Design of LBG Image Compression by Using VHDL Simulation

Mr. Rahul. R. Ade **Mr. Ashish B. Kharate**

Abstract— **Image compression is concerned with minimizing the number of bits required to represent an image. Compress image will transfer higher speed and higher transfer rate. The algorithm used for this paper is Linde, Buzo and Gray (LBG) algorithm. The basic requirement for this paper is codebook generation. The generation of codebook store into VHDL file handling process. The VHDL file handling concept used for the quantization. This process of file handling will convert in blockwise conversion in a set of pixel value. The block array splitting by using Pairwise Nearest Neighbor (PNN) principle. The compression algorithm performance can be measured in a Compression Ratio (CR), Peak Signal to Noise Ratio (PSNR).**

Index Terms— **Vector Quantization (VQ), LBG Algorithm, Image compression, Codebook Generation.**

I. INTRODUCTION

The main goal of image compression is to minimize image data volume with no significant loss of information. The compression technique represent image data using fewer bits than what is required for original image. Application of compression are primarily in transmission and storage of information.

Image compression algorithm aim to remove redundancy in data in a way which makes reconstruction possible. Compression is the main goal of the algorithm to represent image using fewer bits per pixel, without losing the ability to reconstruct the image.

Compression method can be divided into two principle groups: lossless compression which has information preserving compression permit error-free data reconstruction; while lossy compression loss of information do not preserve the information completely. Although lossy compression techniques can give substantial image compression with very good quality reconstruction.

More compression is achieved in case of lossy compression than lossless compression. Compression techniques have been developed such as vector quantization, block truncation method, transform coding, hybrid coding & various adaptive versions of this method. Among this vector quantization is a popular technique used for data compression. Dividing an image into small blocks and representing these blocks as vectors. The basic idea approach comes from information theory, which states that the better compression performance can always be achieved by coding vectors instead of scalars. Input data vectors are coded using unique codeword's from a codeword dictionary.

The codeword choice is based on the best similarity between the image blocks represented by a coded vector and image blocks represented by codeword's from dictionary. The codebook is transmitted together with the coded data. The advantage of vector quantization is a simple receiver structure consisting of a look-up table. A good codebook is required because the reconstruct image highly depends on the codeword's in this very codebook. The generated codebook store into text file for VHDL file handling or data array in VHDL code.

The algorithm for the design of VQ is referred to as LBG algorithm; and it is based on minimization of the squared-error distortion measure. LBG proposed the VQ schemes for gray scale image compression and it has proven to be a powerful tool for both speech & digital image compression.

The VQ fall under three major procedures such as codebook generation, encoding process and decoding process. In the codebook generation process various images are divided from training vectors. The codebook is generated by using PNN principle. The encoding process, any arbitrary vector corresponding to a block from the image & in decoding process codebook which is available at the receiver end. The advantage of VQ is simple receiver structure consisting of look-up table.

II. LITERATURE REVIEW

Image compression maps an original image into bit stream suitable for communication over storage in a digital medium. The number of bits required to represents the coded image should be smaller than that required for original image. The VQ is popular technique used for data compression. Compression is achieved by forming vectors from a training data sequences, grouping similar vectors into clusters and assigning each cluster with a single representative vector. The nearest cluster representative referenced by a simple cluster index. The list of all cluster representative forms as codebook and each coding known as codeword [1].

Vector quantization is one the lossy compression based image compression technique [2].

For using VQ a fast LBG codebook is generated. The LBG algorithm is an iterative procedure. Starting with initial segmentation of the training set. The completion codebook is updated centroid of these training vectors. The new generation codeword stored into average distortion in the codebook design procedure. This method will provides a good way to reduce computation cost in codebook training process [3].

The VQ based image compression technique has major three steps i.e. codebook design, encoding and decoding process. The VQ technique depend on constructed codebook. A widely used technique for VQ codebook design is LBG algorithm. These algorithm depends on codebooks [4].

The codebook is generation by using VQ technique. In the VQ examined 16 pixels from non-overlapping block of 4x4 pixels [5].

A residual codebook similar to vector quantization codebook is generated that represent distortion produced in VQ. Using this residual codebook the distortion in the reconstructed image is remove so increase the image quality [6].
Vector in image domain are formed as compact little connect of adjacent pixel quality or efficiency can attained by size of block [7]. In the image domain strategies for forming vectors are relatively simple. Image pixels that are closer together are highly correlated & VQ performs better if its input vector have component that are more highly correlated. Therefore vector in image domain are form collection of adjacent pixels [8]
An adaptive VQ technique for image compression is presented. The LBG algorithm consist three phase i.e. initial phase, adopted LBG & redundant generated codebook [9].

III. PROPOSED WORK

The vector quantization is done by three process i.e. codebook generation, encoding process & decoding process. The first how to be codebook generated procedure will done. Image is stored as a two dimensional array of integers. The input image is stored as set of pixel array. These image provide information pixel by pixel data. The pixel represent single bytes i.e. converts eight bit into [128 128] block in binary form. In preprocessing process write a code in matlab. The input image is read single dimension vector quantization in binary form to get codebook generation.

Generated codebook used VHDL file handling concept for quantization. This process of image text file will convert in blockwise conversion.

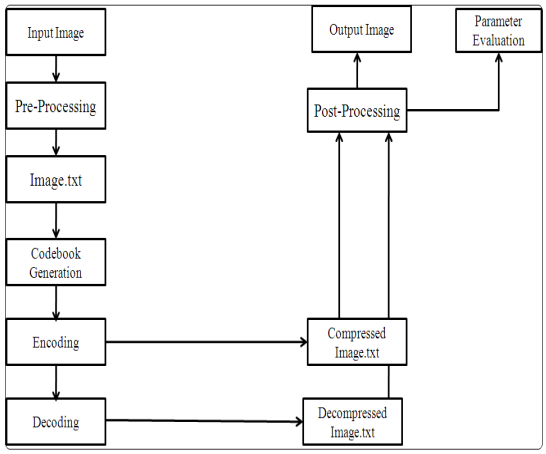

Fig. System Architecture

The image to be encoded is segmented into set of input image vectors and get compress image text file and decoding process to achieved single data. It is comes under in matrix form i.e. single dimension binary data to convert in matrix form and it is display in a form of image. The compression performance measured in a compression ratio and peak signal to noise ratio

IV. RESEARCH & METHODOLOGY

The objective of paper is to compress image using the Linde, Buzo and gray algorithm. The algorithm can be explained few simple steps.

Step1: First find the original image. By using matlab program get original image. The image resize by [128 128] then show image by using matlab program.
Step2: The original image read in single dimension vector quantization in binary form.

Step3: The algorithm requires initial codebook to start with by using modelsim software.

Step4: Generated codebook store into text file for VHDL file handling or data array in VHDL code.

Step5: To convert the whole image into 4x4 block size.

Step6: Encode/convert each block to value which codebook use and store in text file or send these encode values as compress image data.

Step7: The decoding process is reverse operation for getting decompress values.

Step8: Using matlab post processing code output of image will display.
For this steps use both matlab and VHDL Handling process.

CONCLUSION

In this paper image compression technique reducing the amount of data with no significant loss of information. The fundamental goal of this paper is using LBG algorithm. These Algorithm in community of vector quantization for purpose of data compression. The LBG used for to remove redundancy in data reconstruction makes possible.

The most important things requirement for this paper is generation of codebook. This codebook used for compression and decompression text value. The generated codebook store into VHDL file handling process.

FUTURE SCOPE

File size reduction most significant benefit of image compression. Some electronic device may load large images i.e. cant read data at a specific rate so that by using image compression allows faster loading of data on slower device.

The future enhancement focus on LBG algorithm is easy, rapid, efficient and simple algorithm which saves computation cost and time. It also ensure for developing vector quantization technique is less storage space, less transfer time, less image viewing and loading time such that faster file transfer will possible.

REFERENCES

[1] Peter Veprek, A. B. Bradley "An improved algorithm for vector quantization design" 1070-9908 IEEE.
[2] Dr. H. B. Kekre and Tanuja Sarode "New Clustering Algorithm For Vector Quantization Using Rotation of Error Vector" IJCSIS Vol.7 No.3 2010.
[3] Chin-Chen Charng and Yu-Chen-Hu "Fast LBG codebook Training Algorithm for Vector Quantization" 0098-3063/98/IEEE.
[4] Arup Kumar Pal and Anupsar "An Efficient Codebook Initialization using LBG Algorithm" IJCSEA Vol.1 No.4 Aug 2011.
[5] Christina Ni Dhalaigh "Vector Quantization: Codebook Generation" Department of Electronic & Electric Engineering 2012.
[6] K. Somasundaram and S. Domic "Modified Vector Quantization Method for Image Compression" World Academy of Science, Engineering And Technology,2006.
[7] Y. Linde ,A. buzo, & R.M. Gray "An Algorithm for Vector Quantazation" IEEE Transactions communications vol.28, pp.84-95 Jan 2003.
[8] Pamela C. Cosman, R. M. Gray, & Martin Vetterli "Vector Quantization for Image Compression: A Survey" Feb 1996 IEEE.
[9] Abadatief H. Abouli "Image Compression using Adaptive LBG" Aug -13 IEEE.
[10] "Digital Image Processing" by Rafael C. Gonzalez &Richard E. woods
[11] "Digital Image Processing" by S. Jayaraman, S. Esakkirajan, T.Veerakumar-Tata Mc Graw.