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Singly and Doubly JPEG Compression in The Presence Of Image Resizing

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ABSTRACT

In the reverse engineering of double JPEG compression in the presence of image resizing between the different compressions detectors. The approach is based on the fact that previously JPEG compressed images tend to have a near lattice distribution property (NLDP), and that this property is usually maintained after a simple image processing step and subsequent recompression. The proposed approach represents an improvement with respect to existing techniques analyzing double JPEG compression. Moreover, compared to forensic techniques aiming at the detection of resembling in JPEG images, Further we move to steps as to provide an estimation of both the resize factor and the quality factor of the previous JPEG compression. Such additional information can be used to reconstruct the history of an image and perform more detailed forensic analyses. One of the major difficulties encountered in image processing is the huge amount of data used to store an image. Thus, there is pressing need to limit the resulting data volume. It is necessary to find the statistical properties of the image to design an appropriate compression transformation of the image; the more correlated the image data are, the more data items can be removed. The main objective of this is too designed and implemented a Different interpolation algorithm for image compression. Analyze the results using MATLAB software and wavelet toolbox and calculate various parameters such as minimum entropy, Q-factor as quality factor etc. To compress the color images without losing any contents of the images and to maintain the storage memory space.

***Keywords:* -** Entropy, Q-factor, quality factor, Double compression, NLDP.

I. INTRODUCTION

The possibility of acquiring a large amount of multimedia data in digital format and sharing it through the Internet has brought a dramatic change in the way such information is used. With a very little effort, multimedia data such as images can be copied, manipulated, or combined together, making it extremely difficult to maintain a link between the original acquisition and the final digital copy accessed by the users. This fact has stimulated the development of a new discipline, image forensics, aiming at detecting clues regarding the history of a digital image, by looking for distinctive patterns in statistical and geometrical features, including JPEG quantization artifacts, interpolation, demo slicing traces [1].Since a vast amount of digital images is available today in JPEG format, several forensic tools try to obtain clues by analyzing artifacts introduced by JPEG recompression. When the discrete cosine transform (DCT) grids of successive PEG compressions are perfectly aligned, areas which have undergone a double JPEG compression can be detected by recompressing the image at different quality levels [2], or by analyzing the statistics of DCT coefficients [3]. Recent results demonstrate that even multiple JPEG recompressions can be detected using first digit features of DCT coefficients [4].Alternatively, non aligned double JPEG compression can be revealed by considering blocking artifacts [5], or by evaluating the integer periodicity of DCT coefficients when different shifts are applied to the examined image [6]. In both cases, a careful examination of DCT coefficient statistics can also permit automatic localization of doubly compressed areas [7].A classical application scenario for the aforementioned tools is image tampering detection. However, a much more ambitious goal could be that of moving a step further, in order to collect information about the processing chain which led to a specific observed image. In this respect, a first example can be provided by forensic tools that not only detect double JPEG compression, but also estimate previous compression parameters, like [2] or [6]. Unfortunately, the above tools suffer from severe limitations in real life scenarios. For example, if the image is resized between successive JPEG compressions, which is often the case when digital images are posted on photo sharing applications, the models the above methods rely on are no more valid. In this paper, we propose a forensic technique for the reverse engineering of double JPEG compression in the presence of image resizing between the two compressions. Our approach aims at exploiting the fact that previously JPEG compressed images tend to be distributed near the points of a lattice and is based on the extension of the technique proposed in [6] for nonaligned double JPEG compression. The proposed approach represents an improvement with respect to existing techniques analyzing double JPEG compression. Moreover, compared to forensic techniques aiming at the detection of re-sampling in JPEG images like [8], the proposed technique moves a step further, since it also provides an estimation of both the resize factor and the compression parameters of the previous JPEG compression. Such additional information is important, since it can be used to reconstruct the history of an image and Performa more detailed forensic analysis.

Double JPEG Quantization and its Effect on DCT coefficients

By double JPEG compression we understand the repeated compression of the image with different quantization matrices Q_ (primary quantization matrix) and Q_ (secondary quantization matrix). The DCT coefficient F(u, v)is said to be double quantized if Q_(u, v) 6= Q_(u, v). The double quantization is given by:

$$F^{Q^{\beta}}(u,v) = round(\frac{F^{Q^{\alpha}}(u,v)Q^{\alpha}(u,v)}{Q^{\beta}(u,v)})$$

Generally, the double quantization process brings detectable artifacts like periodic zeros and double peaks. The double quantization effect has been studied in [13, 3, and 6].Therefore, for a more detailed analysis of double quantization effects.

II. LITERATURE REVIEW

Tiziano Bianchi (2013) In this paper, we propose a forensic technique for the reverse engineering of double JPEG compression in the presence of image resizing between the two compressions. Our approach is based on the fact that previously JPEG compressed images tend to have a near lattice distribution property (NLDP), and that this property is usually maintained after a simple image processing step and subsequent recompression [1]. **Deepak.S.Thomas, M.Moorthi and R.Muthalagu (2014),** in their paper, “Medical Image Compression Based on Automated Roi Selection for Telemedicine Application” present solutions for efficient region based image compression for increasing the compression ratio with less mean square error at minimum processing time based on Fast discrete curvelet transform with adaptive arithmetic coding. They said this project heavily utilized for compressing medical images to transmit for telemedicine application. To minimize the information loss, arithmetic entropy coding was used effectively. It will be enhanced by combining speck coding for compressing the secondary region and this hybrid approach was increased the CR and reduce the information loss. They analyzed the performance through determining the image quality after decompression, compression ratio, correlation and execution time [2]. **Bianchi, T. (2012),** in this paper, we propose a forensic technique for the reverse engineering of double JPEG compression in the presence of image resizing between the two compressions. Our approach is based on the fact that previously JPEG compressed images tend to have a near lattice distribution property (NLDP), and that this property is usually maintained after a simple image processing step and subsequent recompression. The proposed approach represents an improvement with respect to existing techniques analyzing double JPEG compression. Moreover, compared to forensic techniques aiming at the detection of re-sampling in JPEG images, the proposed approach moves a step further, since it also provides an estimation of both the resize factor and the quality factor of the previous JPEG compression. Such additional information can be used to reconstruct the history of an image and perform more detailed forensic analyses [5]. **F.Negahban (2013),** describes a novel technique in image compression with different algorithms by using the transform of wavelet accompanied by neural network as a predictor. The details sub-bands in different low levels of image wavelet decomposition are used as training data for neural network. In addition, it predicts high level details sub-bands using low level details sub-bands. This Paper consists of four novel algorithms for image compression as well as comparing them with each other and well- known jpeg and jpeg2000 methods [7]. **S.M. Jayakar (2011)** describes the performance of different wavelets using SPIHT [1] algorithm for compressing color image. In this R, G and B component of color image are converted to YCbCr before wavelet transform is applied. Y is luminance component; Cb and Cr are chrominance components of the image. Lena color image is taken for analysis purpose. Image is compressed for different bits per pixel by changing level of wavelet decomposition. Matlab software is used for simulation. Results are analyzed using PSNR and HVS property. Graphs are plotted to show the variation of PSNR for different bits per pixel and level of wavelet decomposition [12]. **V.Krishnanaik and Dr.GM.Someswar (2013)** defines images have large data capacity. For storage and transmission of images, high efficiency image compression methods are under wide attention. In this paper we implemented a wavelet transform, DPCM and neural network model for image compression which combines the advantage of wavelet transform and neural network. Images are decomposed using Haar wavelet filters into a set of sub bands with different resolution corresponding to different frequency bands. Scalar quantization and Huffman coding schemes are used for different sub bands based on their statistical properties. The coefficients in low frequency band are compressed by Differential Pulse Code Modulation (DPCM) and the coefficients in higher frequency bands are compressed using neural network. Using this scheme we can achieve satisfactory reconstructed images with increased bit rate, large compression ratios and PSNR [5].

III. METHODOLOGY

Algorithm for Image compression as singly and doubly

Step 1: Read the input Image in JPG format that we have compressed.
Step 2: Resize the image on 0.6 to 1.4 Scales for singly compression.
Step 3: Browse the resized image for doubly compression.
Step 4: Apply bilinear interpolation or bi-Cubic interpolation for doubly compression.

Step 5: Apply the different algorithms that oracle detector, prior, estimator resize factor on each counter-resized image.
Step 6: Analysis the minimum entropy of the images according to different algorithms.
Step 7: Calculate the kirchoff detector of the image.
Step 8: Repeat the same step 2 to step 6 on multiple images and find the ROC curve.
Step 9: Stop.
If the measure over one of the counter-resized images is greater than a given threshold, label the image as doubly compressed with resizing factor equal to that yielding the maximum value of the measure, otherwise label the image as singly compressed.

IV. RESULTS

Here the image compression is performed on different scales i.e. 0.6, 0.7, 8.8 to 1.4. The snap shot for results are given below:


(a) Original Image


(b) Scaling factor 0.6 image compressed


(c) Scaling factor 0.7 image compressed


(d) Scaling factor 0.8 image compressed


(e) Scaling factor 0.9 image compressed


(f) Scaling factor 0.95 image compressed


(g) Scaling factor 1.0 image compressed


(h) Scaling factor 1.1 image compressed


(i) Scaling factor 1.2 image compressed


(j) Scaling factor 1.3 image compressed


(k) Scaling factor 1.4 image compressed

Figure 1: Tested Image with original and on scaling factor with 0.6 to 1.4 for compression.

In above tested images we are using scaling factor 0.6 to 1.4 for compressing image using parameters detectors such as Oracle, Prior, Estimated resize factor on each counter-resized image. As, we analysis minimum entropy of an image for each different technique.

```
scale = 0.7
Q = 5

oracle detector
   minH = 0.45663
   Q = 16
   k1 = 1
   k2 = 1

prior knowledge detector
   minH = 0.45663
   Q = 16
   k1 = 1
   k2 = 1
   scale = 0.7

estimated resize factor detector
   minH = 0.50828
   Q = 16
   k1 = 1
   k2 = 1
   scale = 0.69975

scale = 0.7
Q = 5
```

Figure 2: Tested Input image-1 compression on 0.7 scales

Above figure 2: shows on running scale factor 0.7 in which Q=5, we gets various detectors values on scaling factor 0.7 as oracle detector have minH=0.45663, Q=16, Prior Knowledge detector have values minH= 0.45663 Q=16 and Estimated resize factor gives us values for minH=0.50828, Q=16. As we tested multiple images with same techniques we find that estimated resize factor is best from all detectors which is having minH values high.

Tables1: show tested images results for minH entropy value with various detectors compression on 0.7 Scale

Oracle detector	Prior Detector	Estimated prior factor detector
0.456631	0.456631	0.508279
0.502126	0.502126	0.636287
0.582157	0.582157	0.646013
0.68268	0.68268	0.605684
0.716863	0.625665	0.687302
0.507069	0.507069	0.559156
0.325384	0.325384	0.378122
0.383361	0.383361	0.554613
0.565769	0.565769	0.594418
0.721173	0.615071	0.639417
0.651059	0.651059	0.635955
0.623493	0.623493	0.659033
0.599799	0.599799	0.606723
0.490839	0.490839	0.65836
0.703308	0.673057	0.644874
0.70626	0.70626	0.626136
0.735782	0.735672	0.686255

0.657945	*0.633926*	*0.644815*
0.514296	*0.514296*	*0.640641*
0.751923	*0.67935*	*0.643563*
0.288247	*0.288247*	*0.661664*
0.250749	*0.250749*	*0.622781*
0.288887	*0.288887*	*0.673864*
0.491317	*0.491317*	*0.628306*
0.739659	*0.588427*	*0.665881*
0.640478	*0.640478*	*0.647262*
0.589966	*0.589966*	*0.628873*
0.531046	*0.531046*	*0.663034*
0.487538	*0.487538*	*0.647424*
0.722123	*0.662149*	*0.632788*
0.558228	*0.558228*	*0.665895*
0.430677	*0.430677*	*0.669384*
0.672253	*0.669754*	*0.642805*
0.764426	*0.695632*	*0.680507*
0.674534	*0.657441*	*0.665577*
0.645184	*0.639169*	*0.659125*
0.544746	*0.544746*	*0.637558*
0.725288	*0.687406*	*0.633831*
0.823545	*0.823545*	*0.835727*

Below shows the graphical represented of detectors as comparing values of minH entropy.

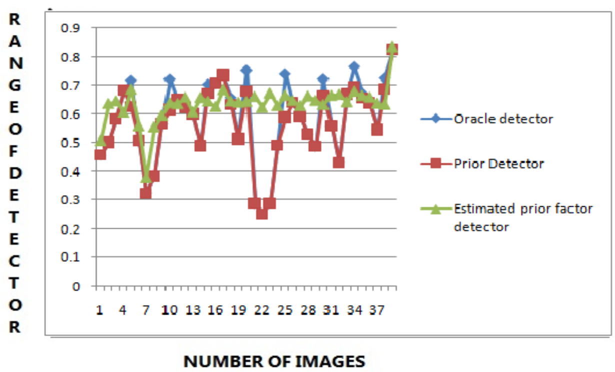

Figure 3: Graph showing Detectors comparing compression on minH entropy on 0.7 scale

V. CONCLUSION

As the paper, presents a practical algorithm for the reverse engineering of a doubly compressed JPEG image when a resizing step has been applied between the two compressions. The method aims at exploiting the fact that previously JPEG compressed images tend to have a near lattice distribution property (NLDP), and that this property is usually maintained after a simple image processing step and subsequent recompression. The results demonstrate that in the presence of prior knowledge regarding the possible resizing factors, the proposed algorithm is usually able to detect a resized and recompressed image, provided that the quality of the second compression is not much lower than the quality of the first compression. When the resizing factor has to estimated, the detection performance is usually lower, however it remains comparable to or better than that of previous approaches. Differently from existing techniques, the proposed approach is also able to estimate with a reasonably good performance some parameters of the processing chain, namely the resizing factor and the quality factor of the previous JPEG compression. This represents an important novelty with respect to the state of the art, since it may open the way to more detailed forensic analyses.

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