Survey Paper of Various Image Techniques in Combination with Training Algorithm and Wavelets

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Abstract - This Survey paper covers neural system based on picture pressure strategy. Picture pressure plays out an imperative part in communication application, to diminish the excess of pixels from the picture, communicate cast and the transmission cost of picture information so that it permits a similar picture reclamation at the collector end. Picture pressure based on back spread neural system with levenberg-marquardt calculation and this is accomplished by partitioning the quantity of pixels of a picture and select one neural system for each square as indicated by its intricacy esteem. Back proliferation calculation is utilized to lessen the combination time and enhance the execution of high pressure proportion of picture. Likewise, neural system's parallel design and adaptability made it to more helpful in picture pressure. In this review paper, we conscious differing procedures and will realize how neural systems are absorbed in picture pressure. Segmentation is considered as one of the main steps in image processing. It divides a digital image into multiple regions in order to analyze them. It is also used to distinguish different objects in the image. Several image segmentation techniques have been developed by the researchers in order to make images smooth and easy to evaluate. This paper presents a literature review of basic image segmentation techniques from last five years. Recent research in each of image segmentation technique is presented in this paper.

Keywords – Image compression, ANN, Image segmentation, neural network.

I. INTRODUCTION

The compression offers a means to reduce the cost of storage and increase the speed of transmission. Image compression is used to minimize the size of image without degrading the feature of the image. Images comprise huge quantities of info that needs abundant storing space, huge broadcast bandwidths and time-consuming for broadcast. Hence it is beneficial to compact the image by keeping simply the vital info wanted to rebuild the image. An image is a matrix of pixel weights. Huge alterations in tint will be a reduced amount of redundancy and tougher to compact. The data are in the form of graphics, audio, video and image. These types of data have to be compressed during the transmission process. Large amount of data cannot be stored if there is low storage capacity present.

1.1 Need of Image Compression: - Table 1.1 describes some features of multimedia data when it transfers in network through internet. The features are size, bit per pixel, uncompressed size, and transmission bandwidth and transmission time [30].

Multimedia Data	Size/Duration	Bit/Pixel or Bits/Sample	Uncompressed size (B for bytes)	Transmission Bandwidth (b For bits)	Transmission Time (using a 28.8K Modem)
A page of text	11 × 8.5	Varying resolution	4-8 KB	32-64 Kb/page	1.1 - 2.2 sec
Telephone quality speech	10 sec	8 bps	80 KB	64 Kb/sec	22.2 sec
Grayscale image	512 × 512	8 bpp	262 KB	2.1 Mb/image	1 min 13 sec
Color image	512 × 512	24 bpp	786 KB	6.29 Mb/image	3 min 39 sec
Medical image	2048 × 2048	12 bpp	5.16 MB	41.3 Mb/image	23 min 54 sec
SHD image	2048 × 2048	24 bpp	12.58 MB	100 Mb/image	58 min 15 sec
Full-motion video	640 × 480,1min (30 frames/sec)	24 bpp	1.66 GB	221mb/sec	5 days 8 hrs

In command to estimate act of image compression coding, it is essential to describe a dimension that can approximate the variance among the unique and decoded image. The common encoding design of image compression arrangement is presented is Figure 1.2. The essential philosophy and conception of every purposeful block will be presented in the subsequent segments.

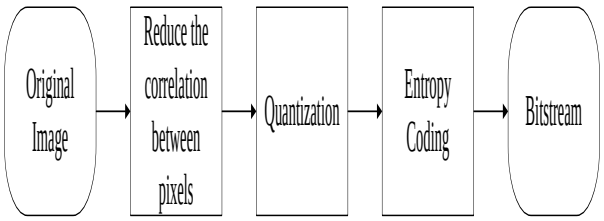


Figure 1.2: The General Encoding flow of Image Compression

1.2 Wavelets Filters

Five wavelets filters, haar, db2, bior4.4, coif4, and sym4 wavelet toolbox are used. These are chosen because they are popular wavelets and are most frequently referred to in the literature, example Daubechies, Burrus, Strang and Nguyen. The following is a brief explanation of these wavelets used in this work. The wavelet names 'dbN', 'biorNr.Nd', 'coif N', and 'syrmN' are short names for daubechies, bi-orthogonal, coiflets and symlets respectively. The N, Nr, and Nd are the order and they are integers. W is known as the length of support.

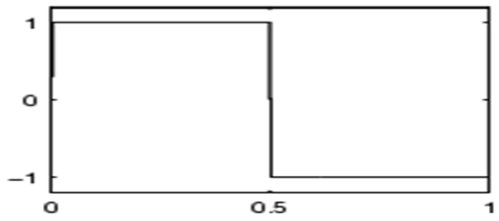
1.3 Wavelets Families

Wavelet transforms comprise an infinite set. The different wavelet families make different trade-offs between how compactly the basic functions are localized in space and how smooth they are. Within each family of wavelets (such as the Daubechies family) are wavelet subclasses distinguished by the number of coefficients and by the level of iteration. Some of wavelets families are described below [32].

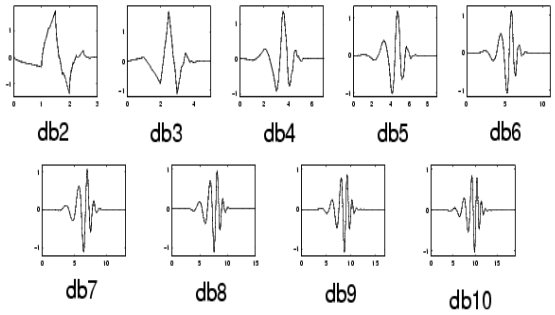
1. Haar
2. Daubechies
3. Coiflets
4. Bi-Orthogonal
5. Symlets
6. Morlet
7. Mexican Hat
8. Meyer

1.3.1 Haar

Haar wavelet is a sequence of rescaled "square-shaped" functions which together form a wavelet family or basis. Haar wavelet is irregular, and looks like a step function. It denotes the matching as Daubechies db1 wavelet.



Daubechies :- Daubechies, one of the positive stars in the domain of wavelet investigation, developed what are termed compactly sustained orthonormal wavelets hence creating discrete wavelet investigation feasible. The designations of the Daubechies personal wavelets are carved as dbN, where N is the order, and db the "family name" of the wavelet. The db1 wavelet, as stated overhead, is identical as Haar wavelet.



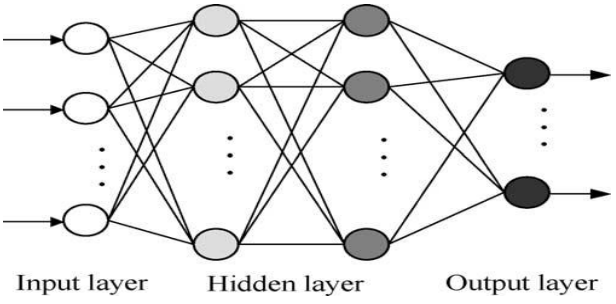
II. NEURAL NETWORKS

A Neural Network (NN) is a data processing model that is inspired by the technique of biological nervous systems, like brain process information. The main component of this model is the novel organization of the information processing model. This model composed by large number of highly interconnected processing elements called neurons, working simultaneously to solve particular problems. NNs, like people, learn by example. An NN is designed for a specific application, like pattern data classification and pattern recognition by learning process. Learning within biological system includes adjustments to the synaptic relations that exist among the neurons. This relations true of NNs as well.

2.1 Structural Design of Neural Networks

2.1.1 Feed Forward Networks

Feed forward ANN is one way network, it permit signals in order to travel in only one way from input to output. There are no loops or feedback that is the output of a layer does not affect the same layer. Feed forward ANN is likely to be straight forward networks that relate inputs with outputs. They are comprehensively used in pattern identification. This type of organization is called as bottom-up or top-down [33].



2.1.2 Feedback Networks :- Feedback networks may have signals traveling in the both directions by introducing loops in the particular network. Feedback networks are

extremely powerful and are hugely difficult. Feedback networks are strict for their state is changing constantly until they reach a stability point. They stay behind at the stability point until the input modifies and a new stability is established. Feedback architectures are referred to as interactive as well as recurrent, although the recurrent is often used in order to represent feedback connections in single layer organizations [33].

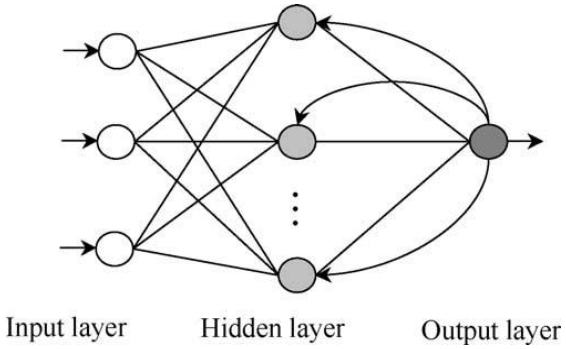


Figure 2.15: Feedback Networks

2.2 Transfer Function

The performance of an Artificial Neural Network is depending upon the weights and the input-output functions known as transfer function. This function typically categories under one of the three categories:

1. Linear Function: In the Linear function the output activity is direct proportional to the total weighted output for linear units.

2. Threshold Function: In threshold function the outputs are set at one of two levels, according the total input is less than or greater than some threshold value for threshold units.

3. Sigmoid Function: In sigmoid function the output varies constantly but not linearly as the input modifies. Sigmoid units contain a greater similarity to actual neurons as compared to linear or threshold units, but all three are considered in rough approximations for sigmoid units.

III. LITERATURE SURVEY

Performance Analysis of Image Compression: A Discrete Wavelet Transform Based Approach

Ms. Yogita Sojitra et.al [8] introduce modified EZW algorithm for the purpose of image compression which seems to be an enhanced version compare to the existing algorithm. This algorithm is an extension of EZW algorithm given and analysed by Sharpiro's where it reduce the difficulty of EZW in transmitting the lower bit planes. In this effort, it comprise digital wavelet alteration and area of attention coding to altered EZW and therefore create it extra higher to EZW and SPIHT Procedure and it is verified with the outcomes.

Embedded Image Coding Using Zero trees of Wavelet Coefficients :- According to J. Shapiro et.al [9] the root denial tree wavelet procedure (EZW) is a humble, however extraordinarily operative, image compressing procedure, have the stuff that the bits in the bit-stream are produced indirection of rank, providing a completely inserted code. The inserted code characterizes an arrangement of binary choices that discriminate an image from the "inacceptable" image. By means of an inserted coding procedure, an en-coder can dismiss the encrypting at any time thus permitting an objective level or goal alteration metric to be watched correctly. Similarly specified a bit-stream, the decoder can cease decoded task at any time in the bit-stream and quietly give closely the similar image that would have been encrypted at the bit proportion conforming to the shortened bit-stream. In adding to produce a completely imbedded bit-stream, the EZW constantly yields compressed consequences that are competitive with nearly entirely recognized Compression procedures on standard retrial images.

A Comparative Study of DCT and Wavelet-Based Image Coding :- Zixiang Xiong et.al [10] reading discloses that, for static images, the wavelet change outdoes the DCT classically by the mandate of nearby 1 dB in top signal-to-noise proportion. For video code, the benefit of wavelet arrangements is fewer understandable. He trusts that the image and video compress procedure must be talked from the complete arrangement perspective quantization, entropy code, and the composite in traction between components of the code scheme are extra vital than expenditure of all the labors on enhancing the convert. Their effort approved on view a reasonable study of DCT and wavelet-centered codes for equally static images and video arrangements. Centered on experimental act on sequences, it demonstrates that the chief issues in image code are the quantizing and entropy somewhat than the alteration among the wavelet change and the DCT. Heading for static-image coding, the variance among the wavelet change and the DCT is a smaller amount than 1 dB, and it is uniformly lesser for video coding.

Image Compression Based on Wavelets with Fractural Compression Code :- Archana Kajal et.al [11] suggests making a coding and encoding that can compress a RGB image by fractal compression method and Haar wavelet alteration. This area-concentrated fractal directive adventures the area-edge plot encoding arrangement for result ant division. In colorful quantization an accurate color image is converted into a color-mapped image comprising of K sensibly certain descriptive colors. The objective of this quantization is to remove info, which is not perception ally important. The suggested merger details to better degree maser presentation act compared to clean fractal coder, and it is quicker than extra state-of-art

fractal code scheme. The anticipated outcome advises that the optimal code can be produced for the image with stable fractal code which is not only decipherable but also bids the probability of recognizing a typical code-word stretch.

Using Wavelet Networks in Image Compression :- Weiwei Xiao & Haiyan Liu [12] presents a method of image compression as the activation function. Wavelet network is used to compress images in this work, and the comparison between wavelet networks and traditional neural based on wavelet neural network. Wavelet network is the tight combination of wavelet decomposition and neural network, where wavelet basis function works network is presented here. The result shows that wavelet network method succeeded in improving performances and efficiency in image compression. This work reviews the fundamental theory of artificial neural network and wavelet network using in approximation of function. Then, it expresses the training algorithms of multi-layer perceptrons and wavelet network. At last, this work gives a lot of experiment results. These experiments also include different kinds of wavelet networks act on different images under different compressed ratio.

Partial Discharge Image Recognition Influenced by Fractal Image Compression :- Jian Li et.al [13] has suggested a "quad-tree partitioning fractal image compression" (QPFIC) technique used in the partial discharge (PD) image distant appreciation scheme. Self-likeness in PD images is the evidence of fractal image compressing and is defined for the classic PD images picked up from fault classic trials in laboratory. Effects of fractal image compressing on a cluster of PD image topographies are deliberated. Fifty PD data examples are castoff to succeed the QPFIC to be castoff in distant PD schema know lodgement. Investigation consequences display that QPFIC technique yield computational faults. Such faults could not affect the PD image appreciation out comes beneath the governor of the PD image compression-errors. His work labels the likeness present in PD images grants the effects by the quad-tree splitting fractional image compressing technique on the acknowledgement of deciphered PD images.

Block Tree Partitioning for Wavelet Based Color Image Compressio :- Singh P. et.al [14] grants an innovative procedure for wavelet centered image compression via exploitation of nil-tree idea in the wavelet decayed image. The procedure has a large edge above formerly settled wavelet centered image compressing procedures in that it exploits inter and intra band connection concurrently, somewhat that preceding procedures unsuccessful to achieve. Further the enhancement in code effectiveness, the procedure also usages meaningfully lesser memorial for calculation and code thus dipping the algorithm complexity. The outstanding characteristic of the procedure is perm itself-determining code that marks it appropriate for application to error opposition arrangements and marks it a lesser amount of susceptible to data damage owing to loud communiqué-net work. The procedure codes totally the colorful bands self-sufficiently hence allowing differential coding for color info. The effort begins with the conversation of concept of the procedure and then perceives the procedure in a wider light. Contrasts have been completed to SPIHT, the well-recognized nil tree coder for wavelet centered image compressing in relations of code effectiveness, memory demand and error-opposition.

Guided Quaternary Reaching Method for Wavelet-based Image Compression :- Xiteng Liu [15] grants a modest-calm to know, cool to implement extraordinary act wavelet centered image compression procedure by guided quaternary reaching (GQR) technique is suggested. Contrasted with JPEG2000, GQR procedure has dual amazing values: 1). ample lesser algorithm complexity and 2). Advanced compression effectiveness in a wavelet-centered image compression scheme, wavelet constants are reorganized into graded sub-bands. Since, image signals are 2-D and therefore the importance of wavelet constants are 2-D dispersed in side every sub-band. After quantizing, maximum constants come to be small integers or nil. To a comparatively huge threshold, the complete background saw that important constant slightly and 2-Dscatter in a wide area of unimportant constants. Hence, linear scan designs unavoidably origins damages in compression effectiveness.

A Neural and Morphological Method for Wavelet-Based Image Compression :- Conferring to de Almeida Filho [16], Image compression by the wavelet transform has quite a few gains above other transform approaches. Though, wavelet-centered compression techniques need encoding of the important constants, with their locations in the image. The effort gifts a wavelet-centered image compressing technique where the importance map is pre-handled by scientific morphology methods to build groups of important constants. It is then encrypted by areas unable NNs whose exercise regulation was established to take gain of some possessions of this gentle of difficulty. Particular trial con sequences are offered to authenticate the competitive learning law and other constituents of the process.

DCT and Wavelet Based Image Compression in Satellite Images :- Hacihaliloglu I. [17] intentions to match record of the well-recognized compression methods to be precise discrete cosine transform and discrete wavelet transform. It examines RADARSAT and SPOT images of dissimilar areas of dissimilar features. RADARSAT-1 well and typical beam manner images of the diverse areas in Istanbul are usage for testing the act of the compression

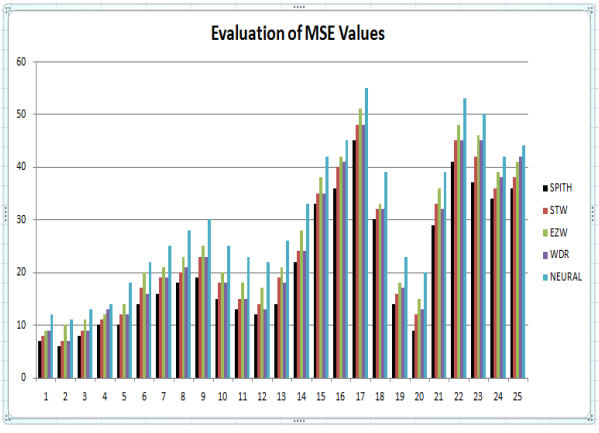
procedures. The areas, which have been examined, were oceanic, woodland, constructed surroundings-domestic and industrialized zones which describe diverse forms of town terrestrial usage. The reading revealed that similar parts like woodland and oceanic provided enhanced compressing consequences matched to varied parts like industrialized and ecological. The sub sequent aim of this reading is to associate the two compressing procedures. The discrete wavelet centered procedure provided for enhanced consequences matched to the discrete cosine transform centered procedure. The con sequence salt ere conferring to the quantizing procedure and the transform-coding method.

IV. PERFORMANCE EVALUATION RESULTS WITH GRAPH AND TABLES

The evaluation of this work includes 25 color images of different size (In KB). These works used neural Network and novel Wavelets SPIHT, STW, EZW and WDR on these 25 images and calculate results. The following figure and tables show the evaluation of various performance parameters like Mean Squared Error (MSE), Peak Signal-to-Noise Ratio (PSNR), Bit per Pixel (BPP) and Compression Ratios (CR) and their comparison.

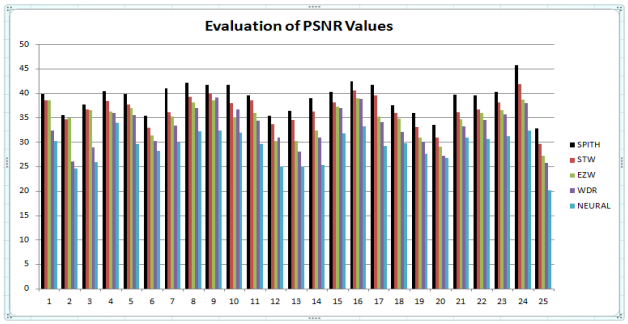
4.1 Mean Square Error (MSE) Evaluation

The Mean Square Error (MSE) is error metric utilize to compare image compression quality. The lower the value of MSE will decrease the error.MSE is also a network performance function, it evaluate the network's performance in accord with to the mean of squared errors. Following Figure 5.10 and Table 5.1 presents the evaluation of Mean Square Error (MSE) values.



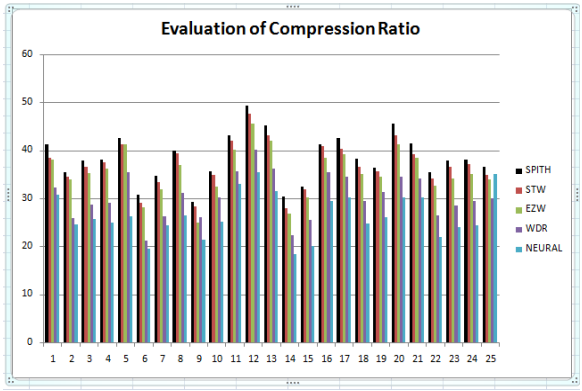
4.2 Peak Signal to Noise Ratio (PSNR) Evaluation

The PSNR is beneficial for quality assessment between the original image and a compressed image. The high value of PSNR, give good quality of the compressed or recreated image. The PSNR is error metric used to compare image compression quality. PSNR shows the measure of the peak error. Following Figure 5.11 and Table 5.2 presents the evaluation of Peak Signal to Noise Ratio (PSNR) values.

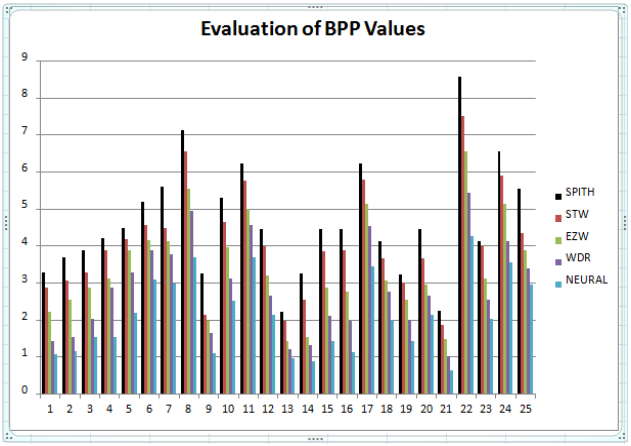


4.3 Compression Ratio (CR) Evaluation

The Compression ratio is a performance parameter of image compression. It is the ratio of the size of the compressed file and uncompressed file. The high value of Compression Ratio (CR) gives good quality of the compressed image. Following Figure 5.12 and Table 5.3 presents the evaluation of Compression Ratio (CR) values.



4.4 Bits per Pixel (BPP) Evaluation Bits per pixel (BPP) are the number of bits stored in per pixel of an image. If more bits are presents in image it represents colors of image. The bits per pixel (BPP) value will vary for different images and different quality compression. The high value of bits per pixel (BPP) gives good quality of the compressed image. Following Figure 5.13 and Table 5.5 presents the evaluation of bits per pixel (BPP) values.



V. CONCLUSION

The results shows that SPIHT calculates better performance parameters like Peak Signal-to-Noise Ratio

(PSNR) and Mean Squared Error (MSE), Bit per Pixel (BPP) and Compression Ratios (CR), as compared to other three wavelets and existing wavelet and neural network based image compression techniques.

Future Scope

The field of image processing has been growing at a very fast speed. The day to day emerging technology requires more and more revolution and evolution in the image processing field. In image processing, the same experiments should also be conducted with other types of neural network to see the different types can improve the performance of the system. The future enhancement says that it should apply genetic algorithm or either fuzzy to make more accurate more advanced.

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