Asian Journal of Science and Applied Technology
ISSN: 2249-0698 (P) Vol.5 No.2, 2016, pp.31-34

DOI: https://doi.org/10.51983/ajsat-2016.5.2.932

A Study on Novel Method of Facial Image Compression Using Master Code

M. Reni Sagayaraj[1], R. Sathishkumar[1*] and S. Anand Gnana Selvam[2]
[1,2]Department of Mathematics, [1*]Department of Computer Science, Sacred Heart College,
Tirupattur, Tamil Nadu, India
Email: sathishsaisu@gmail.com
(Received 1 October 2016; Revised 23 October 2016; Accepted 15 November 2016; Available online 23 November 2016)

Abstract - **In this paper, face images are studied in the context of detection and recognition. In the literature, the problem of compressing human frontal facial images has been addressed. The images that are dealt are passport-type photos namely, full face, frontal view, plain background, no dark glasses, without hates and other non-standard clothing. Compression of Facial Images by using IDL is carried out in this paper. The facial images dealt with are passport-type photos-full face, frontal view. Three different photos of the same person are stored. A single code book is generated and compression is carried out. Appreciable PSNR values are obtained for different block sizes. This paper introduces a method to compress and decompress the facial image, so that it is visually appealing, at a quality sufficient to an un-mistakenly visually identify a given subject.**
Keywords: **Facial Image Compression, Master Code**

I.INTRODUCTION

Increase in the use of images in many different applications are Identified. This is mainly due to: i) technological advances impacting several image operations; ii) the availability of sophisticated software tools for the manipulation and management, and iii) the World Wide Web (WWW) providing easy access to a wide range of users. Typical applications using huge amounts of images are medical imaging, remote sensing, entertainment, digital libraries, distance learning and training and multimedia.

Digital images require huge amounts of space for storage and large bandwidths for transmission. For example, a single 640 x 480 pixel color image using 24 bits/pixel requires close to one megabyte of space. Despite the technological advances in storage and transmission, the demands placed on the storage capacities and on the bandwidth of communication exceed the availability. Image compression has proved to be a viable technique as one solution response.

Digital images generally contain significant amount of spatial and spectral redundancy. Spatial redundancy is due to the correlation between neighboring pixel values, and spectral redundancy is due to the correlation between different color planes. Image compression (coding) techniques reduce the number of bits required to represent an image by taking advantage of these redundancies. An inverse process called decompression (decoding) is applied to the compressed data to get the reconstructed image. The objective of compression is to reduce the number of bits as much as possible, while keeping the resolution and the visual quality of the reconstructed image as close to the original image as possible.

The problem of image compression has been thoroughly explored for years and efficient general purpose compression algorithms are available today. Much less attention has been given to the problem of image compression for the case in which a strong prior is available for the class of image to be compressed. This happens, for example, when the input belongs to a certain, a prior known and possible very specific class of images. It is expected that for such specific cases an even more efficient compression should exit, outperforming general purpose algorithms.

Compression of still images is a very active and matured field of research, vivid in both research and engineering communities. Compression of images is possible because of their vast spatial redundancy and the ability to absorb moderate errors in the reconstructed image. This field of work offers many contributions, some of which became standard algorithms that are widespread and popular [1-5]. Among the many methods for image compression, one of the best is the JPEG2000 standard-a general purpose wavelet based image compression algorithm with very good compression performance [24-25].

This paper introduces a new approach to compress and decompress the facial image, so that it is visually appealing, at a quality sufficient to an un-mistakenly visually identity a given face. The ferret database (Standard facial database available in the web) is used for our research work. Appreciable PSNR values are obtained for different block sizes.

II. FACIAL IMAGES COMPRESSION

Face images are common, and as such are extensively studied in the literature especially in the context of detection and recognition. Remarkably, among the many thousands of papers that discuss ways to compress still images in general, only few address the compression of face images

[6-21]. Assumptions on the images content, and tailoring Compression algorithm that exploit these assumptions, lead these contributions to a variety of solutions.

III. PROPOSED METHODOLOGY

A. Architecture of the FICMCB

Compression of facial images is an appealing problem, both in research and in applications. Application-wise, facial images are perhaps the most popular images, held in large databases by various organizations, and efficient storage of such images is of value. The images are divided into small blocks of size 8x8 (a parameter of the algorithm). We use 8x8 blocks to minimize blackness effects.

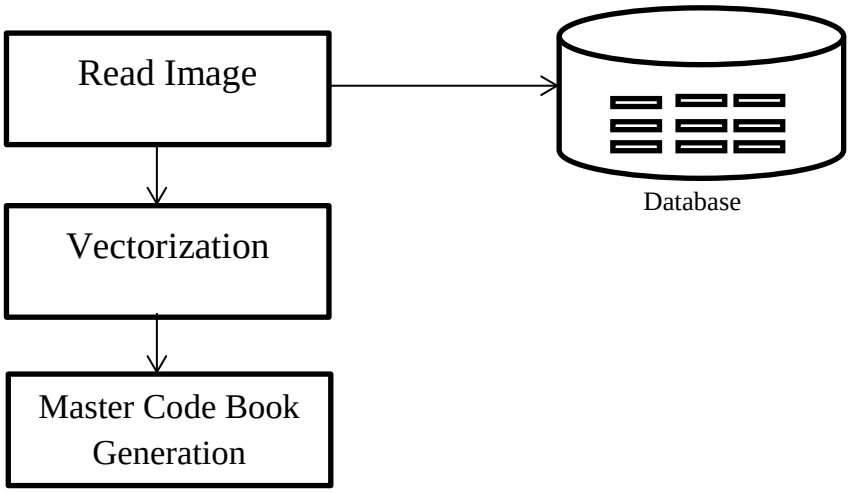

Fig.1 Master Code Book Generation

The images are read from the database. The pixel values are vectorised. The master code book is generated. Initially the code book is zero. The code book size is 0 to 1024. This process is illustrated in Fig. 1.

Quantization involved in image processing, is a lossy compression technique achieved by compressing a range of values to a single quantum value. When the number of discrete symbols in a given stream is reduced, the stream becomes more compressible.

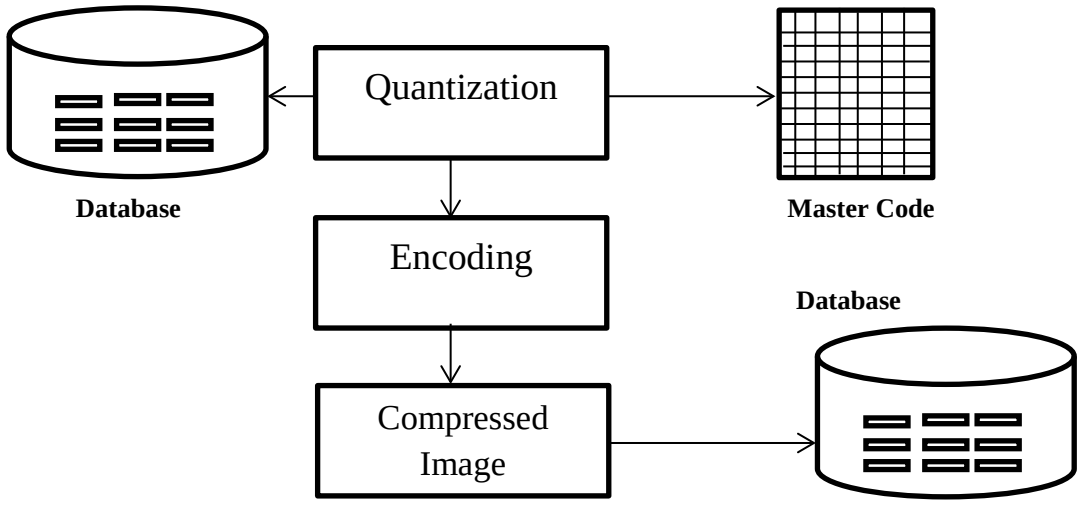

Fig.2 Vector Quantization

Quantization is performed considering a threshold value. Encoding is performed using Huffman coding. The compressed image is stored in a separate database. This process is illustrated in Fig. 2

Reconstruction of the Facial image is done as follows. The compressed image is read from the database and decoding is done using Huffman coding. Dequantization is performed by using the values in the master code book. This process is illustrated in Fig. 3

The algorithm used for creating the master code book is given in section 3.2

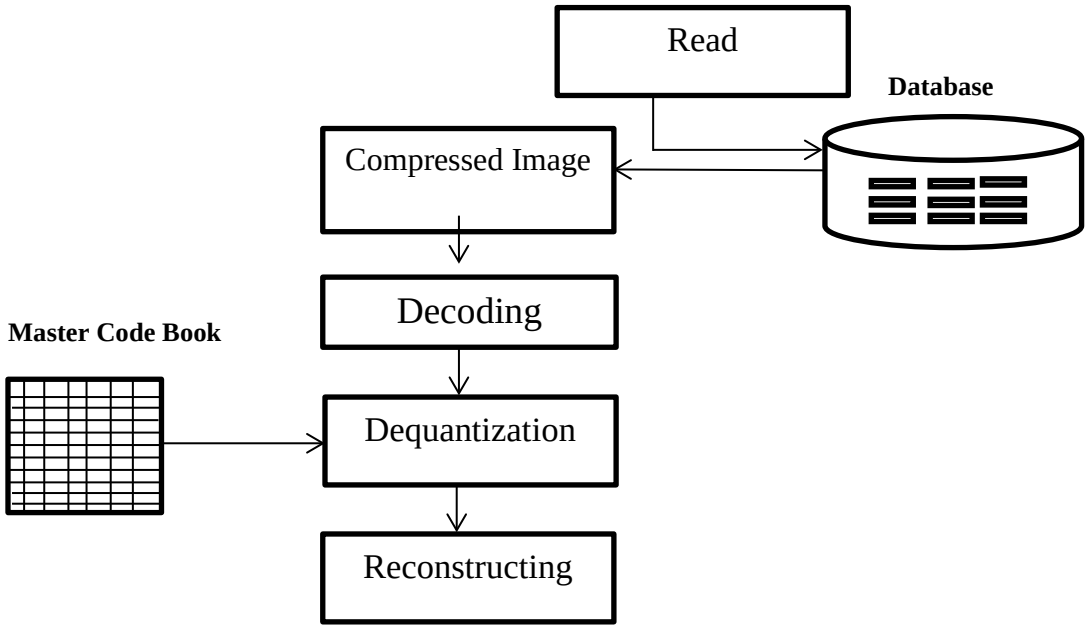

Fig.3 Reconstructing The Facial Image

B. Algorithm

Creating master code book
Master Code book contains codes for the images trained which is used for compression

1. Open the file which contains the code book if exists
2. Read the images one by one
3. Divide the image into 8x8 blocks
4. Resize into a one dimensional array of 64
5. Whether the code book contains the similar code
   Similarity can be tested using the Euclidean distance with allowed
   Tolerance level
   If so, not to be added into the codebook
   If not, add into the code book and increment the size of code book
6. Repeat the step 5 for all blocks in the given image
7. Go to step 2 if any more images added to the code book
8. Write into the files
9. End

Compression using the code book

1. Open the code book file
2. Read the image to be compressed
3. Divide into 8x8 blocks
4. Compare the block with the codebook codes
5. The block is matched with the code and replaced by the code
6. Repeat the process until blocks are coded
7. PSNR is computed to know the compression ratio
8. Image is reconstructed from the compressed code
9. End.

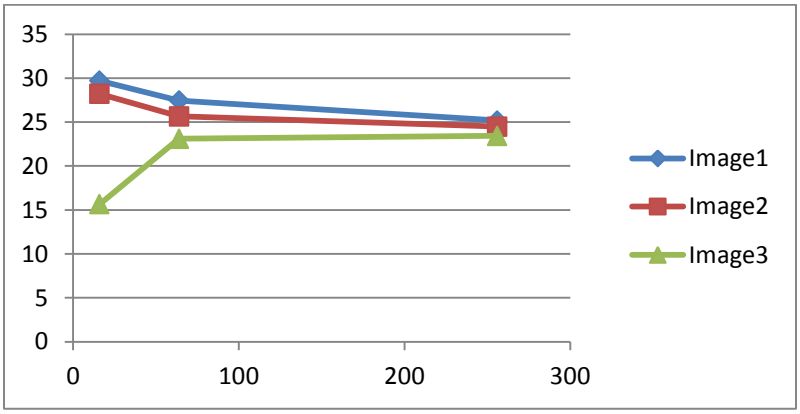

Fig.4 Block Width vs PSNR

TABLE-1 PSNR VALUES OF IMAGES

Image	PSNR		
	16	64	256
1	29.72	27.45	25.18
2	28.21	25.65	24.48
3	15.65	23.10	23.43

IV.CONCLUSION

Importance of Facial images are understood and studied in the context of detection and recognition. The images that are dealt are passport-type photos namely, full face, frontal view, plain background, no dark glasses, without hats and other non-standard clothing. Compression of Facial Images by using IDL is carried out in this project work. This facial images dealt with are passport-type photos-full face, frontal view. Three different photos of the same person are stored. A single master code book is generated and compression is carried out. Decompression is made using the Master code book the ferret database is used for our experiment. Appreciable PSNR values are obtained for different block sizes. This paper introduces a method to compress and decompress the facial image, so that it is visually appealing, at a quality sufficient to an un-mistakenly visually identify a given face. We can define a set of thirteen facial features. Six of them can be anchored to facial anatomical landmarks-eyes, nose, mouth and chin and the rest are along the face outline. Using the facial features, we can revise our compression algorithm and the results can be studied as our future work.

REFERENCES

[1] Bryt O and Elad M, "Compression of Facial Images using K-SVD Algorithm", Journal of Visual Communication and Image Representation, Vol. 19(4), oo, 270-283, 2008.

[2] Bryt O and Elad M, "Improving the K-SVD Facial Image Compression Using a Linear DeblockingMethod",http://www.cs.technion.ac.il/~elad/publications/conferences/2008/IEEE_08_Deblocking.pdf

[3] Burt P.J. and Adelson E. H., "The Laplacian Pyramid as a Compact Image Code", IEEE Trans. Commmun., Vol. COM-31, No.4, pp.532-540, Apr. 1983.

[4] Cosman P., Gray R., and Vetterli M., "Vector Quantization of Images Sub Bands: A Survey". IEEE Trans. Image Process, Vol. 5, No.2, pp 202-225, Feb. 1996

[5] Delac Kresimir, Sonja Grgic and Mistlav Grgic., "Image Compression in Face Recognition: A Literature Survey. Recent Advances in Face Recognition, Book edited by: Delac Kresimir: Dec. 2006.

[6] Ferreira A.J. and Figueiredo M.A.T., "Image Compression Using Orthogonalized Impendent Components analysis", in Proc. Int. conf. images processing, Barcelona, Spain, Sep. 2003, pp.14-17.

[7] Ferreira A.J. and Figueiredo M.A.T., "Image Compression Using Orthogonalized Impendent Components Bases", in Proc. IEEE XIII Workshop on Neural Networks for Signal Processing, Toulouse, France, Sep. 2003, pp.17-19.

[8] Ferreira A.J. and Figueiredo M.A.T., "On the uses of Independent component analysis for images Compression", Signal Process: Image Commun, Vol. 21, No.5, pp. 378-389, 2006.

[9] Gersho A. and Gray R. M. "Vector Quantization and Signal Compression", Dordrecht, The Netherlands: Kluwer, 1992.

[10] Gerek O. N. and Hatice C., "Segmentation Based Coding of Human Face Images for Retrieval". Signal Process., Vol.84, No.6, pp.1041-1047, 2004.

[11] Hazan T., Polak S., and Shashua A., "Sparse Image Coding Using A 3D Non-Negative Tensor Factorization", in Proc. 10th IEEE Int. Conf. Computer Vision, Beijing, China, Oct. 2005, pp. 17-21.

[12] Hu J.H., Wang R.S., and Wang Y., "Compression of Personal Identification Pictures using Vector Quantization with Facial Feature Correction", Opt. Eng. Vol. 35, No. 1, pp. 198-203, 1996.

[13] Huang J. and Wang Y., "Compression of Color Facial Images Using Feature Correction Two Stage Vector Quantization", IEEE Trans. Image Process., Vol.8, No.1, pp.102-109, Jan 1999.

[14] Inoue K. and Urahama K., "DSVD: A Tensor-Based Image Compression and Recognition Method", in Proc. IEEE Int. Symp. Circuits and Systems, Kobe, Japan, May 2005, pp. 23-26.

[15] Lanitis A., Taylor C.J., and Cootes T.F., "Automatic Interpretation and Coding of Face Images using Flexible Models", IEEE Trans. Pattern Anal. Mach. Intell., Vol. 19, No. 7, pp. 742-756, Jul. 1997.

[16] Linde Y., Buzo A., and Gray R.M., "An Algorithm for Vector Quantize Design", IEEE Trans. Commun., Vol. COM-28, No.1, pp. 84-5, Jan.1980.

[17] Moghaddam B. and Pentland A., "An Algorithm System for Model Based Coding of Faces", presented at the DCC Data Compression Conf. Snowbird, UT, Mar. 28-30, 1995.

[18] Pasi Franti., "Lecture Notes on Image Compression", University of JOENSUU, 2002.

[19] Qiuyu Z. and Suczhong W., "Color Personal ID Photo Compression Based on Object Segmentation", in Proc. Pacific Rim Conf. Communications, Computers and Signal Processing, Victoria, BC, Canada, Aug. 2005, pp.24-26.

[20] Sakalli M., Yan H., Lam K. M., and Kondo T., "Model-Based Multistage Compression of Human Face Images". In Proc. 14th Int. Conf. Pattern Recognition, Brisbane, Qld, Australia, Aug. 1998, pp. 16-20.

[21] Sakalli M and Yan H., "Feature- Based Compression of Human Face Images", Opt. Eng., Vol. 37, No. 5, pp. 1520-1529, 1998.

[22] Sakalli M and Yan H., and Fu A., "A Region-Based Scheme using Rklt and Predictive Classified Vector Quantization", Comput. Vis. Image Understand., Vol. 75, No. 3, pp. 269-280, 1999.

[23] Shashua A and Levin A., "Linear Image Coding for Regression and Classification using The Tensor-Rank Principle", in Proc. IEEE Computer Society Conf. Computer Vision and Pattern Recognition, Kauai. HI, Dec. 2001, pp 8-14.

[24] Taubman D. S and Merceiln M "Image Compression Fundamental, Standards and Practice" Norwell, MA:Kluwer, 2001.

[25] J.E. Vila-Forcen, S. Voloshynovskiy, O. Koval, and T. Pun, Facial Image Compression Based on Structured Codebooks in over complete Domain, EURASIP Journal on Applied Signal Processing, 2006, Article ID 69042., Pages 1-11.