International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 3 Issue 6, October 2019 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Design and Analysis of Quantization Based Low Bit Rate Encoding System

Mr. Nilesh Bodne[1], Dr. Sunil Kumar[2]

[2]Professor and Head
[1,2]ECE Department, Kalinga University Raipur, Chhattisgarh, India

ABSTRACT

The objective of this paper is to develop a low bit rate encoding for VQ problems such as real-time image coding.. The decision tree is generated by an offline process.. A new systolic architecture to realize the encoder of full-search vector quantization (VQ) for high-speed applications is presented here. Over past decades digital video compression technologies have become an integral part. Therefore the purpose is to improve image quality in Remote cardiac pulse measurement using Adaptive filter. It describes the approach to be used for feature extraction from many images.. This paper presents a real time application of compression of the image processing technique which can be efficiently used for the interfacing with any hardware. Therefore we have used Raspberry Pi in compression of image. We have developed an algorithm that is based on the endoscopic images that consist of the differential pulse code modulation. The compressors consist of a low cost YEF colour space converters and variable length predictive algorithm for lossless compression.

KEYWORDS: *Compression, Quality, Transmission, Optimization VQ, FIC (Fractal Image Processing), Compression, capsule Endoscope, Image capturing*

How to cite this paper: Mr. Nilesh Bodne | Dr. Sunil Kumar "Design and Analysis of Quantization Based Low Bit Rate Encoding System" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-3 | Issue-6, October 2019, pp.1002-1004, URL: https://www.ijtsrd.com/papers/ijtsrd29289.pdf

IJTSRD29289

INTRODUCTION

Recently a new interest has arisen in the field of the very low bit rate video application. The major requirements for these applications are the low capacity for transmission and storage, in order to use the existing Public Switched Telephone Networks (PSTN) or mobile channels. Numerous algorithms have been explored to implement the high compression system, such as model based and object-based methods. This merger has resulted in the emergence of several applications such as teleconferencing, videophone and video-on-demand. These applications would not be possible without an efficient video compression algorithm. Several international standardization activities are aiming at developing high performance video compression techniques for different applications, e.g. H.261 for video conferencing, MPEGI for CD-ROM based applications, MPEG2 for broadcast TV etc. Currently the MPEG standardization group has started an investigative effort towards developing a standard currently referred to as MPEG4 for low bit rate video compression. With the advantages of simple coding process and high compression ratio, Vector quantization is widely used in the fields of image compression and speech coding, and it can always archive better performance than scalar quantization. In Vector quantization, a vector is compared with codeword in a codebook to find the best matching codeword, and compression is achieved by transmitting or storing the index of that codeword rather than the codeword itself.

Materials and Methods:

In the presented research work [1] A method for choosing reference images based on edge detection for video Compression by Mohammed Benabdellah during proposed method of carrying out tests. It gives the choice of reference images, in the process of video compression, by using only the intra and predicted images extracted from sequences. For each intra and predicted image, perform edge detection. Each image of the sequence is compared with the other images by subtracting corresponding edges. They adopt the criterion of minimum pixels if the resulting images present only points and the criterion of minimum distance between the lines if they present parallel lines and possibly points. Sequences revealed an improvement in data flow and average PSNR as compared to the original encoding and choosing reference images based on the mean square error.

In the presented research work of low bit-rate video streaming for face-to-face teleconference proposed Michael Cohen proposed Face-to-face video teleconferencing is very important for real time communication. In this, they present a system for real-time coding of face video at low bit-rate. There are two main contributions. First, improve the technique of long term memory prediction by selecting frames into the database in an optimal way. A new frame is selected into the database only when it is significantly different from those frames which are already in the database. Second, incorporate the prior knowledge about

faces into the long term memory prediction framework. The prior knowledge includes: (1) facial motions are repetitive such that most of them can be reconstructed from multiple reference frames; and (2) different components of the face.

In the presented research work of Low complexity video compression using moving edge detection based on DCT coefficients proposed by F. Bartolini, V. Cappellini, A. Mecocci, and R. Vagheggi during 2009 proposed a low complexity video compression method based on detecting blocks containing moving edges using only DCT coefficients. In this They uses the concept of ROI based scheme that detects only moving edges and not complete moving objects. If there are non edge regions with motion inside the object this is not detected by this approach. The moving edge detection function blocks detects not only moving edges but also removes false edges via a reduction function block (RFME).After false moving edge reduction, moving micro blocks decreases by 20%.

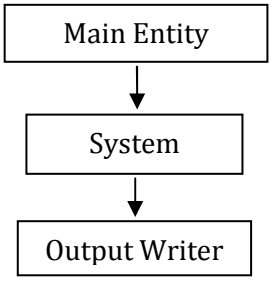
In the presented research work of Edge detection techniques and evaluations proposed by proposed the edge detection techniques and evaluations which are -The edge detector: which gives the thick edges. The Canny edge detector: which gives the non maximal suppression and gives better result from rest of the techniques. The Boolean edge detector. The Euclidian Distance/Vector angle detector The edge detector which gives the thick edges and no guarantee about finding thin edges The Canny edge detector which gives the non maximal suppression and gives better result from rest of the techniques. The Boolean edge detector in which the edges are spotty and non contiguous. The Euclidian Distance/Vector angle detector shows major edges but not much fine grained details. similar to H.264 but they use much larger number of reference frames and update the database selectively.

Methodology:

Video compression manipulates video signals to dramatically reduce the storage and bandwidth required while maximizing perceived video quality. With the advantages of simple coding process and high compression ratio, Vector quantization is widely used in the fields of image compression, and it can always archive better performance than scalar quantization.

Firstly take the input as a video i.e. AVI video then converts the input video into the number of frames. After converting video into frames selects the number of frames to be extracted and apply the Low bit rate downsample algorithm on number of frames. The downsample algorithm exracts the each frame by rows and columns. Then select the decimation factor for low bit rate. For example suppose I have a video of 15 frames and the size of the frame is 120×160.for this the decimation factor is 2.Then the frame rate will be 120×160×15 bytes per second but the data will get transferred in bits forms that's why the fame rate will be 120×160×15×8 bps. From which 120 is the number of row, 160is the number of columns, 15 is the number of frame to be extracted and 8 is number of bits. If the decimation factor is 2 the out of the number of pixels in one frame the alternating frame get skip. That means I have a pixel on 0^{th} position then the next pixel that is on the 1^{st} position pixel will skip followed by taking the next pixel that is 2^{nd} pixel is taken. That means the 0^{th} position pixel is as it is on 0^{th} position, 1^{st} position pixel is skip, the 2^{nd} position pixel is placed on 1^{st} position. This step is followed to all pixel in one frame and same procedure get repeated to the total number of frames.

Apply vector quantization on the number of frames. After VQ apply the edge detection on the compressed. The edge detection is nothing but the process of identifying and locating sharp discontinuities in an image. The edge detection is useful for giving the correctness that the compression is perfect.



Three parts of system flow

Main Entity: The main entity is used for taking the input as a video in the form of frames. Suppose we have 15 frames to be extracted then main entity takes these 15 frames as a input. Then these 15 frames get transferred to the system blocks.

System: The input 15 frames is gives to the system block frame by frame and allow the frames to be compressed The downsample algorithm extracts the each frame by rows and columns. Then select the decimation factor for low bit rate. For example suppose I have a video of 15 frames and the size of the frame is 120×160.for this the decimation factor is 2.Then the frame rate will be 120×160×15 bytes per second but the data will get transferred in bits forms that's why the fame rate will be 120×160×15×8 bps. From which 120 is the number of row, 160is the number of columns, 15 is the number of frame to be extracted and 8 is number of bits. If the decimation factor is 2 the out of the number of pixels in one frame the alternating frame get skip. That means I have a pixel on 0^{th} position then the next pixel that is on the 1^{st} position pixel will skip followed by taking the next pixel that is 2^{nd} pixel is taken. That means the 0^{th} position pixel is as it is on 0^{th} position, 1^{st} position pixel is skip, the 2^{nd} position pixel is placed on 1^{st} position. This step is followed to all pixels in one frame and same procedure gets repeated to the total number of frames.

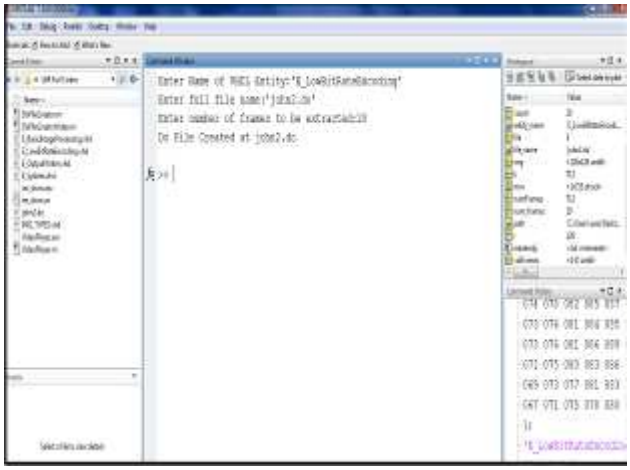
Output Writer: After applying VQ to each frame the output writer generates the text file of the number of frames. The pixel values are not taking as it is. The whole number is converted into the number of digits. Because if we take the pixel value as it is, it gives the ascii value of that Pixel. For example, suppose we have a pixel value 255 then this value get converted into the digits with the help of slash and modulus

255/100 = 2
255 mod 100 = 5
255 mod 1o = 5

After separation the values get transferred as a pixel value.
Eg:
192/100 = 1
192 mod 100 = 92

92/10 = 9
92 mod 10 = 2
Then takes these individual digits as a pixel value.

Results:



Result of Video on MATLAB

After creating the do file in matlab. This do file is import in the modelsim. Initially all the entity in modelsim is undefined. Then from tools menu takes the execute macros. From this macros we can take the do file created in the folder where the code is stored. With the help of this do file we can take the input frames and after giving the clock create the output for those input frames.

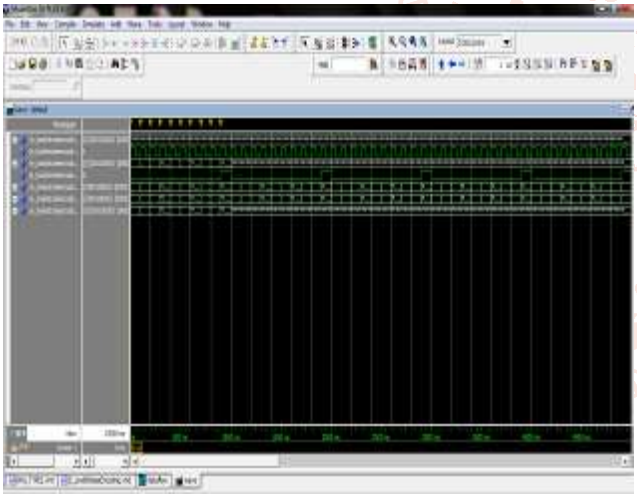
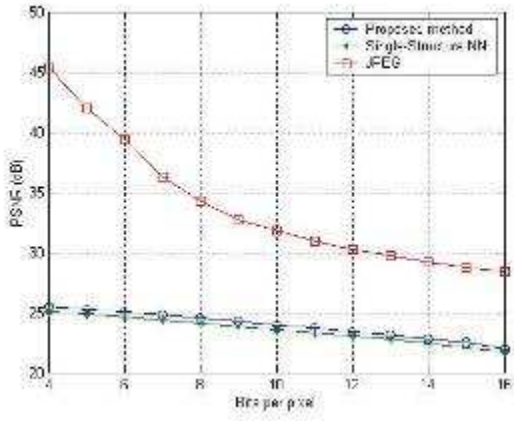


Fig 2 Result of E_low bit rate video encoding for input video frame

Discussion:

The JPEG approach yields a PSNR of 5dB higher on the average than the other two methods. However, the proposed cascaded approach does have certain advantages over the JPEG approach. They are:

1. The decompressed NN output can be recompressed further by up to 30% with a lossless compression scheme with minimal loss in quality. JPEG recompression rate is much smaller in comparison (less than 5%).
2. The coding/decoding time required for the cascade method is also much smaller. Once the off-line training is complete, the compressing and decompressing process is significantly faster with the cascaded method. For instance, at 16:1 CR, it takes less than 2 seconds to compute, while at 4:1 CR the computing time is less than 1 second.
3. The parallel processing capability of NNs makes them superior to JPEG in terms of hardware implementation.



Conclusion:

In this project, a new algorithm for the very low bit rate video coding system is presented. This algorithm contain Vector Quantization is used for lossy data compression, lossy data correction and density estimation, and coding parts. f

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