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International Journal of Innovative Research in Computer Science and Engineering (IJIRCSE)
ISSN: 2394-6364, Volume – 1, Issue – 2. January 2015

Data Hiding and Compression Scheme Based on Image In painting

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***Abstract*— Nowadays, most digital content, especially digital images and videos, are converted into the compressed forms for transmission. Due to the prevalence of digital images on the Internet, how to compress images and hide secret data into the compressed images efficiently. Recently, many data-hiding schemes for the compressed codes have been reported, which can be applied to various compression techniques of digital images, such as JPEG ,JPEG2000 , and vector quantization (VQ). VQ is also utilized for some complex blocks to control the visual distortion and error diffusion caused by the progressive compression. The new idea is that one can side match vector quantization (SMVQ) and image inpainting. The two functions of data hiding and image compression can be integrated into one single module seamlessly. the receiver can achieve the extraction of secret bits and image decompression successfully and securely, according to the index values in the segmented sections.**

Keywords*— *Data hiding, image compression, side match vector quantization, image inpainting.

I. INTRODUCTION

With 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 techniques can be implemented on digital content to reduce redundancy, and the quality of the decompressed versions should also be preserved.VQ compression process, the Euclidean distance is utilized to evaluate the similarity between each image block and the codewords in the codebook. The index of the codeword with the smallest distance is recorded to represent the block. Thus,an index table consisting of the index values for all the blocks is generated as the VQ compression codes. Instead of pixel values, only the index values are stored, therefore, the compression is achieved effectively. The VQ decompression process can be implemented easily and efficiently because only a simple table lookup operation is required for each received index. In this work, we mainly focus on the data embedding in VQ-related image compressed codes.Side match vector quantization (SMVQ) was designed as an improved version of VQ , in which both the codebook and the subcode books are used to generate the index values, excluding the blocks in the leftmost column and the top most row. SMVQ In the proposed scheme, rather than two separate modules, only a single module is used to realize the two functions, i.e.,image compression and secret data embedding, simultaneously. The image compression in our JDHC scheme is based mainly on the SMVQ mechanism. According to the secret bits for embedding, the image compression based on SMVQ is adjusted adaptively by incorporating the image inpainting technique.

II. PROPOSED SYSTEM

According to the secret bits for embedding, the image compression based on SMVQ is adjusted adaptively by incorporating the image inpainting technique. In proposed an SMVQ-based secret-hiding scheme using adaptive index. The weighted squared Euclidean distance (WSED)was utilized to increase the probability of SMVQ for a high embedding rate. In order to make the secret data imperceptible to the interceptors, data hided secret data into the SMVQ compressed codes of the image by using a partially sorted codebook . The restoration of the original SMVQ-compressed image can be achieved at the receiver side. After receiving the secret embedded and compressed codes of the image, one can extract the *embedded secret bits successfully during the image decompression.*

III. IMAGE COMPRESSION AND SECRET DATA EMBEDDING

As an extension of VQ, SMVQ was developed to alleviate the block artifact of the decompressed image and increase the compression ratio, because the correlation of neighboring blocks is considered and the indices of the subcodebooks are stored. In our scheme, the standard algorithm of SMVQ is modified to further achieve better decompression quality and to make it suitable for embedding secret bits.In our scheme, the sender and the receiver both have the same codebook Ψ with W code words, and each code word length is n2. Denote the original uncompressed image sized M ×N as **I**, and it is divided into the non-overlapping n × n blocks. For simplicity, we assume that M and N can be divided by n with no remainder. Denote all k divided blocks inraster-scanning order as **B**i, j, where k = M × N / n2, i = 1, 2, …, M / n, and j = 1, 2, …, N / n. Before being embedded, the secret bits are scrambled by a secret key to ensure security. The blocks in the leftmost and topmost of the image **I**, i.e., **B**i, 1 (i = 1, 2, …,M / n) and **B**1, j (j = 2, 3, …, N / n), are encoded by VQ directly and are not used to embed secret bits. The residual blocks are encoded progressively in raster-scanning order, and their encoded methods are related to the secret bits for embedding the correlation between their neighboring blocks.

IV. SMVQ (SIDE MATCH VECTOR QUANTIZATION)

The image compression, the proposed scheme can achieve the function of data hiding that can be used for covert communication of secret data. The sender can transmit the secret data securely through the image compressed codes, and the receiver can extract the hidden secret data effectively from the received compressed codes to complete the process of covert communication. Additionally, because the secret data extraction in our scheme can be conducted independently with the decompression process, the receiver can obtain the secret bits at any time if he or she preserves the compressed codes.

We are using SMVQ in high capacity data hiding and color image encryption algorithm was developed to encrypt 64-bits of plaintext into 64-bits of cipher text efficiently and securely. The operations selected for the algorithm were table lookup, modulus, addition and bitwise exclusive or to minimize the time required to encrypt and decrypt data on 32-bit processors. A conscious attempt was made in designing the algorithm to keep the operations simple and easy to code while not compromising security. But during each round of Blowfish, the left and right 32-bits of data are modified unlike DES which only modifies the right 32-bits to become the next round's left 32-bits. This operation is different from the permutation function performed in DES.

The first block is entered to the decryption function and the same encryption key is used to decrypt the image but the application of sub keys is reversed. The process of decryption is continued with other blocks of the image from top to bottom.

V. IMAGE INPAINTING

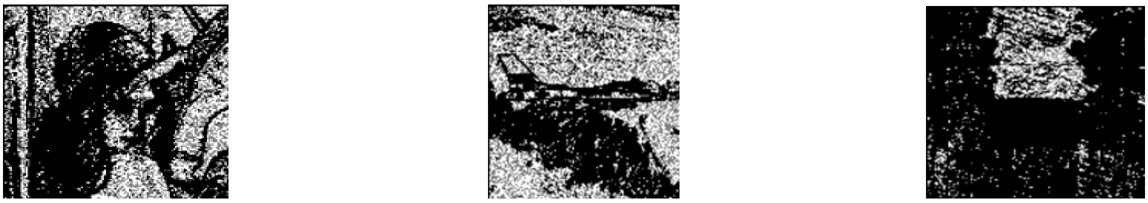
The concept of image inpainting is inherited from the ancient technique of manually repairing valuable artworks in an undetectable manner . Inpainting for digital images has found applications in such areas as repairing of damaged photographs, filling in or removing chosen areas, and wiping off visible watermarks. Image inpainting can generate or create image regions that initially do not exist at all, based on the useful information in the close neighborhood. Currently, there are mainly three classes of the image inpainting figure(1),(2).

i.e.,partial differential equation (PDE) based methods [34-36], interpolation-based methods [37], and patch-based methods[38]. Image inpainting can recover the image structural information effectively when the processed region is not too large.

(a) Lena (b) Airplane (c) Lake

Figure (1)Original image

i.e., VQ codeword, SMVQ codeword, or inpainting result, for the success of progressive mechanism. The used image inpainting technique is described in the next subsection detailedly. The whole procedure of image compression and secret data embedding finishes until all residual blocks are processed. Then, the compressed codes of all image blocks are concatenated and transmitted to the receiver side.



(a) Lena (b) Airplane (c) Lake

Figure (2) Inpainting image

A. Image Decompression and Secret Data Extraction

After receiving the compressed codes, the receiver conducts the decompression process to obtain the decoded image that is visually similar to the original uncompressed image, and the embedded secret bits can be extracted either before or during the decompression. After receiving the compressed codes, the receiver conducts the decompression process to obtain the decoded image that is visually similar to the original uncompressed image, and the embedded secret bits can be extracted either before or during the decompression Because the $(M + N - n) / n$ blocks in the leftmost and topmost of the image need to be used in the decompression for other residual blocks, they should be first decompressed b their VQ indices retrieved from the image compressed codes Each VQ index of these pre-decompressed blocks occupied log2 W bits. Then, the $k - (M + N - n) / n$ residual blocks are processed block by block in raster-scanning order. Figure shows the flowchart of decompression and secret bit extraction of its left and upper decompressed blocks show that figure(3).

a) Lena (b) Airplane (c) Lake

Figure (3) Decompressed image by using SMVQ and image inpainting.

VI. CONCLUSIONS

In this above paper, we proposed a joint data-hiding and compression scheme by using SMVQ and image inpainting. 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 SMVQ, and image inpainting. The results show that our scheme has the satisfactory performances for hiding capacity, compression ratio, and decompression quality. Furthermore, the proposed scheme can integrate the two functions of data hiding and image compression into a single module seamlessly.

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