An Enhanced Anti-Forensic Technique to Manage the Compact Ability among Forensic Untraceability and Picture Peculiarity in JPEG Image

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Abstract— Forensic method which determine the forgery in the image. Similarly, Anti-forensic technique which makes fool of the forensics detectors and hides the trace of the operation done in the image. Now, we are proposing the anti-forensic method by using four steps. The first step normalize the image coefficients using total variation in the deblocking artifacts. The second work which uses dithering model for smoothening the image. The third work which again carries the first one with difference in the parameters and the final step is the balancing of the calibrated value in the image. By experimental simulation results proves that the proposed work is efficient in terms of untraceability and image peculiarity than the existing system.

Key words: Deblocking artifact, Normalization, Dithering signal model, calibrated feature

I. INTRODUCTION

Nowadays, Digital Photography is the main origin of data in digital world. Due the easy way of recovery and its repository they are the rapid means of loading the information. Pictures can be used as an verification for any cases. The images put forth on an electronic media and in newspapers are permitted as the certificate for their certainty of such programs. Images are being used in many applications from armed forces to therapeutic area to trace the diseases. Therefore digital image forensics develops as speedy growing need of the world. Thus the images are in need to authentication. Due to hi-tech evolution and possibility of low-cost hardware and software kits it is most easy to do the modifications in the digital images without leaving the visible traces of operation. It has become toughest to trace this history. As the problem comes up the integrity and authenticity of digital images has been lost. These modifications in image can be used for some risk purpose like to hide some important trace information from an image. Thus using forged images to transfer useless information. To determine the integrity of the images we want to detect any modification present in the image. Digital Image Forensics is that branch on study of science that deals with revealing the fake image manipulation. Anti-forensics technique which hides the history traces of the image and it does not permit the detectors to identify the forgery.

II. PROPOSED SYSTEM

This Anti-forensic technique has been frequently applied to create the undetectability with uncertainty management and incomplete reasoning. We are proposing the anti-forensic method by using four steps. The first step normalize the image coefficients using total variation in the deblocking artifacts. The second work which uses dithering model for smoothening the image. The third work which again carries the first one with difference in the parameters and the final step is the balancing of the calibrated value in the image.

This system will provide the efficient tradeoff between the forensic Untraceability and the picture peculiarity is obtained and Sensitive to other properties of pictures and forgeries has not been analyzed. Reliability of the each individual framework has been improved to not detect the forgery. Combination process can take advantage of the specificity of each method.

III. FORGERY CREATION PROCESS

A. Total Variation Performance on Deblocking Artifacts:

The first framework is normalizing the image coefficients in the image using the total variation at the spatial domain using the blocking artifacts by deblocking it. Besides the elimination of JPEG blocking artifacts value, the other idea of this step is to partially fill the gaps in the Discrete Cosine Transform histogram, so as to facilitate the following step of explicit histogram smoothing. Experimentally, it is in need and favorable to conduct this first framework with deblocking operation, especially for a good histogram recovery in the high frequency domain and the spatial domain where all DCT coefficients are equalized to zero in the JPEG image.

For JPEG deblocking purposes, a variational approach is used to minimize a Total variation method consists of two measurement term one is the basic total variation term and other one is the blocking measurement term of total variation operation. Let us take processing image as I.

The final constrained TV-based minimization problem is formulated as follows: where α > 0 is a regularization parameter, balancing the two energy terms. It is easy to demonstrate that E(X) is a convex function (though not differentiable) and U is a convex set. We set α = 0.9, and the step size t = 1/(k) at the k-th iteration. As to the setting of the convex set U, here we set μ = 1.5, which constrains that the processed Discrete Cosine Transform coefficient should stay within the same or the neighbouring quantization bins as its original value.

B. Smoothing using Dithering Signal Model and Distribution:

After JPEG image I has been processed using the total variation method for blocking artifacts, the gaps in the Discrete Cosine Transform and the spatial domain have been partially filled in the resultant image Ii. The partly restored information in the Discrete Cosine Transform domain of Ii will allow us to build an adaptive local dithering signal model based on both the Laplacian distribution and the uniform distribution for a better goodness-of-fit. Here both the ac component and dc component can be used for the manipulation of Ii image.

\[ Z = Y + N \]
In the above equation the Z is an image where the N is the signal of dithering model. we can improve the signal efficiency by 1.

![Diagram](image)

**Fig. 1: Signal Model**

**C. Second Iteration on Total Variation:**

In the smoothing using dithering signal model and distribution, although we have tried to change the Discrete Cosine Transform coefficients and the wavlet coefficients while reducing the spatial and frequency domain distortion, there must be some unnatural noise and blocking artifacts introduced in I, where I is the resultant image of the second framework. Since the JPEG blocking artifacts presented in I are not as serious as those in I, hence we lower the parameters α and t for a milder JPEG deblocking. We set α = 0.95, and the step size t = 1/(k + 2) at the k-th iteration. As to the setting of the convex set U, here we set μ = 1.58, which constrains that the processed Discrete Cosine Transform coefficient should stay within the same or the neighbouring quantization bins as its original value. Once a processed coefficient goes outside of the constrained range, the projection operator PU modifies its value back to a random value uniformly distributed in the original quantization bin. This can avoid strong Discrete Cosine Transform histogram shape modification by the total variation deblocking and prevent the emergence of new Discrete Cosine Transform quantization artifacts. Here also the α value will be greater than zero.

**D. Decalibration:**

For $I_{bb}$ all the existing detectors seems to be well fooled except the calibrated feature based detector, where $I_{bb}$ is the resultant image of the second iteration on total variation. In fact the calibrated feature value has also been significantly decreased to 25 from 28. However, for genuine, uncompressed images, this feature value is highly condensed in an interval of very small values. It is hard to further decrease this value by performing deblocking, when keeping the best visual quality.

The optimized energy function for decalibration purposes of minimization problem is formulated as: After decalibration the JPEG Forged IF image has been obtained.

**IV. PERFORMANCE EVALUATION**

**A. Accuracy:**

In the section, we are evaluating the performance of the proposed system is compared to the existing system in terms of accuracy measurement. The Accuracy can be calculated from formula given as follows

**B. PSNR:**

Peak signal-to-noise ratio (PSNR) is an expression for the ratio between the maximum possible value (power) of a signal and the power of distorting noise that affects the quality of its representation. Because many signals have a very wide dynamic range, (ratio between the largest and smallest possible values of a changeable quantity) the PSNR is usually expressed in terms of the logarithmic decibel scale.

**C. SSIM Comparison:**

The structural similarity (SSIM) index is a method for measuring the similarity between two images. The SSIM index is a full reference metric; in other words, the measuring of image quality based on an initial uncompressed or distortion-free image as reference. SSIM is designed to improve on traditional methods like peak signal-to-noise ratio (PSNR).

**D. SSIM Comparison:**

The SSIM comparison is shown in this graph. In the X-axis 1st TV deblocking, DCT smoothing, 2nd TV deblocking and Decalibration methods is taken. Y-axis SSIM is taken. Here JPEG anti forensics and double JPEG compression SSIM metrics are analyzed according to the steps. The JPEG anti forensics is high SSIM metric compare to the double JPEG compression.

**E. PSNR Comparison:**

The PSNR comparison is shown in this graph. In the X-axis 1st TV deblocking, DCT smoothing, 2nd TV deblocking and Decalibration methods is taken. Y-axis SSIM is taken. Here JPEG anti forensics and double JPEG compression SSIM metrics are analyzed according to the steps. The JPEG anti forensics is high SSIM metric compare to the double JPEG compression.

![Graph](image)

**Fig. 2: SSIM Comparison**

**Fig. 3: PSNR Comparison**
The peak signal to noise ratio comparison is shown in this graph. In the X-axis 1st TV deblocking, DCT smoothing, 2nd TV deblocking and Decalibration methods is taken. Y-axis peak signal to noise ratio is taken. Here JPEG anti forensics and double JPEG compression PSNR are analyzed according to the steps. The JPEG anti forensics is high PSNR rate compare to the double JPEG compression.

V. CONCLUSION AND FUTURE WORK

A. Conclusion:
The existing method aims at removing from a given image the footprints left by Joint photographic experts group compression, in both the spatial domain and frequency domain. Efficient trade-off between the forensic Undetectability and the image visual quality is obtained. Sensitive to different properties of images and forgeries have been analyzed.

B. Future Work:
Future research shall be devoted to the design of an optimal attack to the Joint photographic experts group image considering multiple detectors and the non-convex Structural similarity metric. We may get inspirations from existing work on optimal attack to a single, histogram-based forensic detector. We would like to further study the image statistics in the Discrete cosine transform domain for a better histogram restoration, and to compare our adaptive local dithering model with the recently proposed calibration-based non-parametric Discrete cosine transform quantization noise estimation method.

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