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An Effective Method for Detecting Double JPEG Image by Using an Effective Classifier -Review

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Abstract-There are many approaches proposed to detect double JPEG compression when primary and secondary compressions have different quantization matrix. An effective error based statistical feature extraction is introduced to solve the problem of distinguishing the primary and secondary compression with the same quantization matrix. First upon the JPEG file is decompressed to form are constructed image ,then an error image is obtained by computing the differences between the inverse discrete cosine transform coefficients and pixel values in the reconstructed image. Mainly, Rounding error block and Truncation error block are analyzed. Then, a set of features is proposed to characterize the statistical differences of the error blocks between single and double JPEG compressions. Finally, any effective classifier is employed to identify whether a given JPEG image is doubly compressed or not..This enhance the efficiency of the images which is detected as double compressed and error rate is very low compared to other methods .Hence the overall performance can be increased efficiently.

Index Terms—Digital forensics, double JPEG compression,artifacts rounding error, truncation error.

I. INTRODUCTION

Nowadays JPEG related forensic issues have been receiving more and more attention recently. Double JPEG compression detection have mainly significance in digital forensics. Double JPEG compression we understand the repeated compression of the image with different quantization matrices primary quantization matrix and secondary quantization matrix .Here we detecting double JPEG compression with the same quantization matrix is still a challenging problem**.**

We propose an effective error based statistical feature extraction scheme to distinguish between double and single JPEG compressed images. Firstly, a given JPEG file is decompressed to form a reconstructed image. An error image is obtained by computing the differences between the inverse discrete cosine transform coefficients and pixel values in the reconstructed image.

Two classes of blocks in the error image are rounding error block and truncation error block which are analyzed. Then, a set of features is proposed to characterize the statistical differences of the error blocks between single and double JPEG compressions. Finally, the support vector machine classifier is employed to identify whether a given JPEG image is doubly compressed or not. We can adopt different techniques for the detection and in case of the classifier .Neural network classifier is also best classifier for detection of doubly compressed images. Experimental results on three image databases with various quality factors have demonstrated that the proposed method can significantly outperform the state of- the-art method.

II. JPEG COMPRESSION AND DECOMPRESSION

There are three major steps in JPEG compression: discrete cosine transform of 8 by 8 image blocks, quantization of DCT coefficients, and entropy encoding of the quantized DCT coefficients. JPEG decompression is performed in the reverse order: entropy decoding, de-quantization and inverse DCT. There exist three kinds of error during JPEG compression and decompression. The first kind of error is called the quantization error, which occurs in the process of JPEG compression. It is defined as the difference between the float value of the divided DCT coefficient before rounding and its nearest integer value. Both the second and third kinds of error exist in the process of JPEG decompression. After performing IDCT on the de-quantized JPEG coefficients, the resulting IDCT coefficients which are float values should be rounded to their nearest integers, and truncation is even needed if the rounded IDCT coefficients exceed the range [0, 255]. Accordingly, the difference between the float IDCT coefficient and its rounded integer is called the rounding error (note that it occurs only when the rounded IDCT coefficient falls in the range of [0, 255]); while the difference between the float IDCT coefficient and its truncated integer (i.e., 0 or 255) is called the truncation error. It is worth noting that the float un-quantized DCT coefficient cannot be obtained ,so the quantization error is unavailable .As a result, only the rounding and truncation error can be utilized to discriminatebetween singly and doubly compressed images with the same quantization matrix. So we only focus on these two kinds of errors,

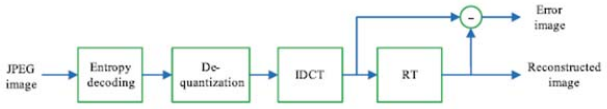

Fig. 1. Flow chart of generating the error image in the JPEG decompression process.

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III. FEATURE EXTRACTION

Here am introducing a better way for Feature Extraction .Old Works for the rounding error blocks, the mean and variance of absolute error values, denoted by *mean(|**R**rn|)* and *var(|**R**rn|)*, are given by

$$mean(|\boldsymbol{R}_n^r|) = \frac{\sum_{l=1}^{L}\sum_{i=0,j=0}^{i=7,j=7}|\boldsymbol{R}_n^{r,l}(i,j)|}{64L}$$

$$var(|\boldsymbol{R}_n^r|) = \frac{\sum_{l=1}^{L}\sum_{i=0,j=0}^{i=7,j=7}(|\boldsymbol{R}_n^{r,l}(i,j)| - mean(|\boldsymbol{R}_n^r|))^2}{64L}$$

where *L* denotes the number of the unstable rounding error blocks in the error image. For the truncation error blocks, the mean and variance of absolute error values, denoted by *mean(|**R**tn|)* and *var(|**R**tn|)*, can also be calculated in a similar way.

But these methods are so time consuming and leads more complexity .Our aim is to overcome these problems by using variance only .From these we gets necessary feature points to extract the image which is compressed .we need only 20 or 25 feature points for extracting an image ,but by other methods 8000 or more feature points are obtained.These may create more complexity in time and performance .Here we using the same equation for variance calculation as given below. Effective feature extraction by selecting better feature points which helps to extract images easily. Better way creates detection of double compressed images easily and faster. Our Experimental flowchart is given below

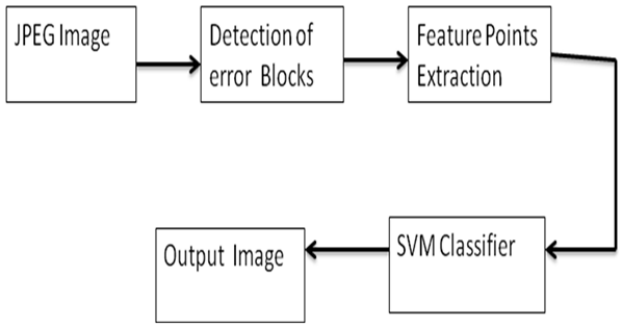

Fig 2. Flowchart for Detection of Double Compressed Image .

III. Related Works Review

1.Jing Zhang[1] proposed a method for the detection of double compression in JPEG . In this method calculates the difference between the sub-band DWT coefficient histograms between single and double JPEG compression which introduces specific artifacts, visible in the histograms of these coefficients. A quantitative measure for these artifacts is devised, and used to discriminate between single and double JPEG compressed images. The proposed technique detects double JPEG compression more accurate and more precisely.

2.Tiziano Bianchi and Alessandro Piva [2] proposed probability models for DCT coefficients of singly and doubly compressed images. Hypothetically it is considered that original areas undergoes double compression while forged areas will have single compression.Method is based on the observation that DCT coefficients exhibit an integer periodicity when the blockwise DCT is computed according to the grid of the primary JPEG.

3.Fangjun Huang [3] tells about different quantization matrixes used for primary and secondary compressions .In this method he proposed to detect double JPEG compression with the same quantization matrix. A JPEG image is recompressed with the same quantization matrix showing a sequential decrease in the quantized DCT coefficients.A proper ratio is calculated on the JPEG coefficient of recompressed test image via implementing a random perturbation strategy.This method is not only applicable for the detection of double compression but can also detect triple and sometimes for times compression and so on. It is accurate and so it is used for more compression detection.

4.FangLing SHI [4] analyzed different features between JPEG double and single compression quantization histogram and estimated values and then proposed a method in which the extracted features were categorized into two classifier with the SVM which is called as Support Vector Machine, then a simulation experiment is conducted to differentiate between double compressed JPEG images and single compressed JPEG images. Method proposed is practical and applicable to real life experiments. It basically improves accuracy of checking whether images are double compressed or not. This method laid foundation for detecting image distortion and image computer forensics. Disadvantage of this method is that it is time consuming.

5 .Yu Chen and Carmen Cheh [5] proposes a method to improve the accuracy of JPEG image tampering detection. It is done by differentiating between JPEG single and double compressed quantization histograms. It considers the characteristics of the random distribution of high value bins in the DCT histograms of real-world images. For this method we have used publicly available CASIA authentic and tampered image data set of 9501 JPEG images.

Experimentally we prove, average improvement in the true negative and positive rate. Our method can supported automated and reliable digital image evidence authenticity verification. It had better performance.

6.This paper [6] provides detailed study of digital image forgery on JPEG images. When a tampered JPEG image is double compressed, final image will have different compression properties than that of single compressed images. This difference in the blocking artifacts is used to detect recompression. To hide the information of the target image a portion of digital image is copied and pasted either on the same or different image in order to hide.BACM(Blocking artifact characteristics matrix) properties are used to detect whether an image is cropped or not.

7. In this paper of ,Tomas pevny[7] introduced a method for detection of double compression in JPEG for application in steganography that is based on DCT coefficients. Primary quantization matrix is compared with secondary matrix. This method detects double-compression not only for cover images but also for images processed using steganographic algorithms. This is first complete solution to the problem of estimation of the primary quality factor in double-compressed JPEG images.

8. .Bianchi and Piva [8] discussed an algorithm relying on Direct Current coefficients statistics allowing us to apply single threshold detector. The observations about DCT coefficients exhibit an integer periodicity when the blockwise DCT is computed according to the grid of the primary JPEG compression are taken into consideration. This method can also detect grid shift and the quantization step of the DC coefficient of the primary compression

9.In this paper, we propose a powerful recompression detection method by extending the first digit features. Based on the analysis of the distribution of the first digits of quantized DCT coefficients, we extract the joint probabilities of the mode based first digits of the quantized DCT coefficients including value zero as the classifying features to distinguish between singly and doubly compressed images. Many experiments are done to detect the double JPEG compression effectively and out performs the existing algorithms significantly. Our method gives more accuracy with quality factor 95 .we have to construct a classifier for each secondary quality factor QF2 due to the unknown of the QF1.The (SVM) Classifier with the Gaussian Kernal is used to distinguish the doubly compressed images from the singly compressed ones.One of the experimental images are given below.

10. C. Chen, Y. Q. Shi, and W. Su,(2008) [11] In this paper, Double JPEG compression detection is of significance in digital forensics. We propose an effective machine learning based scheme to distinguish between double and single JPEG compressed images. Firstly, difference JPEG 2D arrays, i.e., the difference between the magnitude of JPEG coefficient 2D array of a given JPEG image and its shifted versions along various directions, are used to enhance double JPEG compression artifacts. Markov random process is then applied to modeling difference 2-D arrays so as to utilize the second-order statistics. In addition, a thres holding technique is used to reduce the size of the transition probability matrices, which characterize the Markov random processes. All elements of these matrices are collected as features for double JPEG compression detection. The support vector machine is employed as the classifier. Experiments have demonstrated that our proposed scheme has outperformed the prior arts.

Fig 3. Experimental Image After Detection of Double Compressed Image

IV CONCLUSION

We have presented a method to detect double JPEG compression with the Minimum Feature Points, which is easy to implement while shows promising performance. We first analyzed the error blocks in JPEG compression and error-based statistical features were extracted from rounding and truncation error blocks separately. Features are obtained by variance calculations. Finally,with the extracted features, the SVM or any other classifier is applied for detecting double JPEG compression. Huang et als method have two aspects. First,it proposed features can effectively characterize the magnitude information of rounding and truncation error, instead of simply counting the number of different JPEG coefficients as done in Haung et als .Second, the proposed features are directly extracted from the spatial and DCT domain of the error image, while Huang et als method needs to generate an image-dependent threshold by randomly perturbing and JPEG compressing the given image multiple times. From above we can seen different methods for detection of double compressed JPEG images with different classifier like Bayesian ,neural networks,support vector machines etc. All these methods ensure better accuracy and performance but having some disadvantages like time consuming ,usage of more memory,error affecting problems etc. so to overcome these issues a new method is proposed for detecting double JPEG image with same Quantization Matrix in more easier way which provides better performance than earlier stages.

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