# A REVIEW ON EFFECTIVE COMPRESSION IN MPEG-4 VIDEOS USING MARKOV STATISTICS

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***Abstract*-Video editing softwares are easy to use but videos are exposed to tampering. Mostly, video cameras are built in MPEG-4 codec. Therefore, the detection of double compression in MPEG-4 videos as a first step in video forensics research. Markov based features are used to detect double compression artifacts.**

***Index Terms*—Digital forensics, double compression, Markov statistics,MPEG-4.**

## I. INTRODUCTION

For video tampering process, the software should first decode the compressed videos and then work in the uncompressed domain. The tampered video should be re-encoded and saved in compressed format after interpolation. Therefore, the double compression artifacts, as the intrinsic characteristics, may reveal the occurrence of tampering. There are many encouraging results in the field of double JPEG compression detection. However, less work has been done to detect video double compression. In the double compression detection is accomplished by examining the periodic artifacts in Discrete Cosine Transform (DCT) histograms of frames. In the disturbance in the probability distribution of the first digits of non-zero quantized AC coefficients is used as evidence of double compression. Only first digit distributions from the intra-coded frames are selected to further enhance the detection accuracy.

To detect video double compression, less work has been done. Double compression detection is accomplished by examining the periodic artifacts in Discrete Cosine Transform (DCT) histograms of I frame. Markov transition probability matrix could accurately identify double compressed JPEG images.

The contributions of this paper are three fold. First ,the detection of double MPEG-4 compression is accomplished. Second, by analyzing the quantization and dequantization methodologies in MPEG-4,which differ from JPEG. Third, the comprehensive comparison on the detection performance of Markov Statistics with other features used in video, including the first digit distribution and the DCT histogram.

## II. RELATED WORK

### *A. Perspective Constraints:*

A perspective-constraint based approach to detect image forgery. The height ratio between two objects in the image is different from that in the world scene due to the perspective effect. If two objects rest on the reference plane, and their actual height ratio and the height of one object in the image are available, another object's size in the image can be uniquely determined. The perspective constraints can be used to detect fake images even if they have been down-sampled or compressed with a low quality factor .No single method can detect all kinds of image forgery. Methods aimed to deal with different situations are useful in the sense that they make the forgers attend to one thing and lose another.

### *B. Support Vector machine:*

To detect double compressed JPEG images, support vector machine with features derived from the first -order statistics of individual DCT modes of low-frequency DCT coefficients. To detect double-compression not only for cover images but also for image processed using steganographic algorithms. Accuracy is better than 90%.

### *C. Popescu's method:*

It is used to detect double JPEG compression. JPEG mode has undergone double quantization, which is part of double JPEG compression operation. double quantization introduces periodic artifacts to the JPEG mode's histogram



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*D. Double compression detection algorithm*

*a. First digit distribution in MPEG video:*

The first digit distribution can be utilized well in JPEG double compression detection. It is reasonable to deduce that the first digit distribution in MPEG has the same characteristic. To verify the application of parametric logarithmic law, the first digit distribution of quantized AC coefficients was extracted from both original video and doubly compressed video. Then, the probabilities were fitted with the parametric logarithmic law, as in

$$Y=N\log_{10}(1+(1/s+x^{q}))\ldots(1)$$

where x stands for the first digits, y is the corresponding value in the logarithmic law, and N, q, s are three parameters which are limited to [0.1, 3], [0.1, 3] and [-1, 1].

*b. MPEG double compression detection algorithm*

Due to the sensitiveness of first digit distribution to video content and target bit rate, machine learning framework is
Adopted to enhance accuracy. The detailed process is as follows:
1)For both query and training video, the first digit distribution of quantized AC coefficients is extracted.
2)Test the first digit distribution with parametric logarithmic law. Three goodness-to-fit statistics are calculated, including squares due to error (SSE), root mean squared error (RMSE) and R-square. SSE and RMSE closer to zero, R-square closer to one means a good fit.
3) Combine the first digit probabilities and goodness-to fit statistics to compose a 12-D feature. Only I frames are taken into consideration because the fitting results for intra frames are better than that for non-intra frames.
4)Each GOP with a 12-D feature is treated as a detection unit, so the SVM classifier will judge on a GOP basis. The GOP proportion D is defined as

$$D=M/N\ldots.(2)$$

Where M stands for the number of GOPs which are labeled as double compression, and N means the total number of GOPs. If D passes the threshold T, it is extremely possible that the video has gone through double compression. Note that T is adaptive according to the demand of TNR and TPR. Generally T might be set as 0.50.

*c. Original bit rate estimation algorithm*

Taking a deep look into the fitting results of doubly compressed MPEG video, the difference between target bit rate decreasing situation and increasing situation is notable. This is the trigger for a more detailed classification. The serial SVM architecture for this estimation. It has been verified that the violation of the parametric logarithmic law will be much more obvious if target bit rate is larger than original bit rate. So the bit rate increasing situation can be classified by SVM1. SVM2 focuses on the judgment of bit rate decreasing situation and original video. As a result, the probability can be calculated with

$$p=C/N\ldots.(3)$$

where C stands for the number of GOPs which are labeled as a certain class and N is the total number of GOPs in a video. P means the probability, namely, confidence index.

## III. PROPOSED METHOD

Markov statistics has been proved to be distinguishable for single and double compression in JPEG images. Since blocks in MPEG-4 are encoded using a JPEG-like scheme, it is reasonable to deduce that Markov statistics could be effective in the double MPEG-4 compression detection.

First, extract the quantized DCT coefficients during decoding process.
Second, compute the difference array D along the horizontal, vertical, major diagonal, and minor diagonal directions.

Third, truncate the difference array D by thresholding operation.

Fourth, a first-order Markov random process is modeled on each difference array, along the same direction.

Finally, separately average the horizontal and vertical matrices and then the two diagonal matrices to form the feature sets F' and F" as

$$F'=1/2(P^{\rightarrow}+P^{\downarrow})\ldots. (4)$$

$$F''=1/2(P^{\searrow}+P^{\swarrow})\ldots.(5)$$

The final feature F is the concatenation of F' and F", which is 162-D.

The rounding errors caused by double quantization process will leave statistical artifacts among elements of the difference array. According to the theory of random process, the one-step Markov transition probability matrices could characterize those difference arrays. Hence,


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double MPEG-4 compression can be detected by using machine learning architecture.

The actual quantization process in MPEG-4, which has been illustrated is more complicated. It can be shown that the parity of$qs_2/q_1$ has a large impact on the detection performance. Consider videos which are single-compressed by $qs_2$ or double-compressed by $qs_1$ and successively. If is an odd multiple of , more than 99% of quantized DCT coefficients in singly and doubly compressed videos are exactly the same, leaving almost no trace for detection. But if is even, a considerable number of quantized coefficients are different due to rounding process. In this case, Markov feature has enough discriminative power to identify double compression.

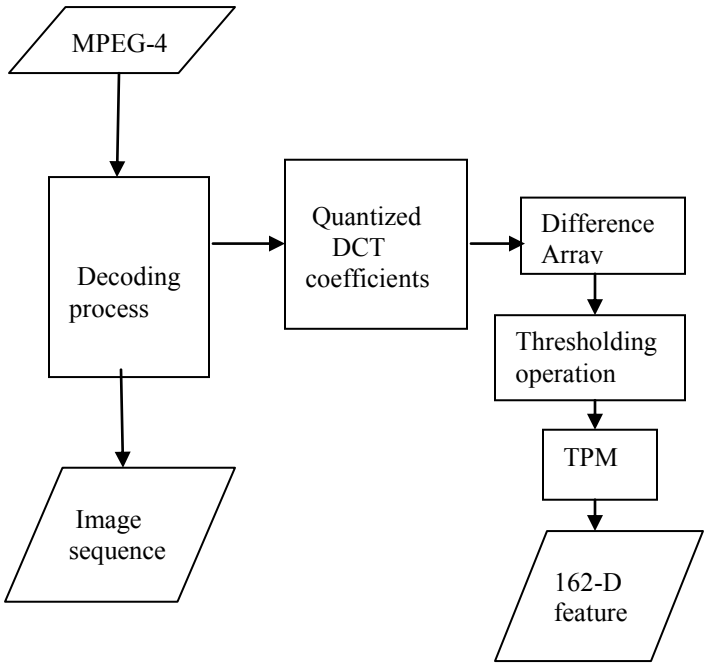


Fig1:Markov Feature Extraction Procedure

## IV. CONCLUSION

We have proposed an effective method to detect double compression in MPEG-4 videos. Double quantization with different parameters will inevitably introduce rounding errors, leaving detectable artifacts. Markov random process could capture the artifacts and detect double-compressed videos.

Besides, we have explored the limitations of double MPEG-4 compression detection algorithms by delving into the quantization methodology. The prior arts, including first digit distribution and DCT histogram, will fail when $qs_1$ is a divisor of $qs_2$.However, the detection accuracies achieved by using Markov features can reach 90% when is an even multiple of because Markov feature is second-order statistics and it can extrude the subtle artifacts.

## REFERENCES

[1] C.-H. Chen, Y.-Q. Shi, and W. Su, "A machine learning based scheme for double JPEG compression detection," in Proc. Int. Conf. Pattern Recognit. (ICPR), Dec. 2008, pp. 1814–1817.

[2] D.-D. Liao, R. Yang, H.-M. Liu, J. Li, and J. -W. Huang, "Double H.264/AVC compression detection using quantized nonzero AC coefficients," in Proc. SPIE Int. Soc. Opt. Eng. (Media Watermarking, Security, and Forensics), 2011, vol. 7880.

[3] H.-J. Yang and A. Kot, "Binary image authentication with tampering localization by embedding cryptographic signature and block identifier," IEEE Signal Process. Lett., vol. 13, no. 12, pp. 741–744, Dec.2006.

[4] H. Yao, S.-Z. Wang, Y. Zhao and X.-P.Zhang, "Detecting image forgery using perspective constraints," IEEE Signal Process. Lett., vol. 19, no. 3, pp. 123–126, 2012.

[5] T.-F. Sun, W. Wang, and X.-H. Jiang, "Exposing video forgeries by detecting MPEG double compression," in Proc. IEEE Int. Conf. Acoust. Speech Signal Process. (ICASSP), Mar. 2012, pp. 1389–1392.

[6] T. Pevny and J. Fridrich, "Detection of double-compression in JPEG images for applications in steganography," IEEE Trans. Inf. Forensics Secur., vol. 3, no. 2, pp. 247–258, Jun. 2008.

[7] T. Pevny, P. Bas, and J. Fridrich, "Steganalysis by subtractive pixel adjacency matrix," IEEE Trans. Inf. Forensics Secur., vol. 5, no. 2, pp.215–224, Jun. 2010.

[8] W. Chen and Y.-Q. Shi, "Detection of double MPEG compression based on first digit statistics," Lect. Notes Comput. Sci. (IWDW 2008),vol. 5450, pp. 16–30, 2009.

[9] X.-P. Zhang and S.-Z. Wang, "Statistical fragile watermarking capable of locating individual tampered pixels," IEEE Signal Process. Lett., vol. 14, no. 10, pp. 727–730, Oct. 2007.

[10] Xinghao Jiang, Wan Wang, Tanfeng Sun, Yun Q. Shi, Fellow, IEEE, and Shilin Wang, "Detection of double compression in MPEG-4 Videos on Markov Statistics", IEEE Signal Processing Letters,Vol.20,no.5,may 2013.

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