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DATA HIDING AND IMAGE COMPRESSION USING SMVQ AND DCT

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ABSTRACT: Propose a novel joint data hiding and compression scheme for digital image using side match vector quantization(SMVQ), discrete cosine transform(DCT) and image in painting. The two function data hiding and image compression can be integrated into single module seamlessly. On the sender side, except for the blocks in the leftmost and topmost of the image , each of the other residual blocks in raster scanning order can be embedded with secret data and compressed simultaneously by DCT and SMVQ adaptively according to the current embedding bit. VQ also utilizes for some complex blocks to control the visual distortion and error diffusion caused by the progressive compression. After segmenting the image compressed code into a series of sections by the indicator bits, the receiver can achieve the extraction of secret bits and image decompression successfully according to the index values in the segmented sections. Experimental results demonstrate the effectiveness of the proposed scheme.

INDEX TERMS: side match vector quantization, discrete cosine transform, vector quantizer.

I INTRODUCTION

The rapid development of internet technology, people can transmit and share digital content with each other conveniently. In order to guarantee communication efficiency and save network bandwidth. Compression technique can be implemented on digital content to reduce redundancy and the quality of decompressed version should also be preserved. Nowadays most digital content especially the digital images and videos are converted into the compressed form for transmission. Another important issue in an open network. Environment is how to transmit secret or private data securely. Even though traditional cryptographic methods can encrypt the plaintext into the cipher text, the meaningless random data of the cipher text may also arouse the suspicious from the attacker. To solve this problem, information hiding technology have been widely developed in both academic and industry, which can embed secret data into the cover data imperceptibly. Due to the prevalence of digital images on the internet, how to compress images and hide secret data into compressed images efficiently deserve in-depth study.

As one of the most popular lossy data compression algorithms, DCT is widely used for digital image compression due to it's simplicity and cost effectiveness in implementation. During the DCT compression, the Euclidian distance is utilized to evaluate the similarity between each image block and the code words in the codebook. The index of the codeword with the smallest distance is recorded to represent block. In this paper the main work is data embedding in SMVQ related image compressed codes.

The weighted Euclidean distance(WCD) was utilized to increase the probability of SMVQ for a high embedding rate. The restoration of the original DCT compressed image can be achieved at the receiver side. However in above all the mentioned schemes, data hiding is always conducted after compression. Which means the image compression process and data hiding process are two independent modules on the server or sender side. Under the circumstance, the attacker may have the opportunity to intercept the compressed image without the watermark information embedded, and the two independent modules may cause a lower

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efficiency in applications. Thus in this work we not only focus on the high hiding capacity and recover quality, but also establish a joint data hiding and compression (JDHC) concept to integrate the data hiding and image compression into a single module seamlessly, which can avoid the risk of the attack from interceptors and increase the implementation efficiency.

III DESIGN PROCEDURE

in all of the schemes, data hiding is always conducted after image compression, which means that the compression and data hiding processes are two independent modules on the sender side. Under this circumstance the attacker may have the opportunity to intercept the compressed image without the water mark. The proposed method that requires de clustering be performed on the main codebook and on each state codebook. De clustering for the main codebook can be performed in offline in advance, while a state codebook requires only 254 operations to compute all code word distortions from current blocks of the main codebook.

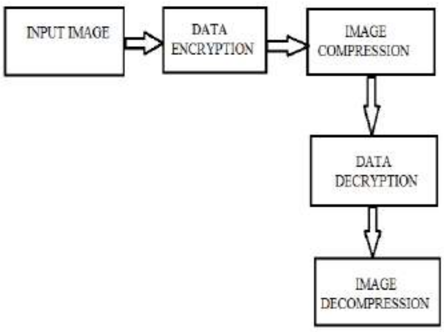

fig 3.1 block diagram

in other words, this method requires S-2 operation to form a state codebook than SMVQ requires. Threshold setting is used to adjust the performance of the proposed method. A suitable threshold setting helps user to get desired compression image outcome. Then the problem becomes one of the finding trade-off between image quality and compression rate. The comparison results for different threshold settings when the sizes of the main codebook and the state codebook are 256 and 8 respectively. The PSNRs of the proposed method are higher than the others and are very close when TH= 20 or 10. A user may use a larger threshold to get better compression rate. Hence in order to fulfil all these requirements this new system is being implemented. In this proposed method data hiding is performed by using SMVQ technique and compression through DCT and both are combined together to form a single module respectively.

IV DATA EMBEDDING PROCEDURE

In this proposed scheme, the indices in the first row and first column of the index table, are called seed indices and will be kept unchanged and don't carry any secret data. The data embedding procedure embed data in residual indices as follows.

Input : a VQ index table, the secret bit stream, a codebook

(n=codebook size , b=[log $_2$n]), and parameter c(d=b-c, r=2d-1)

Output: the embedded index table for each index Ii do

Step 1: compute SMD for all code words in the codebook and then sort the codebook based on SMD

Step 2: find Pi which is the position of Ii in the sorted codebook.

Step 3: embedded index Ii′ is obtained based on Pi according to the following two cases:

Case 1(Pi<r): retrieve next c secret bits and compute it's decimel value Sk. Then compute Pi′ which is the position of the embedded index as follows: Pi′=Pi * 2c +Sk. Then index Ii′ which is the index located in the position Pi′ of the sorted codebook is sent to the output as embedded index.

Case 2(Pi≥r): retrieve next c secret bits and compute it's decimal value Sk. Then compute Pi′ which is the position of an index as indicator as follows: Pi′=Pi *2c +Sk and then send nIi′║Ii to the output, where Ii′ is the index located in the position Pi′ of the sorted codebook and Ii is current index and ║ is the concatenation operation.

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V DATA EXTRACTION AND ORIGINAL VQ INDEX TABLE RECOVERY PROCEDURE

Input: a VQ index table, stream, secret bit, codebook

n= codebook size, b=[$\log_2 n$]), and parameter c(d=b-c, r=2d-1)

output: the original VQ index table and the secret bit stream for each embedded index Ii′ do:

Step 1: compute SMD for all codewords in the code book and then sort the codebook based on SMD

Step 2: find Pi′ which is the position of current embedded index Ii′ in the sorted codebook.

Step 3: compute Pi as follows: Pi′/2c extract secret data Sk by Sk= Pi′-Pi*2c and convert that to it's binary format in c bits and concatenate with previously extracted secret bits.

Step 4: recover original index Ii based on Pi according to the following two cases:

Case 1(Pi<r): find original index Ii in the position Pi of the sorted codebook.

Case 2(Pi=r): retrieve next index from embedded index table as original index Ii.

VI SIMULATION RESULTS

Fig 6.1 Input image

Fig 6.2 Encrypted image

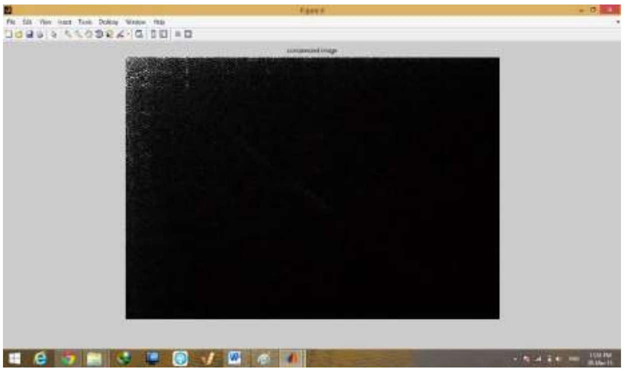

Fig 6.3 Compressed image

Fig 6.4 Decompressed image

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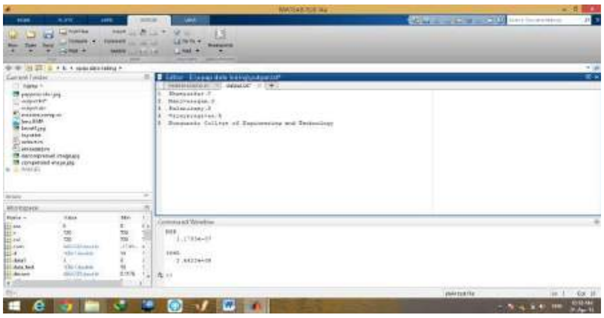

Fig 6.5 result for college image

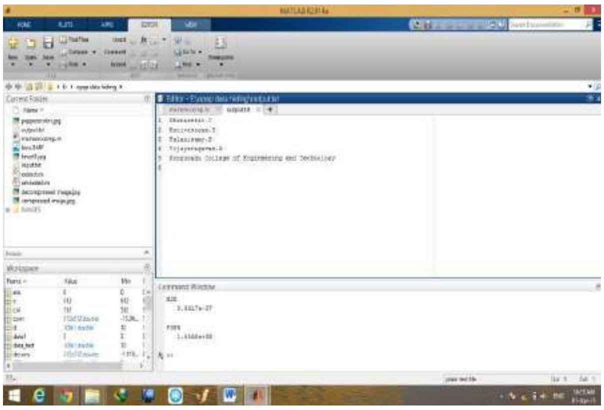

Fig 6.6 Result for lena image

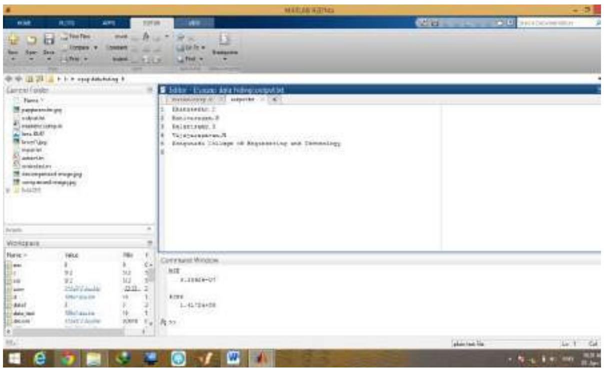

Fig 6.7 Result for peppers image

VII Comparison table

Images	PSNR	MSE
College	2.6622e+08	2.1785e-07
Lena	1.4566e+08	3.9817e-07
peppers	1.6172+08	3.5862e-07

Table 7.1 Comparison of results

VIII comparison graph

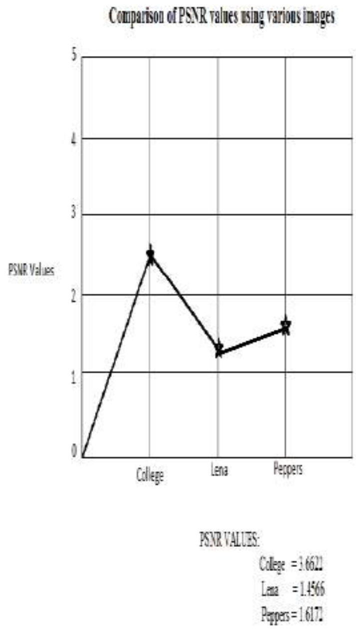

Fig 8.1Comparison of PSNR values

IX CONCLUSION

A joint data hiding compression scheme by using SMVQ and PDE-based image in painting. The blocks, except for those in the leftmost and topmost of the image, can be embedded with secret data and compressed simultaneously, and the adopted compression method switches between SMVQ and image in painting adaptively according to the embedding bits. VQ is also utilized for some complex blocks to control the visual distortion and error diffusion. On the receiver side, after segmenting the compressed codes into a series of sections by the indicator bits, the embedded secret bits can be easily extracted according to the index values in the segmented sections, and the decompression for all blocks can also be achieved successfully by VQ, SMVQ, and image in painting. The experimental results show that our scheme has the satisfactory performances for hiding capacity, compression ratio and decompression quality. Furthermore, the proposed scheme can integrate the

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two functions of data hiding and image compression into a single module seamlessly.

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