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Joint data hiding and compression scheme on efficient threshold computation algorithm

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Abstract
The rapid development of internet technology that in development, people can transmit the data and share digital (images, video) content with each other conveniently and it is rapidly used. The existing system introduced a Novel Joint Data-Hiding and Compression Scheme which is based on the side match vector quantization (SMVQ) and image inpainting. However the predefined threshold value cannot be accurately decided to all the images to obtain optimal embedding capacity and to achieve exact recover cover image. And also PDE-based image inpainting algorithms were used for maintaining the structure of the Inpainting area. And hence these algorithms produce blurred resulting image and large textured regions are not well reproduced. To overcome this problem, the proposed system introduced an efficient threshold computation algorithm and exemplar based inpainting algorithm.

Keywords: Joint Data hiding and compression, VQ, SMVQ, Image inpainting.

1. Introduction
In image data hiding scheme, the cover image can be exactly recovered after the embedded secret data is extracted. In existing system, introduced a joint data hiding and compression scheme that can embed high capacity of secret bits into a VQ and Side Match Vector Quantization (SMVQ) based compressed image and recover cover image after data extraction. In this system an indicator is used to decide whether the residual block is encoded by VQ or SMVQ according to the threshold value. However the predefined threshold value cannot be accurately decided to all the images to obtain optimal embedding capacity and to achieve exact recover cover image. In proposed system an efficient threshold computation algorithm is used for solve the above problem. The proposed system uses Contrast sensitivity and MSE as the fitness function to find optimal threshold value of the cover image.

2. Literature Survey
In 2002, many techniques for data hiding were proposed in [1] and [2] which were applied to JPEG and JPEG2000 images. Here, high capacity image hiding scheme [3, 4] based on VQ was used. The main drawback of this was that it was a lossy compression method. In 2003, reversible data hiding [5] based on adaptive compressed method was proposed. Here, two to three sub-codebooks were generated from VQ codebook and the best one was supposed to cover up the secret bits. With this, the hiding capacity was improved. A major flaw in this method was that there was more distortion in the extracted image. In 2006, a new index-domain method [6] based on SMVQ method was proposed. This would hide the secret data on the indices of the SMVQ compressed image. There were two stages viz., encryption stage and decryption. Major drawback of this method was that more time was consumed for the extraction stage and recovered image. In 2006, Fractal Curve [7] was used to improve embedding for VQ index; in 2008, a combination of codebook with high embedding capacity [8] was applied. In 2009, adaptive embedding techniques [9] for VQ-compressed images were introduced. In 2010, a multilevel reversible data hiding technique [10] based on adaptive coding method was proposed. It was an embedding method for encoding secret data into edge block and non-sufficiently smooth blocks to conceal (hide) secret data. In 2011, an effective data hiding technique was introduced [11]; it used the combination of LAC method

and VQ. The histogram of indices' position used VQ compression and the LAC techniques. In 2013, a reversible data hiding technique based on the histogram method [12] was proposed. The limitation of this scheme was that it would return intervals instead of actual values. A new scheme was proposed in which histogram shifting was applied on the difference of pixel values rather than original pixel values. This scheme was known as the reversible image authentication scheme. In 2013, a reversible data hiding method using adaptive coding method [13] was proposed. The main disadvantage of vector quantization was that the boundaries were clearly visible between input block and thus, SMVQ was used to solve this problem. In 2013, a steganographic data secret method based on histogram shifting method [14] was proposed. Reference pixel considers the PDE technique based on CDD model peak and zero point were selected from the prediction error histogram for encoding the hidden bits by the histogram shifting operation.

3. System Design
3.1 Process of Compression and Secret Data Embedding

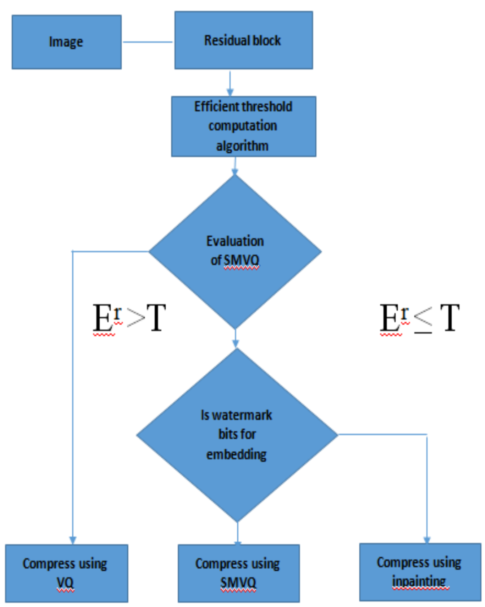


Figure 3: Flow diagram showing compression and confidential data embedding for each residual block for all the residual blocks, except those in the capital row and the aftermost column, a mean square error (MSE) value or distortion value is calculated and this value is then compared with a threshold value. If this MSE is greater than the threshold value, then the block is straightly compressed using the VQ ratio. And if the MSE is less than or equal to the threshold value, then the embedded watermark bit is checked. If the embedded watermark bit is 0, then it is clear that the block is compressed using SMVQ ratio and if the fixed upper limit bit is 1, then it can be said that picture inpainting is used for compression. Thus, the blocks in the image are compressed by adaptable using VQ, SMVQ or image inpainting.

3.2 Process of Decompression and Secret Data Extraction

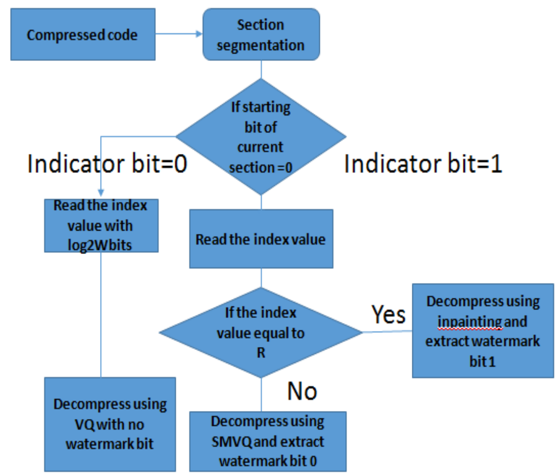


Figure 5: Flowchart showing decompression and secret data extraction for each residual block for the decompression, the area of compressed continuing blocks are disjointed and for every section the indicator bits are checked. If the index bit is 0, then the index value is read with log2 *W* bits and that block is directly decompressed using VQ. If the index bit is 1, then the index value is read with log2 (*R*+1) bits. Now, the index value compared with *R*. If it is lower than *R*, then it can be aforesaid that the block has to be decompresses using SMVQ and the watermark bit 0 is extracted. And if the index value is equal to *R*, then the block has to be decompressed using image inpainting and the watermark bit 1 is extracted.

3.3 Mathematical Model
a. Picture Compression and Data Embedding

- Input: an initial image of size M x N with *n2* pixels divided into n x n blocks.
- From all of the *n2* pixels, only 2*n*-1 pixels are used for searching the codebook Ψ.
- Between the 2*n*-1 pixels Mean Square Error (MSE), E*w* is calculated in the following way:
- If the smallest MSE is greater than the threshold value, i.e. E*r*>*T*, then, it is considered as a complex block, and hence VQ is used. Here, no bit is embedded and also an indicator bit 0 is added.
- If the smallest MSE is less than or equal to the threshold value, i.e. E*r*≤ *T*, then, it is considered as a continuous region block, and hence SMVQ or inpainting is used adaptively. Here, a secret bit is embedded and also an index bit 1 is added.
- If secret portion, i.e. *s* = 0, then SMVQ is used for compression of the image; or
- If secret portion, i.e. *s* = 1, then picture inpainting is used for compression.

The blocks in the leftmost column and topmost rows are encoded using VQ and the secret bits are not embedded here. The remaining blocks are taken in raster scanning order and they are encoded using any of the techniques depending upon the secret embedded bits.

b. Image Decompression and Data Extraction

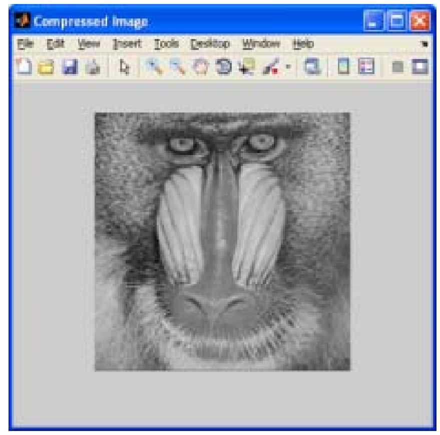
- Input: Compressed and embedded image
- Sections of compressed blocks are segmented according to indicator bits.
- If the indicator bit is 0 and the following log2 W bits are segmented as a section, then it is clear that this is a VQ block with no embedded bit.
- If indicator bit is1, then it is to be checked if the next log2 $(R + 1)$ bits are segmented as a section, and
- If the value of log2 $(R + 1)$ is the same as R, then inpainting must be used for decompression and the bit to be extracted is 1; or
- If the value of log2 $(R + 1) \in [0, R - 1]$, then it is clear that SMVQ must be used for decompression and the bit that is to be extracted is 0.

4. Experimental Result

Fig 1

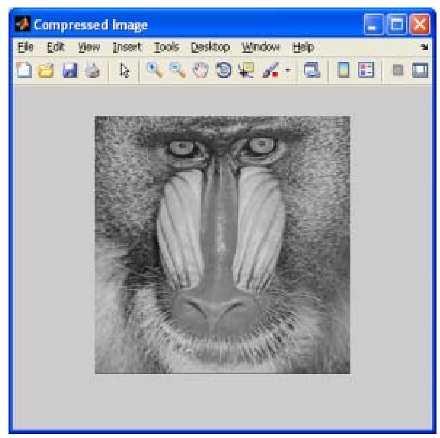

```
Message to embed
     1     1     1     0     1     0     1     1     1     0

Decrypted message
     1     1     1     0     1     0     1     1     1     0

Compression ratio
         0.274155419565764

PSNR: 50.2136399 dB
```

Fig 2




```
Message to embed
     1     1     1     0     1     0     1     1     1     0

Decrypted message
     1     1     1     0     1     0     1     1     1     0

Compression ratio
         0.291323665018023

PSNR: 52.2624806 dB
```

Fig 3

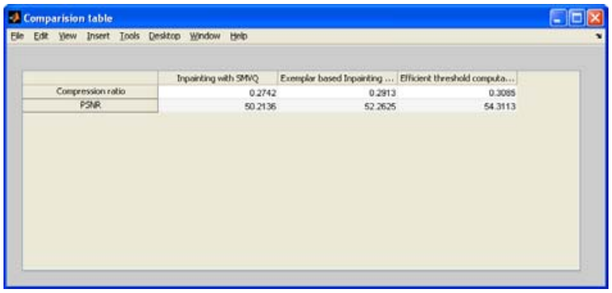



```
Message to embed
     1     1     1     0     1     0     1     1     1     0

Decrypted message
     1     1     1     0     1     0     1     1     1     0

Compression ratio
         0.308491910470283

PSNR: 54.3113212 dB
```

Fig 4

Fig. (1)-Original Image, Fig.(2)-Compressed Image of Inpainting with SMVQ and message embed and decrypted message with PSNR, CR, Fig.(3)-Compressed Image of Exemplar Based Inpainting with SMVQ and message embed and decrypted message with PSNR, CR, Fig(4)-Compressed Image of Efficient Threshold Computation Algorithm and also message embed and decrypted message with PSNR,CR

4.1 Comparison Table



	Inpainting with SMVQ	Exemplar based Inpainting ...	Efficient threshold computa...
Compression ratio	0.2742	0.2913	0.3085
PSNR	50.2136	52.2625	54.3113

4.2 Comparison of Various Images

	Inpainting with SMVQ	Exemplar approach with SMVQ	Efficient threshold compuatation algorithm
		Waterfall Image	
Compression Ratio	0.1624	0.1766	0.1907
PSNR	52.6620	57.1592	61.6564
		Camera man Image	
Compression Ratio	0.4287	0.4715	0.5143
PSNR	52.9200	57.6752	62.4304
		Building Image	
Compression Ratio	0.3664	0.4023	0.4282
PSNR	49.2870	50.4092	51.5313

5. Conclusion

In order to guarantee communication efficiency and save network bandwidth, compression techniques can be implemented on digital content to reduce redundancy, and the quality of the decompressed versions should also be preserved. The proposed system introduced an efficient data-hiding and compression approach. In this system an indicator is used to decide whether the residual block is encoded by VQ or SMVQ according to the threshold value. An efficient threshold computation algorithm is used for optimal threshold value based on Contrast sensitivity and MSE. The proposed system introduced exemplar based inpainting algorithm which is efficient for reconstructing the large target regions. The experimental results show that our scheme has the satisfactory performances for compression ratio, PSNR and decompression quality.

6. References

1. Chang CC, Chen TS, Chung LZ. A steganographic method based upon JPEG and quantization table modification. Inf Sci. 2002; 141(1):123-138.
2. Su PC, Ku CC. Steganography in JPEG2000 compressed images. IEEE Trans. Consum Electron. 2002; 49(4):824-832.
3. Wang WJ, Huang CT, Wang SJ. VQ applications in steganographic data hiding upon multimedia images. IEEE Syst J. 2002; 5(4):528-537.
4. Hu YC. High-capacity image hiding scheme based on vector quantization. Pattern Recognit. 2006; 39(9):1715-1724.
5. Du WC, Hsu WJ. Adaptive data hiding based on VQ compressed images. IEE Proc. Vis, Image Signal Process. 2003; 150(4):233-238.
6. Chang C, Lu T. Reversible index-domain information hiding scheme based on side-match vector quantization. The Journal of Systems and Software. 2006; 79:1120-1129.
7. Yang CH, Lin YC. Fractal curves to improve the reversible data embedding for VQ-indexes based on locally adaptive coding. J Vis Commun Image Represent. 2010; 21(4):334-342.
8. Hsieh YP, Chang CC, Liu LJ. A two-codebook combination and three-phase block matching based image-hiding scheme with high embedding capacity. Pattern Recognit. 2008; 41(10):3104-3113.
9. Lin CC, Chen SC, Hsueh NL. Adaptive embedding techniques for VQ-compressed images. Inf Sci. 2009; 179(3):140-149.
10. Lee CF, Chen HLK. An adaptive data hiding scheme with high embedding capacity and visual image quality based on SMVQ prediction through classification codebooks. Image and Vision computing. 2010; 28:293-1302.
11. Chang CC, Nguyen TS, Lin C. A reversible data hiding scheme for VQ indices using locally adaptive coding. J Vis Commun Image Representation. 2011; 22:664-672.
12. Wanga ZH, Leeb CF, Chang CY. Histogram-shifting-imitated reversible data hiding. The Journal of Systems and Software. 2013; 86:315-323.
13. Wang L, Pan Z, Ma X, Hu S. A novel high-performance reversible data hiding scheme using SMVQ and improved locally adaptive coding method. J Vis Commun Image R. 2013; 25:454-465.
14. Qin C, Chang C. An inpainting-assisted reversible steganographic scheme using a histogram shifting mechanism. Ieee Transactions On Circuits And Systems For Video Technology. 2013, 23(7).