ISSN:0975-9646

Integrated Particle Swarm Optimization and Genetic Algorithm Based Compression for Reduction of Blocking Artifacts

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Abstract: Image compression has become very important tool in digital image processing. The main objective of the compression is to reduce the amount or unwanted data while retaining the information in the image. The goal behind is to save the amount of memory required to save the image(s) or to utilize network bandwidth in efficient manner. Transform-based compression is extensively used for image compression. But transform based methods introduce blocking artifacts in the output image. The compression may also results in ringing artifacts around edges. The ringing artifacts are in general more difficult to characterize and remove than the block transform compression artifacts. This paper has proposed a new compression technique which has integrated the Particle swarm optimization (PSO) and Genetic algorithm (GA) based compression in wavelet domain for reduction of blocking artifacts in images. The comparison also drawn among the proposed and the existing technique based upon the various standard quality metrics of the compression techniques. No techniques is acceptable in every case.

Keywords: **Image Compression, Hybrid particle swarm optimization, Genetic algorithm, wavelet transform**

1. INTRODUCTION:

Image compression is the process to compress the relevant information from one to more images into a single image. The resulting image will contain all the important information as compare to input images. The new image will extracts all the information from source images [1]. Image compression is a useful technique by using hybrid PSO and GA to enhance the information. The objective of image compression is to compressed information from one image in order to produce an image that deliver only the useful information [2]. The discrete cosine transformation (DCT) each one block of the image is compressed during quantization. The array of compressed blocks that form the image is stored in a significantly summary quantity of gap.. DWT (Discrete Wavelet Transform) of a digital image consist of two sequence expansions: one matching to the estimate (low-pass filter), and the additional linked to the information of the image (high-pass filter). In PSO(Particle Swarm Optimization)behave as a set of particles that shift in the search space in fluenced by three components: (i)current velocity,(ii)distance connecting its present position and its own local top position, and(iii) distance connecting its present position and the global best position of the fittest particle in the whole swarm initiate so[3]. GA(Genetic Algorithm) are adaptive heuristic search algorithm based on an similarity with the genetic structure and performance of chromosomes within a population of those. In the genetic algorithm crossover and mutation operators are used for to generate the optimized results[4].

2. LITERATURE SURVEY

Kaveh Ahmadi et al.[1]has discussed that Image compression is one of the mainly significant study area in the field of image processing suitable to its great number of application such as aerial surveillance, reconnais- sance, medicine and multimedia communication. still while high data rates are accessible, image compression is essential in organize to reduce the transmission cost. For applications relating information protection, a fast release also reduce the probability of compromise more a communication channel. Camara Lerner et al.[2] has discussed the difficulty of bit allocation in lossy image set compression. Instead of treating each one image separately, image set compression algorithms study the relations amongst related images and eliminate inter-image redundancies to recover compression presentation. These algorithms map the unique image place into a number of calculation remaining images to be coded. Characteristically the same bit rate is used to code each remaining. We illustrate that a rate-distortion move toward based on Lagrangian optimization can show the way to more improvement in image set compression algorithms. Victor Sanchez et al. [3] has discussed that DNA microarrays are high-tech tools in biological and medical research. The correctness of lossy compression for DNA microarray images and underline the requirement for a distortion metric to review the loss of applicable information. We also suggest one feasible metric that consider the essential image features employed by most DNA microarray analysis techniques. Tentative outcome be a sign of that the proposed metric can classify and distinguish essential and insignificant change in DNA microarray images. Hitoshi Kiya et al.[4] has discussed that a lossy data compression for a thin Histogram image signal is planned. It is extended from an accessible lossless coding which is base on a lossless histogram packing and a lossless coding. We establish a lossy mapping, which has fewer computational weights than the rate-distortion optimized Lloyd-Max quantization, and join it with a lossless coding. Ming-Ming Li et al.[5] has discussed that to decrease the memory rations of theVideo application, we here a lossy Bayer image compression pipeline perform improved set-partitioning in hierarchical trees (SPIHT) coding as the center of the creative data compressionalgorithm. The

future technique encodes and decodes images accessible in the CFA arrangement. Once concluding the image coding phase, a demosaicking period frequently follow to make a full color image. Hengjian li et al.[6] has discussed the points to facilitate the lossy image compression has lying for the performance aggressive codes of palmprint verification algorithms. Connection between lossy compression on palmprint appreciation presentation are worth focusing on in applications where image space for storing and program instance are of great meaning. To eliminate that objective featuring its inference for bandwidth and storage, we experiment the connection between image lossy compression on competitive code in dissimilar transforms, quantization and encoding algorithms utilizing a publicly available palmprint database. Vladimir V.Lukin et al.[7] has discussed that images be capable to exist susceptible to lossy compression in their normal technique that initiate distortion are usually not observable. Because of this, two current visual quality metrics, MSSIM and PSNR-HVS-M, could be use. Their principles can absolutely be provide not a reduced amount than 0.99 and 40 dB, respectively, as well as equivalent lossy compression might be approved out. Attained compression ratio (CR) relies on image properties and also a coder used. Tomoo Inoue et al.[8] has discussed that Test compression / decompression is one kind of effective options for testing today's VLSI. In test compression with image compression algorithms, e.g., JPEG algorithm. Image compression algorithms can not simply achieve considerably high compression but additionally require no additional decompression circuity on the chip under test in the event the chip includes image decoders has been explored . Moreover, we propose a way for generating seeds (or compressed test data) in case when a JPEG decoder must be used as an experiment decompressor. Nadeem Akhtar et al.[9] has discussed that individuals propose and implement a fresh lossy technique to compress are just looking for image. We perform technique like quantization, smoothing before you apply our novel, simple addition based way to compress the image. The whole picture is split up into range of 4*4 blocks. The outcomes are good and similar to JPEG compression algorithm, specifically when image quality is high. Ran Hu et al.[10] has discussed that Compression of encrypted data has attracted considerable research interests nowadays caused by distributed processing and cloud computing. A novel lossy compression scheme for encrypted gray-scale images. The main image is first split into non-overlapping blocks. Then, it really is encrypted with a modulo-256 addition and block permutation. In compression phase, the spatial correlation and quantization are exploited to cut back the compression ratio. Lei Wang et al.[11] has discussed that a progressive image compression scheme is investigated using reversible integer discrete cosine transform (RDCT) which comes from the matrix factorization theory. Previous techniques dependant on DCT are afflicted with bad performance in lossy image compression in contrast to wavelet image codec. And lossless compression methods for example IntDCT, I2I-DCT and so forth cannot equate to JPEG-LS or integer discrete wavelet transform (DWT) based codec. Nathan Schemm et al.[12] has discussed that a CMOS image sensor has long been intended to accomplish the front-end image decomposition within a Prediction-SPIHT image compression scheme. The prediction circuitry based upon charge sharing is integrated through the sensor array to carry out a 3-level image decomposition. A CMOS test chip has long been prototyped and tested. The examination results justify the pixel design and demonstrate that lossy prediction based focal plane image compression can be realized through the sensor pixel array to achieve a higher frame rate though with a great deal less data readout volume. Raul Pinto Elias et al.[13] has discussed that a good edge preserving lossy image coder is presented. A footing image is purchased from an original with an electronic digital image processing module using four different filters: Canny, Sobel, Roberts and Prewitt, then an original image is domain transformed with wavelets or contourlets, as well as a pixel mapping from original domain to transformed is done. Xiang Xie et al.[14] has discussed that the analysis of exist compression-first methods, this presents a novel means of lossy image compression for digital colorful image sensors with Bayer Color Filter Arrays (CFAs). In using this method, an optimized compression and decompression structure is presented, plus the captured CFA raw info is firstly low-pass filtered in RGB space using a smooth filter then the down-sampling operation. Then, the info are transformed from RGB space to YCbCr space. P.Ashok Babu et al.[15] has discussed that image data compression could be the major element of communication and storage systems where in actuality the uncompressed images requires considerable compression technique, that ought to manage to reducing the crippling disadvantages of data transmission and image storage. The novel image compression technique is proposed that is on the basis of the spatial domain that is quite effective for the compression of images has been explored. V.Jagan Naveen et al.[16] has discussed that image compression is just a widely addressed researched area. Many compression standards have been in place. But nonetheless here there's a scope for high compression with quality reconstruction. The JPEG standard employs Discrete Cosine Transform (DCT) for compression. The introduction of the wavelets gave an alternative dimensions to the compression. Its aims at the analysis of compression using DCT and Wavelet transform by selecting proper threshold method, better result for PSNR have already been obtained. Extensive experimentation has been carried out to reach at the conclusion. B.Chandra Mohan et al.[17] has discussed that presents a fresh compression technique and image watermarking algorithm centered on Contourlet Transform (CT). For image compression, a power based quantization is used. Scalar quantization is explored for image watermarking. Double filter bank structure is utilized in CT. The Laplacian Pyramid (LP) is used to fully capture the purpose discontinuities, and then followed by way of a Directional Filter Bank (DFB) to link point discontinuities. The coefficients of down sampled low pass version of LP decomposed image are re-ordered in a pre-determined manner and prediction algorithm can be used to cut back

entropy (bits/pixel). Y.Sravani et al.[18] has discussed that Image de-noising is among the fundamental problems in the field of image processing necessary for improving the image quality before performing different high-level vision tasks. Numerous wavelet based denoising methods were utilized for performing image de-noising process. Such works, there's too little analysis in selecting the correct threshold value. Moreover, such analysis contributes to the determination of static threshold value. The fundamental formulae exist when we treat noisy image as just one image without dividing it into blocks. We could also check the performance of the standard methods by dividing the noisy image into different block sizes and then applying dynamic methods to select proper threshold value. Jamuna.M.et.al[19] has discussed that image compression has applications in several fields like digital video, video conferencing and video over wireless networks and internet etc. It handles the implementation of VLSI Architecture of image compression system using low power DWT (Discrete Wavelet Transform). DWT is the absolute most popular image compression technique and it's the absolute most efficient algorithm utilized in JPEG image compression has been explored. It presents implementation of 2 ways of DWT, one is conventional method and another one is lifting scheme. Aisha Fernandes.et.al[20]has discussed that in today's digital era, the demand for data storage capacity and data transmission bandwidth continues to surpass the capabilities of available technologies. In this paper we propose an algorithm for image compression using the Antonini 7/9 wavelet filter. An image when passed through a wavelet transform separates into a set of sub-bands. The coefficients obtained are then quantized. By using an error metric, we approximate the reconstituted coefficients quantization error and thus minimize the distortion.

3. GAPS IN LITERATURE:

1. The performance of the particle swarm optimization depends upon the initial particles, poorly selected particles lead poor results.
2. The genetic algorithm does not guarantee the global optimized results but rich because of its mutation and crossover operators.
3. The use of the hybrid PSO/GA is ignored in the image compression techniques.

4. PROPOSED ALGORITHM:

We develop hybrid PSO and GA based compression using nonlinear enhancement approach for image compression. As we know that the image compression is a process to reduce the number of bits of the image and in order to deliver only the useful information .It is found that the discrete cosine transforms (DCT) based methods of image compression are more suitable and time-saving in real-time systems using DCT based standards of still image or video.PSO based image compression produced results with more clarity, more PSNR value and less Mean square error. Therefore the overall objective is to improve the results by combining PSO with GA and non-linear enhancement. The proposed algorithm is designed and implemented in MATLAB using image processing toolbox.

4.1 Steps of proposed approach:

The detailed algorithm for the proposed approach is given below:

Step1: First of all one image which are partially compressed to the system. Then we find the size of an image using equation

$[M, N, D] = size(orgImg)$……. (1)

Where M represent rows, N represent columns and D represent dimensions. OrgImg is an input image.

Step2: Apply 3-Level DWT transform to convert into particles

1. Initialize to the number of bits planes
2) Set the LSP as an empty list, and add the coordinates (i, j) H to the LIP, and only those with descendants also to theLIS, as type A entries.
3) Sorting Pass:
a. for each entry (i, j, k) of the LIP
i. If output Sn (i, j, k) = 1,
1. Move (i, j, k) in LSP
2. Output the sign of ci, j, k
b. for each entry (i, j, k) of the LIS
i. if the entry is type A then
1. Output Sn (D (i, j, k))
2. If Sn (D (i, j, k)) = 1 then
a. for all (i,j,k) ∈ O(i, j, k) do:
i. if output Sn (i,j,k)= 1 then
1. add (i, j, k) to the LSP
2. Output the sign of ci′, j′, k′
ii. Else
1. add (i, j, k′) to the end of the LIP
b. if L(i, j, k) ≠ Ø,
i. move (i, j, k) to the end of the LIS as a type B entry.
c. else,
i. remove (i, j, k) from the LIS
3. if the entry is type B then
a. output Sn(L(i, j, k))
b. if Sn (L(i, j, k)) = 1
i. add all the (i′, j′, k')∈ O(i, j, k) to the end of the LIS as a type A entry
ii. Remove (i, j, k) from the LIS
4) Refinement Pass:
a. for all entries (i, j, k) of the LSP, except those included in the last sorting pass:
i. output the nth most significant bit of ci,j,k
5) Quantization-Step Update: decrement n by 1 and go to Step 3.a).

Step3: In this step by applying 3- level DWT transform to obtain the initial particles which can be used to obtain the effective result of the image.

Step4: Update each obtained particles based upon its objective fuction by using hybrid PSO algorithm.

1) Initialize swarm size s, particle position vector Pi and velocity vector vi. Set particle's personal best Pbest= pi for i= 1, 2… s.

2) The image is transformed by 3D discrete wavelet transform (3D DWT) and full decomposition tree is gotten and fed to the 3level DWT algorithm with arithmetic coding.

3) Calculate each particle's fitness value

The fitness function useful for the choice of better particles from the swarm is a combination of the entropy, as well as the PSNR values. The entropy represents the compression gain, whilst the PSNR indicates a way of measuring the distortion. This combination will result in the choice of the best solution which produces an optimum image with reasonable compression as well as distortion. Therefore, the fitness function is defined as following:

Fitness = x × entropy + $\frac{y}{PSNR}$ ……(2)

The importance of parameters x and y in the exceeding equation are random and can be altered as per the users condition in order to regulate the most wanted level of compression and distortion, correspondingly. The fitness function is used to achieve an best possible result such that the entropy is minimize and the PSNR is maximized.

The PSNR value of a reconstruct image is commonly calculate using the following equation:

PSNR = $10 \times \log_{10}(\frac{MAX^2}{MSE})$……..(3)

Where MAX denotes the most strength value in the image. For an n ×m size image, MSE can be defined as in which O(i,*j*) and K(i,*j*) are the original and there constructed images, respectively.

MSE=$\frac{1}{n \times m} \sum_{i=0}^{n-1} \sum_{j=0}^{m-1}[O(i,j) - K(i,j)]^2$……(4)

Step4: Apply mutation and crossover operator in the each of the initial particles that are obtained by using 3- level DWT transform and PSO algorithm .

1) Begin with a randomly generated image of n l−bit chromosomes.

2) Calculate the fitness f(x) of every chromosome x in the image.

3) Clustering (grouping the most similar input instances in sets that have common characteristics between these input instances).

4) Genetic operations are performing the crossover and mutation operations on the elements of the sets that are produced from step2.

5) Merging those sets becomes nearest after performing the genetic operations in step4.

6) Performing evaluation and termination criteria (testing the performance of the algorithm at each generation and termination criteria, if the termination criteria are satisfied the STOP, otherwise GOTO step3).

Step5: Now improved adaptive thresholding is applied on image compression in wavelet domain by using hybrid PSO and GA algorithm on the boundaries of the image for the reduction of the blocking artifacts from the image to obtain the compressed image

Step 6: End

4.2 performance Metrics:

The quality of an image is examined by objective evaluation as well as subjective evaluation. For subjective evaluation, the image has to be observed by a human expert. There are various metrics used for objective evaluation of an image. Some of them are Mean squared error (MSE), peak signal to noise ratio (PSNR), Root mean square error(RMSE), Bit error rate (BER), Structural similarity index metric(ssim).

Mean Square Error (MSE):

Mean square error is a measure of image quality index. The large value of mean square means that image is a poor quality. Mean square error between the reference image and the compressed image is

MSE=$\frac{1}{mn}\sum_{i=1}^{m}\sum_{j=1}^{n} (A_ij - B_ij)^2$

Ai, j and Bi, j are the image pixel value of reference image

Peak Signal to Noise Ratio (PSNR):

The PSNR block computes the peak signal-to-noise ratio, between two images. This ratio is often used as a quality measurement between the original and a compressed image. The higher the PSNR, the better the quality of the compressed or reconstructed image. PSNR value is computed by following equation:

$$PSNR = 10 \log_{10}(\frac{R^2}{MSE})$$

Root Mean Square Error (RMSE):

RMSE is a frequently used measure of the differences between values (sample and population values) predicted by a model or an estimator and the values actually observed. The RMSD represents the differences between predicted values and observed values. These individual differences are residuals when the calculations are performed over the data sample that was used for estimation, and are called prediction errors when computed out-of-sample.

The RMSD of estimator $\hat{\theta}$with respect to an estimated parameter $\theta$is defined as the square root of the mean square error.

$$\mathrm{RMSD}(\hat{\theta}) = \sqrt{\mathrm{MSE}(\hat{\theta})} = \sqrt{\mathrm{E}((\hat{\theta} - \theta)^2)}.$$

For an unbiased estimator, the RMSD is the square root of the variance, known as the standard error.

The RMSD of predicted values $\hat{y}_t$for times *t* of a regression's dependent variable $y$is computed for *n* different predictions as the square root of the mean of the squares of the deviations:

$$\mathrm{RMSD} = \sqrt{\frac{\sum_{t=1}^{n} (\hat{y}_t - y)^2}{n}}.$$

Bit Error Rate(BER):

The bit error rate (BER) is the number of bit errors per unit time. The bit error ratio (also BER) is the number of bit errors divided by the total number of transferred bits during a studied time interval. BER is a unitless performance measure, often expressed as a percentage. The bit error probability p_e is the expectation value of the bit error ratio. The bit error ratio can be considered as an approximate estimate of the bit error probability. This estimate is accurate for a long time interval and a high number of bit errors

For example, in the case of QPSK modulation and AWGN channel, the BER as function of the Eb/N0 is given by:

$$\mathrm{BER} = \frac{1}{2}\mathrm{erfc}(\sqrt{E_b/N_0})$$

Structured Similarity Index Metric(SSIM):

The structural similarity (SSIM) index compares the brightness, contrast and structure between each pair of vectors, where the structure similarity index metric(SSIM) between two signals x and y is given by following expression:

$$\mathrm{SSIM}(x,y) = \frac{(2\mu_x\mu_y + c_1)(2\sigma_{xy} + c_2)}{(\mu_x^2 + \mu_y^2 + c_1)(\sigma_x^2 + \sigma_y^2 + c_2)}$$

5.EXPERIMENTAL SET-UP:

In order to implement the proposed algorithm, design and implementation has been done in MATLAB using image processing toolbox. In order to do cross validation we have also implemented the hybrid PSO and GA based image compression using nonlinear enhancement. The developed approach is compared against some well-known image compression techniques available in literature. After these comparisons, we are comparing proposed approach against DCT, PSO, GA and DWT using some performance metrics. Result shows that our proposed approach gives better results than the existing techniques. Table 5.1 is showing the various images which are used in this research work. Images are given along with their formats. All the images are of same kind and passed to proposed algorithm.

Fig. 5.1 Images taken for experimental analysis

Image name	Format	Size in K.Bs (Original image 1)	Size in K.Bs (Compressed image 2)
image1	.jpg	44.2	44.0
image2	.jpg	34.7	35.6
image3	.jpg	84.2	70.1
image4	.jpg	16.0	70.2
image5	.jpg	44.2	43.2
image6	.jpg	192	103
image7	.jpg	148	116
image8	.jpg	60.8	44.5
image9	.jpg	56.1	44.7
image10	.jpg	40.0	38.2

5.2Experimental results:

Figure 5.1 has shown the input images for experimental analysis. Fig.5.1 (a) is showing the original image and fig.5.1 (b) is showing the compressed image. fig 5.3(c) is showing the original image and fig 5.4(d) is showing the compressed image. The overall objective is to show relevant information from one or more compressed an image that is more informative and suitable for both visual perception and further computer processing.

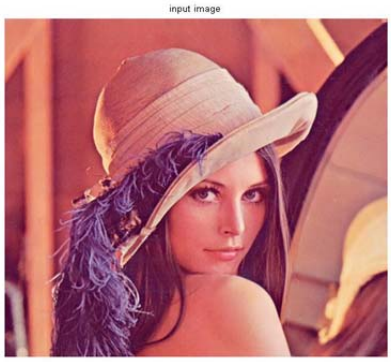


Fig 5.1(a) original Image

Fig 5.2 (b) compressed image

Fig 5.3 (c) Original Image

Fig 5.4 (d) Compressed Image

6. PERFORMANCE ANALYSIS:

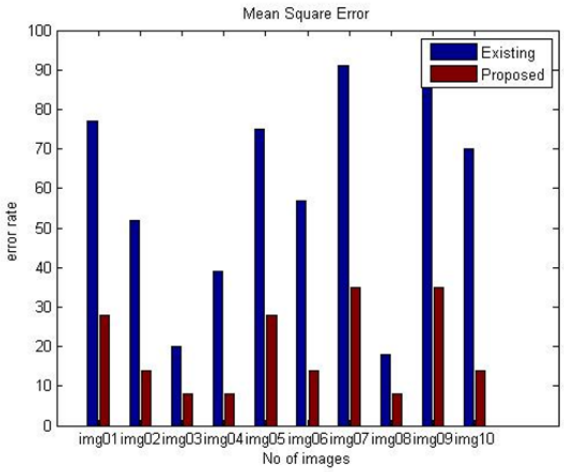
This section contains the cross validation between existing and proposed techniques. Some well-known image performance parameters for digital images have been selected to prove that the performance of the proposed algorithm is quite better than the existing methods

6.1 Mean Square Error Evaluation

Table 6.1 is showing the quantized analysis of the mean square error. As mean square error need to be reduced therefore the proposed algorithm is showing the better results than the available methods as mean square error is less in every case.

Image name	Existing value	Proposed value
Image1	77	28
Image2	52	14
Image3	20	8
Image4	39	8
Image5	75	28
Image6	57	14
Image7	91	35
Image8	18	8
Image9	89	35
Image10	70	14

Fig 6.1 Mean Square Error Evaluation



Graph 6.1 MSE of Existing & Proposed Approach for different images

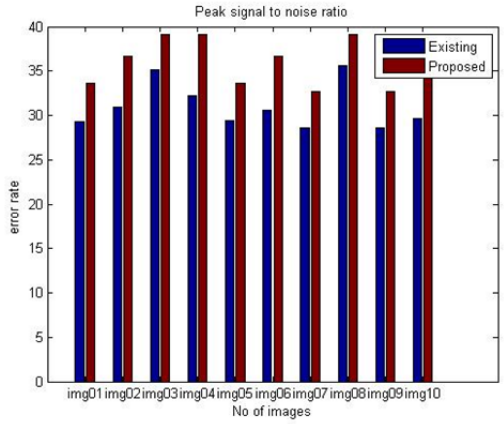
Figure 6.1 has shown the quantized analysis of the mean square error of different images using compression by Existing value in(Blue block), proposed value of images in(Red color).It is very clear from the plot that there is decrease in MSE value of images with the use of proposed method over other methods. This decrease represents improvement in the objective quality of the image.

6.2 Peak signal to noise ratio:

Table 6.2 is showing the comparative analysis of the Peak Signal to Noise Ratio (PSNR). As PSNR need to be maximized; so the main goal is to increase the PSNR as much as possible. Table 6.2 has clearly shown that the PSNR is maximum in the case of the proposed algorithm therefore proposed algorithm is providing better results than the available methods.

Image name	Existing value	Proposed value
Image1	29.2659	33.6592
Image2	30.9708	36.6695
Image3	35.1205	39.0999
Image4	32.2202	39.0999
Image5	29.3802	33.6592
Image6	30.5721	36.6695
Image7	28.5404	32.6901
Image8	35.5781	39.0999
Image9	28.6369	32.6901
Image10	29.6778	36.6695

Fig 6.2 Peak Signal To Noise Ratio Evaluation



Graph 6.2 PSNR of Existing & Proposed Approach for different images

Figure 6.2 has shown the quantized analysis of the peak signal to noise ratio of different images using compression by Existing approach in (Blue Color), compressed by Proposed Approach (Red Color).

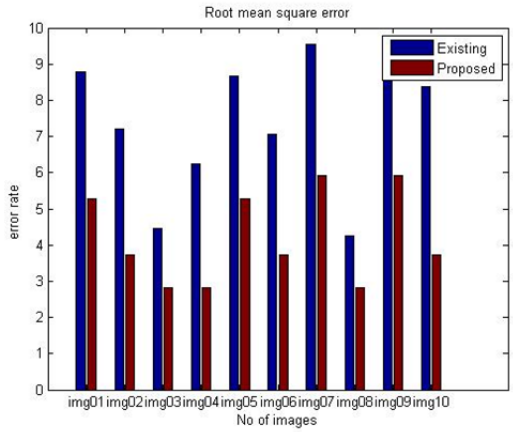
It is very clear from the plot that there is increase in PSNR value of images with the use of proposed method over other methods. This increase represents improvement in the objective quality of the image.

6.3Root Mean Square Error:

Table 6.3 is showing the comparative analysis of the root mean square error. As RMSE need to be maximized; so the main goal is to decrease the RMSE as much as possible. Table 6.3 has clearly shown that the RMSE is minimum in the case of the proposed algorithm therefore proposed algorithm is providing better results than the available methods.

Image name	Existing value	Proposed value
Image1	8.7750	5.2915
Image2	7.2111	3.7417
Image3	4.4721	2.8284
Image4	6.2450	2.8284
Image5	8.6603	5.2915
Image6	7.0598	3.7417
Image7	9.5394	5.9161
Image8	4.2426	2.8284
Image9	9.4340	5.9161
Image10	8.3666	3.7417

Fig 6.3 Root Mean Square Error Evaluation



Graph 6.3 RMSE of Existing & Proposed Approach for different images

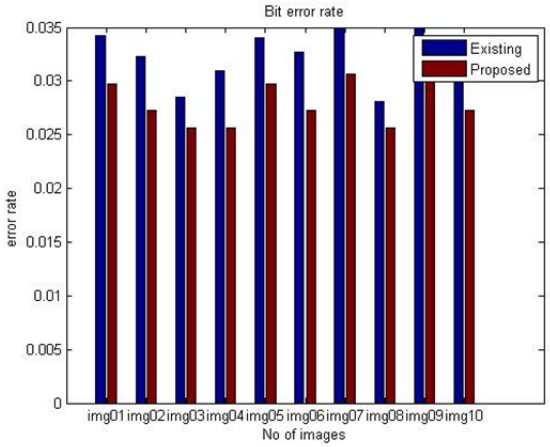
Figure 6.3 has shown the quantized analysis of the Root Mean Square Error of different images using compressed by Existing approach (Blue Color),compressed by Proposed Approach (Red Color). It is very clear from the plot that there is value of RMSE is minimum in every case with the use of proposed method over other methods. This represents improvement in the objective quality of the image.

6.4 Bit Error Rate:

Table 6.4 is showing the quantized analysis of the bit error rate. As bit error rate is need to be reduced therefore the proposed algorithm is showing the better results than the available methods as bit error rate is less in every case.

Image name	Existing value	Proposed value
Image1	0.0342	0.0297
Image2	0.0323	0.0273
Image3	0.0285	0.0256
Image4	0.0310	0.0256
Image5	0.0340	0.0297
Image6	0.0327	0.0273
Image7	0.0350	0.0306
Image8	0.0281	0.0256
Image9	0.0349	0.0306
Image10	0.0337	0.0273

Fig 6.4 Bit Error Rate Evaluation



Graph 6.4 BER of Existing & Proposed Approach for different images

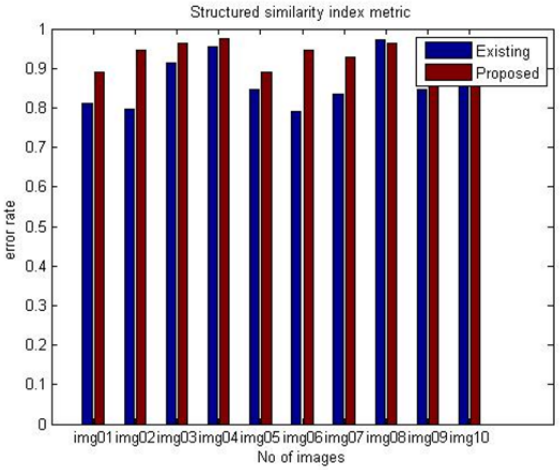
Figure 6.4 has shown the quantized analysis of the Bit Error Rate of different images using compressed by Existing approach (blue Color),compressed by Proposed Approach (Red Color). It is very clear from the plot that there is value of BER is very less in every case with the use of proposed method over other methods. This represents improvement in the objective quality of the image.

6.5 Structured Similarity Index Metric:

Table 6.5 is showing the quantized analysis of the structured similarity index metric . As structured similarity index metric is need to increase therefore the proposed algorithm is showing the better results than the available methods as SSIM has maximum value in every case.

Image name	Existing value	Proposed value
Image1	0.8124	0.8909
Image2	0.7964	0.9453
Image3	0.9127	0.9630
Image4	0.9548	0.9757
Image5	0.8466	0.8909
Image6	0.7903	0.9453
Image7	0.8340	0.9288
Image8	0.9720	0.9632
Image9	0.8465	0.9291
Image10	0.8797	0.9642

Fig 6.5 Structured Similarity Index Metric



Graph 6.5 SSIM of existing and proposed approach for different images

Figure 6.5 has shown the quantized analysis of the different image Structured Similarity index Metric using compressed by Existing approach in (Blue Color), compressed by Proposed Approach (Red Color). In SSIM the values of the proposed approach is maximum for better results to improve the quality of the image.

7. CONCLUSION

This paper has proposed a new compression technique which has integrated the Particle swarm optimization (PSO) and Genetic algorithm (GA) based compression in wavelet domain for reduction of blocking artifacts in images. The comparison also drawn among the proposed and the existing technique based upon the various standard

quality metrics of the compression techniques. No techniques is acceptable in every case. The performance of the particle swarm optimization depends upon the initial particles, poorly selected particles lead poor results. The genetic algorithm does not guarantee the global optimized results but rich because of its mutation and crossover operators. The experiments has been done using MATLAB tool along with the help of image processing toolbox. The experiments has clearly shown that the proposed technique outperforms over the available techniques. This work has not consider the effect of the noise in digital images. In near future we will propose a new technique which will integrate the image filtering technique with the proposed technique.

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