram separation. Output of this technique is obtained after the two sub image is composed into one.

D. Automatic Weighting-Mean separated Histogram Equalization (AWMHE)

This technique provides a novel histogram equalization to improve the extreme over enhancement. There are two state involved in AWMHE

- Automatic Histogram Separation
- Piecewise Transform Function

In automatic histogram separation input image separated according to the combination of weighting mean function. In piece wise transform function, equalizing the sub-histogram in small scale details able to achieve contrast enhancement.

E. Contexual and variational contrast Enhancement (CVC)

This technique enhances the contrast of image by using inter-pixel contextual information. It increase the image brightness by maintain the high contrast between object region. To improve the overall image quality with clear details, this method increase both contrast and average brightness. Output image of this technique, which have mean brightness of the image value propositional to the original image .It is not only improving the contrast also preserve the entire content of the image. But needs high computational time.

F. Recursive Sub-image Histogram Equalization (RSIHE)

This technique have multiple local median intensities to overcome the drawback of Dualistic Sub-image Histogram Equalization (DSIHE) .Instead of separating image once, it recursively separate the image several time to get multiple sub histograms.

G. Minimum Mean Brightness Error Bi-Histogram Equalization

The basic principle behind this method is that decomposition of an image into two sub images and applying equalization process independently to the resulting sub images which is similar to BBHE and DSIHE except difference is that this technique searches for a threshold level, which decomposes input image into two sub images in such a way that the minimum brightness difference between the input and the output image is achieved. This is called absolute mean brightness error (AMBE). After this histogram equalization is applied to each sub image to produce output image. The steps taken in this process. Absolute mean-brightness error is calculated for each possible threshold level. Find a threshold level that yields low absolute mean brightness error.

H. Dynamic Histogram Equalization (DHE) This Dynamic Histogram Equalization (DHE) technique takes control over the effect of traditional HE so that it performs the enhancement of an image without making any loss of details in it. DHE divides the input histogram into number of sub-histograms until it ensures that no dominating portion is present in any of the newly created sub-histograms. Then a dynamic gray level (GL) range is allocated for each sub-histogram to which its gray levels can be mapped by HE. This is done by distributing total available dynamic range of gray levels among the sub-histograms based on their dynamic range in input image and cumulative distribution (CDF) of histogram values. This allotment of stretching range of contrast prevents small features of the input image from being dominated and washed out, and ensures a moderate contrast enhancement of each portion of the whole image. At last, for each sub-histogram a separate transformation function is calculated based on the traditional HE method and gray levels of input image are mapped to the output image accordingly. The whole technique can be divided in three parts partitioning the histogram, allocating GL ranges for each sub-histogram and applying HE on each of them.

III. PROPOSED WORK

1. Detecting globally applied contrast enhancement in image: Contrast enhancement operations are viewed as non linear pixel mapping which introduce artifacts into an image histogram. Non linear mappings are separated into regions where the mapping is locally contractive. The contract mapping maps multiple unique input pixel values to the same output pixel value. Result in the addition of sudden peak to an image histogram.

2. Detecting locally applied contrast enhancement in image: Contrast enhancement operation may be locally applied to disguise visual clues of image tampering. Localized detection of these operations can be used as evidence of cut and paste type forgery. The forensic technique is extended into a method to detect such type of cut and paste forgery.

3. Detecting Histogram equalization in image: Just like any other contrast enhancement operation, histogram equalization operation introduces sudden peaks and gaps into an image histogram. The techniques are extended into method for detecting histogram equalization in image.

4. Image Security algorithm:

- Input data of the cipher are pixel matrices, i.e. three matrices of color components
- In RGB coding, where each element of the matrix takes a value from 0 to 255. If the image is monochromatic, there is obviously one matrix of numbers (grayscale values).
- The value of each color component of the pixel is used as initial value for the logistic equation. Conversion to floating-point numbers and back to colors are realized by formulas.

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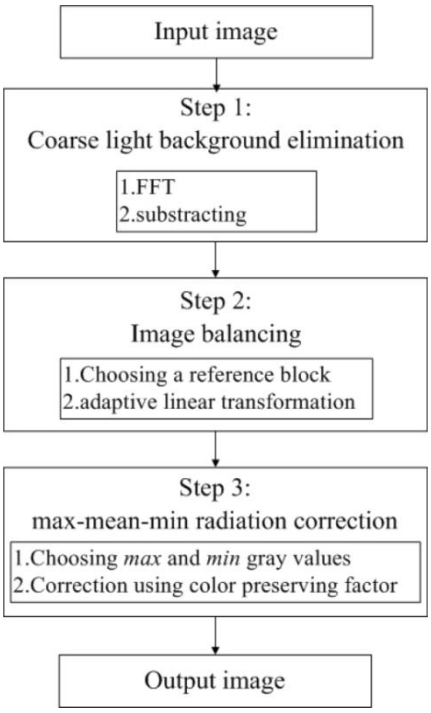

Fig1. Flow chart

Encryption procedure

Let the plain image contain N £M = m pixels, and let i = 1; 2;: : : ; m be a pixel index. To make the description simpler, let us assume that the image is black and white, represented by one matrix of numbers.

Decryption procedure

Again, let us assume for simplicity that the encrypted is Image is black and white.

- Firstly, to recover the original image, pixels of ciphertext should be converted to a matrix of floating-point numbers.
- Then, from the value of m-th pixel we subtract the value of the previous pixel, which was earlier iterated n times on the chaotic map.
- If the result is less than 0, it should be normalized by adding ±x. These operations are repeated for all pixels of the image, remembering about the assumed condition for the last pixel. The whole image is processed j times.
- If we have a color image, we expand the algorithm in a way analogous to the encryption procedure

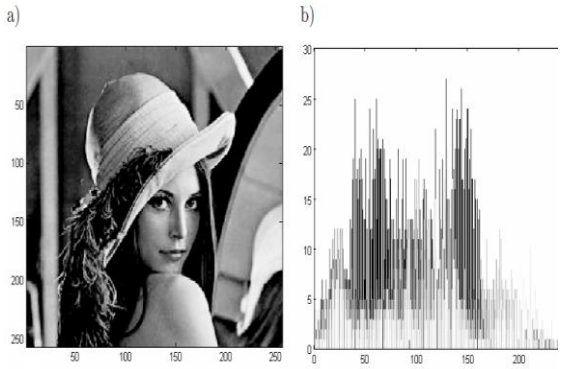

Fig2. Image Encryption

IV. CONCLUSION

This paper discussed about various contrast enhancement techniques. The various methods discussed here are Global Contrast Enhancement Detection, Local Contrast Enhancement Detection, Dualistic Sub-Image Histogram equalization, Automatic-Mean Weighting Mean Separated Histogram (AWMHE), Contextual and variational contrast Enhancement (CVC), Minimum Mean Brightness Error Bi-Histogram Equalization .As far as the security is concerned the previous works does not deal with the anti-forensic activities security related to it. But in this paper along with different techniques of contrast enhancement a security algorithm is also used to remove the drawback of previous work.

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