AN INNOVATIVE APPROACH FOR DATA HIDING IN COLOUR IMAGES USING COMPRESSION TECHNIQUES

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Abstract - A combined data-hiding and compression scheme are proposed in colour images using pattern based side match vector quantization and patch based image inpainting. Data hiding and Image compression can be implemented into one single module. On the sender side, the blocks in boundaries of the image is compressed by Adaptive Vector Quantization, each of the other residual blocks can be embedded with secret data and compressed simultaneously by PSMVQ or patch based image inpainting. Adaptive Vector quantization is utilized for some complex blocks to control the visual distortion and error diffusion. After dividing the compressed image into blocks, the receiver can achieve the extraction of secret bits and image decompression successfully using PSMVQ and patch based image inpainting.

***Index Terms*– Data hiding, compression, adaptive vector quantization (AVQ), pattern based side match vector quantization (PSMVQ), and patch based image inpainting.**

I. INTRODUCTION

In day to day life, a large amount of information is stored, processed and transmitted digitally. In order to get efficient transmission and transmission capacity, compression methods can be performed on digital image to reduce the redundancy and quality of the decompressed image should be preserved. Another important issue in an open network environment is how to transmit secret or private data securely. Cryptographic methods can encrypt the plaintext into the ciphertext; the random data of the ciphertext may also arouse the suspicion from the attacker.

1. Compression

Compression is to reduce irrelevance and redundancy of the image data in order to store or transmit data in an efficient form. The two type of image compression are lossy or lossless. In Lossless compression, every single bit of data remains unchanged, when the image is uncompressed and all the information is completely restored. Lossy compression reduces the file size by permanently eliminating redundant information.

2. Data Hiding

In data hiding, each pixel in the cover image is modified to hide the secret information and the cover image is compressed to reduce the storage and the bandwidth space of the embedded image. Secret information is hidden into cover image by using a data hiding technique. Many data hiding techniques for the compressed data have been reported such as JPEG, JPEG2000 and vector quantization (VQ). Vector quantization based image data hiding schemes are proposed both reversible techniques and irreversible techniques. VQ technique is very simple and cost effectiveness in implementation. A combined data hiding and compression approach consists of directly embedding the binary data during the compression process. The main constraints that must be considered are tradeoffs between data payload, compression bit rate, computational complexity and distortion induced by the insertion of the message.

II. RELATED WORKS

Data hiding in compressed color image uses side match vector quantization (SMVQ) and

patch based Image Inpainting. In [1] Arjun Nichalet.al discuss the JPEG2000 compression system. Hiding Capacity is very important aspect for efficient secret communication. In this system Redundancy Evaluation method is used for increasing hiding capacity. This method determines embedding depth adaptively for increasing hiding capacity. I.e. without changing much image quality maximum secret data is embedded. In [2] B. Smithal and K.A. Navas discuss about the methodology of watermarking has been adapted for hiding data in many applications namely Electronic Patient Record (EPR) data hiding in images. Large sized images are stored without loss of redundancy. The JPEG (Joint Picture Expert Group) compression may be used on these image types without loss of diagnostic content. In [3]Che-Wei Lee et.al discuss the scheme of hierarchically dividing a cover image into smaller blocks for data embedding using the histogram shifting technique. This technique yields a large data hiding capacity and results in a high stego-image quality. In [4] Gregory K. Wallace discuss about JPEG method supports a wide variety of applications for continuous-tone images. In JPEG compression, Baseline method is sufficient for a large number of applications. But the application costs is very high. In [5] Hsien-Wen et.al. discuss about a high capacity data hiding method based on JPEG. This method employs a capacity table to estimate the number of bits that can be hidden in each DCT component so that the distortions in the stego-image can be avoided. In [6] Jagadish H.pujar et.al discuss the lossless technique for compression of Images during transmission and storage of the raw images. This compression technique is faster, memory efficient and simple suits the requirements of the user. In [7] Po-Chyi Su et.al discuss about steganography techniques in JPEG 2000 compressed images. In this system the challenges of covert communication in the state of art image codec are analyzed and a steganography scheme is proposed for reliably embed high volume data into JPEG2000 bit stream. In the encoder side, the original image first undergoes the forward image transform, which includes the inter-component transform and the intra-component transform. The decoder side reverses the operations by decoding and quantizing the bit-stream and applies the inverse image transform to reconstruct the image. In [8] Ranade et.al discusses the embedding algorithm, which is based on the quantized projection embedding method with some enhancement to achieve high embedding rates.

III. PROPOSED SYSTEM

To improve the compression ration Data hiding performed in compressed images and also improves secure communication and integrity of the data. Compression used to save the network bandwidth for efficient data transmission. SMVQ used to reduce the size of an image and patch based Image Inpainting used to improve the quality of the image.

IV. SYSTEM MODEL

In data hiding, cover image is divided into K x K blocks. In each block, correlations between neighbouring blocks are determined. Data is hidden into image based on the predicted value. The secret data is extracted from the cover image based on the index value. Figure 1 shows the architecture of the proposed system.

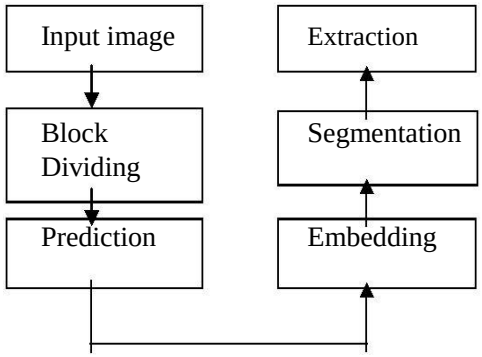


Figure 1: System Architecture

V. IMPLEMENTATION

A. EMBEDDING

In an embedding phase, both the sender and receiver have the same codebook. The input image size of L x W is represented as B and it is divided into k x k blocks. Then prediction method is applied to determine the correlation between neighboring blocks. High correlation between the blocks in the leftmost and topmost of the image can be compressed by Adaptive Vector Quantization (AVQ) and it is not used for data hiding. Figure 2

shows the procedure for embedding a n image into cover image.

For the given input image, current processing block is represented by B(x, y), Left and upper block are represented by B(x,y-1) and B(x-1,y) and Right and Lower block are represented by B(xn,yn-1) and B(xn-1,yn). After applying prediction in each block, the prediction error can b e measured. The Prediction error is compared with the threshold value for every image block. The threshold value is a fixed value and it is used to find the smooth and the complex region. If data can be embedded in the complex region then the embedded image is fully changed.

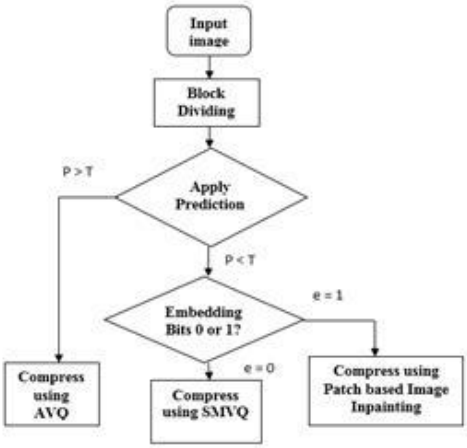


Figure 2: Flowchart for embedding an image

The attacker may hack the image an d finally the quality of the image may be changed. If an image can be embedded in the smooth region then the quality of the image can be preserved. If the Predicted error P is greater than the threshold T value then the Adaptive Vector Quantization (AVQ) is used. Adaptive Vector Quantization is used to improve the quality of the image and the compression ratio. If the Predicted error is less than the threshold value then the side match vector quantization (SMVQ) and patch based Image Inpainting methods are used. If the indicator bits for embedding are 0 then the side match vector quantization is used. If the indicator bits for embedding is 1 then the Image Inpainting is used.

B. EXTRACTION

In an Extraction Phase, sec ret bits are extracted from the cover image. Fig 2 shows the procedure for extracting the secret data from the cover image. The Output image is divided into blocks of image.

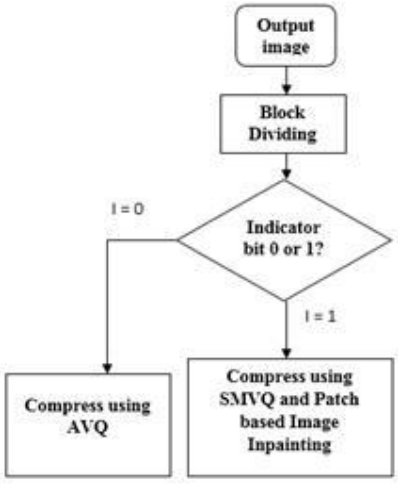
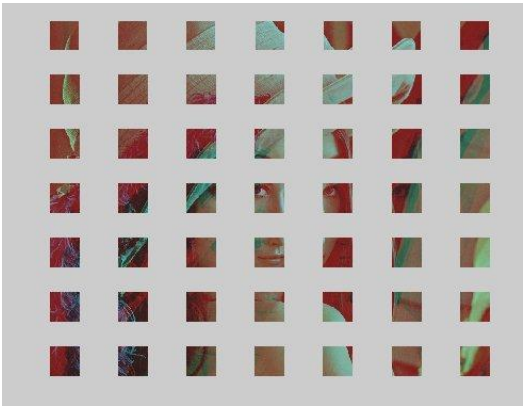


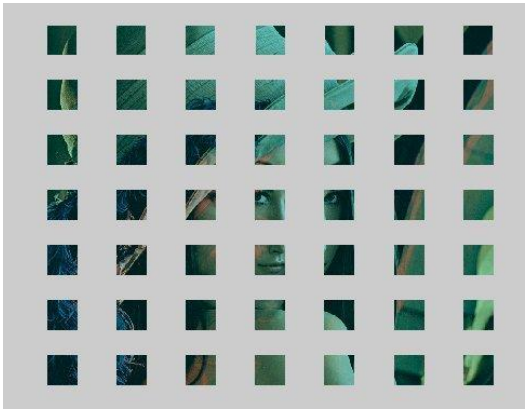
Figure 3: Flowchart for extract secret image

The secret image is extracted from the cover image using the index value. If the index value is equal to 0 then the side match vector quantization (SMVQ) is used. If the index value equal to 1 then the patch based I mage Inpainting method is used.

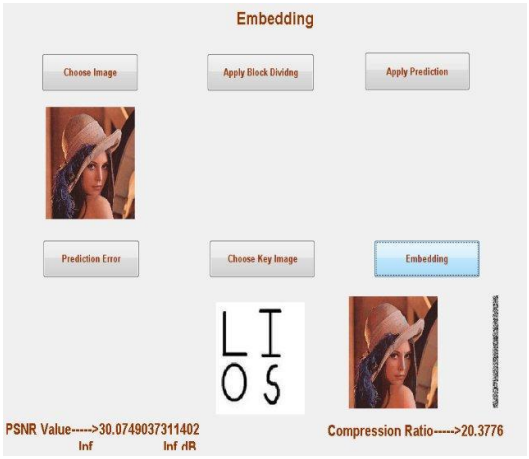
VI. RESULT



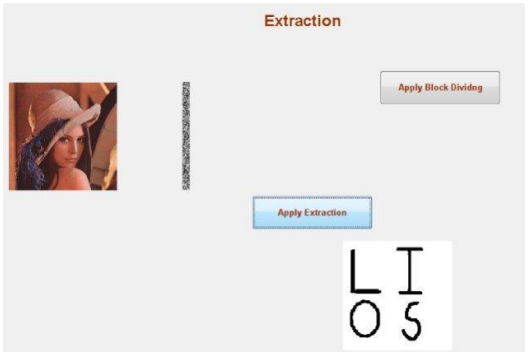
a. Prediction



b. Prediction error



c. Embedding



d. Extraction

VII. CONCLUSION

A combined Data-hiding and Compression scheme are proposed 0by using pattern based Side Match Vector Quantization and patch based Image Inpainting. Adaptive Vector Quantization is utilized to control the visual distortion. Color images are used. The proposed system will be capable of providing high Data hiding capacity, High compression ratio and Decompression Quality.

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