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Approach for finding residual of image with the help of 2-D wavelet Compression system in order to display level of tendency and dispersion.

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Abstract: **This research paper includes image compression system that reduces the size of the original image , the reason behind the reduction in original image is that the larger size of the image will contain larger bandwidth and more time while downloading from internet . So we use compression system to overcome this problem. Here in this research paper we use image with ID having dimensions (480×640) with width 640 pixels and height 480 pixels. Then we perform image compression through wavelet 2-D tool of mat lab software .Before compression the percentage of cfs (CWT Coefficients) recovery was 99.8% and number of zeros were 93.25% but after the compression there is change in percentage of coefficients recovery i.e. the percentage of cfs recovery is 100% percent and number of zeros is 91.06%. Later we find histogram and commutative histogram of residual image for getting proper level of tendency and dispersion. Compressing an image is significantly different than compressing raw binary data. on the other hand, most graphic files, such as .GIFs (Graphics interchange format) and .JPEGs (Joint photographic experts group), have little redundant information and compress poorly. In some instances, the new "compressed" version of a file may be larger than the original. This also applies to audio formats such as .MP3.**

Keywords- CFS; DWT; GIF; JPEG.

I.INTRODUCTION

General purpose compression programs can be used to compress images, but the result is less than optimal. This is because images have certain statistical properties which can be exploited by encoders specifically designed for them.

One-Dimensional Wavelet Packet Compression

Global hard thresholding methods with GUI-driven choice are available. Predefined thresholding strategies in one dimension wavelet packet compression are

1 Empirical method
2 Balance sparsity-norm
3 Remove near 0

Two-Dimensional Wavelet Packet Compression

Global thresholding methods with GUI-driven choice are available.Predefined thresholding strategies in two dimension wavelet packet compression are

1 Empirical method
2 Balance sparsity-norm
3 Balance sparsity-norms (sqrt)
4 Remove near 0

Compression is achieved by the removal of one or more of three basic data redundancies.

(1) Coding redundancy, which is present when less than Optimal (i.e. the smallest length) code words are Used.
(2) Interpixel redundancy, which Results from the correlations between the pixels of an Image &
(3) Psycho visual redundancy.

II. DISCRETE WAVELET TRANSFORM IMAGE COMPRESSION

Digital images are very large in size and hence occupy larger storage space. Due to their larger size, they take larger bandwidth and more time for upload or download through the Internet. This makes it inconvenient for storage as well as file sharing. To combat with this problem, [1] the images are compressed in size with special techniques. Wavelets are functions which allow data analysis of signals or images, according to scales or resolutions. The processing of signals by wavelet algorithms in fact works much the same way the human eye does or the way a digital camera processes visual scales of resolutions, and intermediate details. But the same principle also captures cell phone signals, and even digitized color images used in medicine [2]. Wavelets are of real use in these areas, for example in approximating data with sharp discontinuities such as choppy signals, or pictures with lots of edges. While wavelets is perhaps a chapter in function theory, we show that the algorithms that result are key to the processing of numbers, or more precisely of digitized information, signals, time series,

still-images, movies, color images, etc. Thus, applications of the wavelet idea include big parts of signal and image processing, data compression, fingerprint encoding, and many other fields of science and engineering.

III. BLOCK DIAGRAM OF IMAGE CODER

The method of compression used depends on the desired quality of output. If the image compression application is expected to produce a very high quality output without any loss in fidelity, lossless compression technique is used [3].The theory of continuous and discrete wavelet transforms has inspired much basic and applied research in signal and image processing, as well as revitalizing the study of sub-band filtering .The Discrete Wavelet Transform (DWT) is obtained by repeated filtering and sub-sampling into two bands with low- and high-pass Finite Impulse Response (FIR) filters called the analysis filters.

Compressing an image is significantly different than compressing raw binary data. Of course, general purpose compression programs can be used to compress images, but the result is less than optimal. This is because images have certain statistical properties which can be exploited by encoders specifically designed for them. Also, some of the finer details in the image can be sacrificed for the sake of saving a little more bandwidth or storage space. In the diagram number one, we have shown Image coder through which we can perform coding and decoding of the image [4].First of all we will do the energy compression of the image by reducing original data of the image. The second block of the image is quantizer means we have to quantize the image into fixed packets. Then we use entropy coding block for random coding of the image and then we have entropy decoder for decoding the randomness of image then sent the image to the inverse quantizer block and at the last we will have to again reconstruct the original image to recover the properties of the image again.

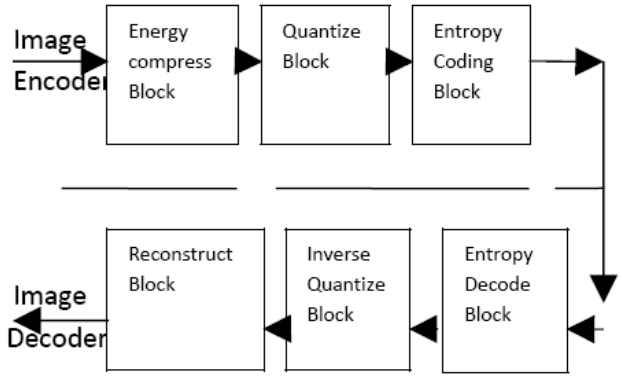

Diagram1. Image coder

An approximation of the original image is enough for most purposes, as long as the error between the original and the compressed image is tolerable. In recent years, the development and demand of multimedia product grows increasingly fast, contributing to insufficient bandwidth of network and storage of memory device [5].

IV PERSPECTIVE OF INFORMATION THEORY

Residuals are differences between the one-step-predicted Output from the model and the measured output from the validation data set. Residual analysis consists of two tests: the whiteness test and the independence test. According to the whiteness test criteria, it has the residual autocorrelation command inside confidence interval, indicating that the residuals are uncorrelated. According to the independence test criteria, it has residuals uncorrelated with past inputs. Evidence of correlation indicates that it does not describe how part of the output relates to the corresponding input [6]. For example, a peak outside the confidence interval for lag k means that the output y (t) that originates from the input u (t-k) is not properly described in perspective of information theory.
In the field of image statistics, such redundancies correspond to statistical invariant properties of our environment. These properties have been comprehensively discussed in literature pertaining to natural image statistics. A basic principle in visual system is to suppress the response to frequently occurring features, while at the same time keeps sensitive to features that deviate from the norm .Therefore, only the unexpected signals can be delivered to later stages of processing [7] . From the perspective of information theory, effective coding decomposes the image information H (Image) into two parts:

H (Image) = H (Innovation) + H (Prior Knowledge)

H (Innovation) denotes the novelty part, and H (Prior Knowledge) is the redundant information that should be suppressed by a coding system. Now it is widely accepted that natural images are not random, they obey highly predictable distributions.

V APPLICATIONS OF IMAGE COMPRESSION

1 The compression not only helps in saving storage space but also enables easy sharing of files. Image compression applications reduce the size of an image file without causing major degradation to the quality of the image.

2 This technique is used where a high degree of accuracy is a must. In applications where some quality can be compromised, lossy compression technique is used. This technique is used in applications where a little compromise on quality of image is required [8].

3 Image compression applications compress images quickly. Thus they result in efficient utilization of time, memory and bandwidth.

VI ADVANTAGES AND DISADVANTAGES OF IMAGE COMPRESSION

1 Compressing large files makes them easier to send as email attachments and quicker to send over the Internet.

2 Most compression programs let you encrypt files by typing a password. The encrypted file appears to contain a meaningless jumble of data. The program cannot decompress an encrypted file without the password [9].

3 If you have many small files on your hard drive, it may make sense to compress them into one or more files having a smaller size than the originals.

4 A file compression program works by mathematically analyzing a file's data, then saving it with most of the redundancies removed. This has the greatest effect on text files, word processor documents, spreadsheets, databases.

5 File compressions is a mathematically intense operation. Compressing hundreds of megabytes of files might take the better part of an hour, depending on your computer's speed. Compressing and decompressing a few small files is quick; however, the time adds up for large files [10].

VII. METHODOLOGY OF GUI BASED IMAGE COMPRESSION SYSTEM.

Step1First of all start with 2-D Wavelet analysis tool and from the Matlab Prompt we have to type wavemenu. After this command the wavelet tool menu will appears like this [11].

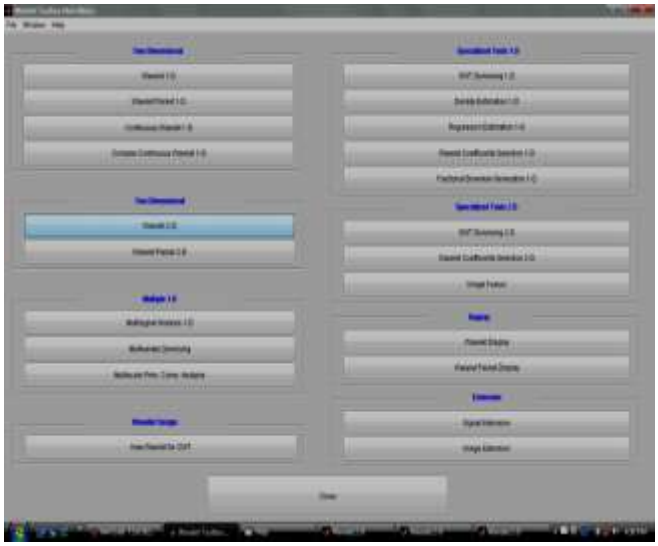

Diagram2 Wavelet Toolbox Main menu

Step2Press click on wavelet 2-D menu items and after this the tool for discrete Wavelet analysis for the 2-D of image data appears like this [12].

Diagram3 Wavelet 2-D window

Step3 Open file menu and load the image then press image option button.

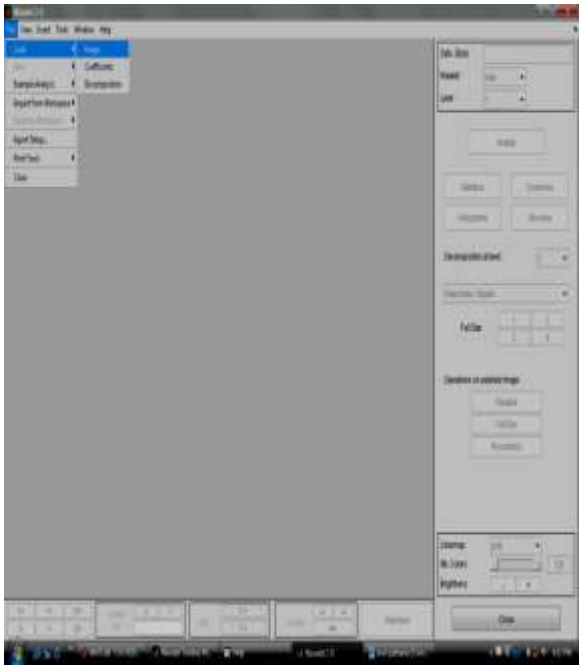

Diagram4 Wavelet 2-D window with image

Step4 After step third the image dialog box will appears like this and then we select Demo mat-file wbarb.mat. This is a command that should be inside the matlab directory toolbox/wavelet/wave demo and Press ok.

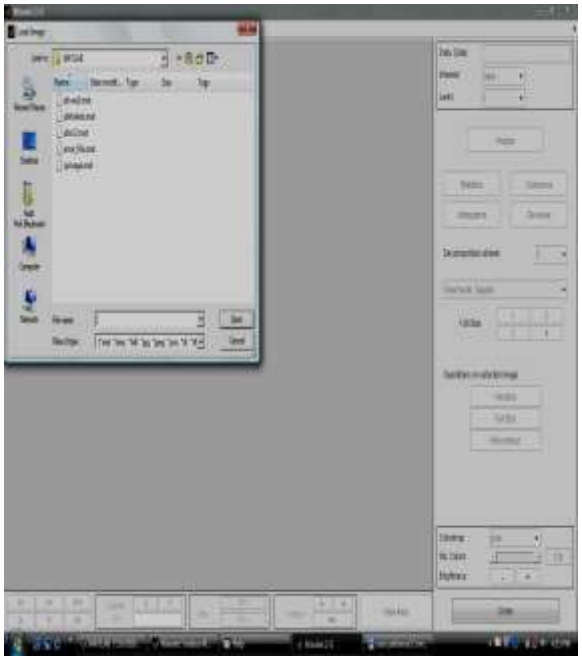

Diagram5 Load image window

Step5 In this step we have to determine the main family of the wavelet, type of wavelet and level of the wavelet those are located to upper right side and Select bior3.7 wavelet at level2 for doing analysis work. Now press analysis button.[13]

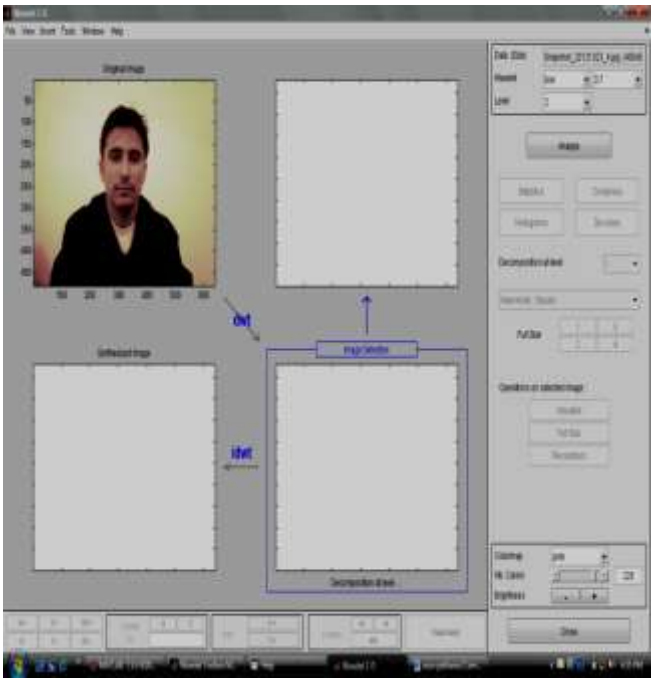

Diagram6 Wavelet 2-D window before analysis

Step6 Take an advantage of square mode feature for the analysis that appears in square mode as default .We have four different displays for this analysis. In the upper left side there is Original image, and below that there is a reconstructed Image from the various level approximations. At the lower right there is the decomposition in all horizontal, and the diagonal in vertical and detail of all the coefficients .Now at top right there are Visualization space which display all the Component for analysis. Click on the first visualization button. Image will display.

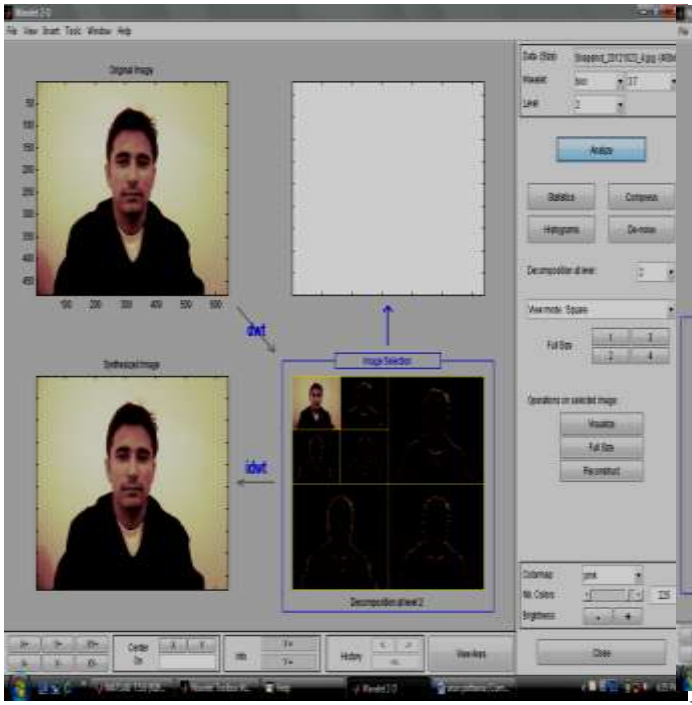

Diagram7 Wavelet 2-D window after analysis

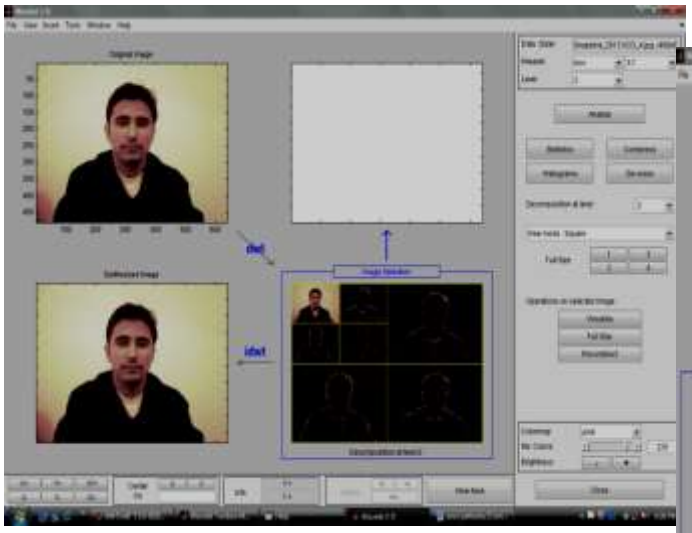

Diagram8 Wavelet 2-D window after analysis with other options

Step7. Apply tree mode feature . From view mode of menu select tree mode information contained in this that is same as square mode.

.

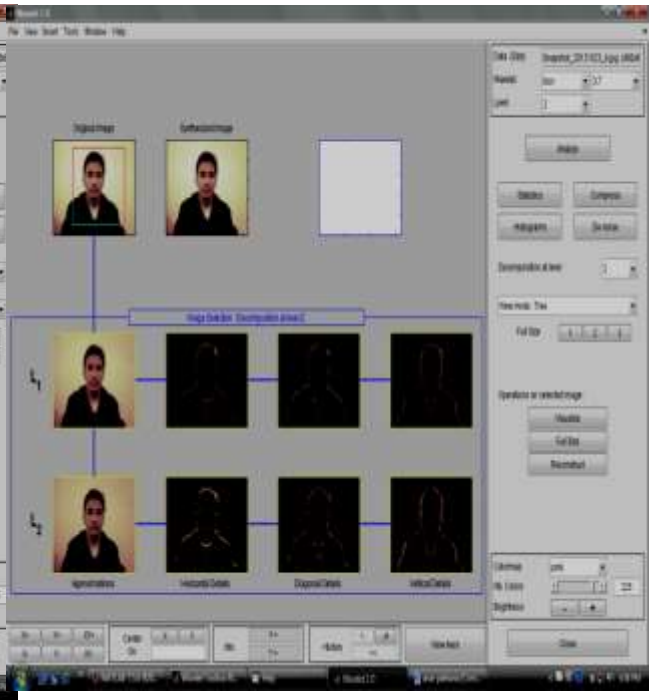

Diagram9Wavelet 2-D window with tree mode

Step8.Zoom image in detail. Select xy+ button of wavelet 2-D tool for enlarging the image .For magnification of original image click the history << button.

Diagram10 Wavelet 2-D window with Zoom in detail

Step9. For compressing the image click the compression button The wavelet 2-D compression windows will appears like this. We will select the threshold level

in order to provide better balance between energy of retaining image .use remove at near zero option .

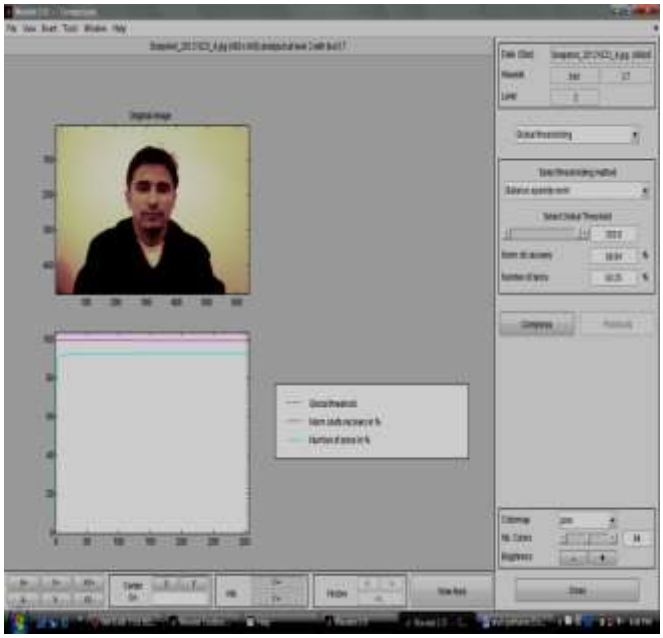

Diagram11 Wavelet 2-D compression window

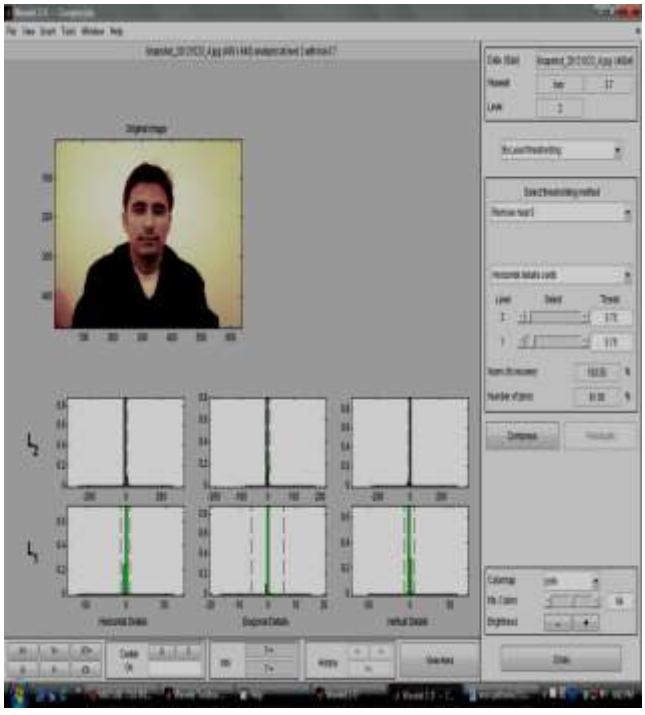

Diagram12 Wavelet 2-D compression window with different levels

Step10 In order to show the residuals. Click the residual button from wavelet 2-D tool of compression.Now we have to use Wavelet 2-D Compression window which will appear like this that is used to display all level of tendency and dispersion.

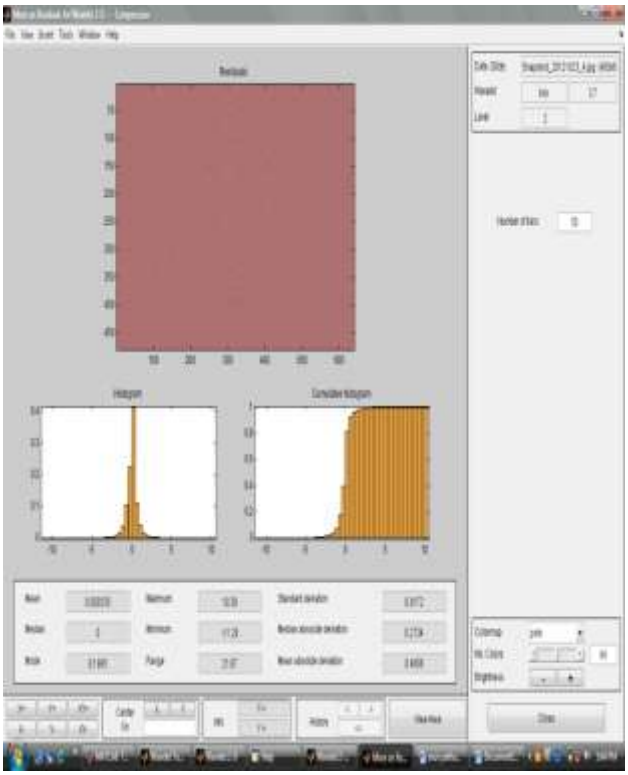

Diagram13 More on Residuals for wavelet 2-D compression

Step11 Also we have to save the synthesized image from already loaded signal of arun1 type in matlab command window.With level three andsym4 .In wavelet 2-D tool, select file option and then Save option to load image in the work Space.

For doing this we will use following command

Load arun1

Whos

Name	Size	Bytes	Class
x	480×640	2457600	double
map	225×3	5400	double
valTHR	0×0	0	double
wname	1×7	14	char

Diagram14 Synthesized image compressed parameters

V. CONCLUSION

The aim of our research was to compress the image up to the level where we can define residual coefficients and decomposition of each part of image in order to show level of tendency and dispersion .We found compression 2-D wavelet tool helpful in providing better result .Later we find histogram and cumulative histogram of residual image for getting proper level of tendency and dispersion. Main result of this research paper was to find compressed image that must be easy to download from internet because after compression the bandwidth of image got reduced.

REFERENCES

[1] S. Todd, G. G. Langdon, Jr., and J. Rissanen, new "Parameter reduction and context selection for the Compression of the gray-scale images," IBM Jl. Res Develop., vol. 29 (2), pp. 188–193, Mar. 1985.

[2] G. G. Langdon, Jr., A. Gulati, and E. Seiler, "On the JPEG model for lossless image Compression in the Proc. 1992 Data Compression Conference, USA & Utah, pp. 172– 180, Mar. 1992.

[3] G. G. Langdon, Jr. and M. Manohar, "Centering of the context-dependent components of prediction of Error distributions," in Proc. SPIE (Applications of digital Image Processing XVI), vol. 2028 , 1993.

[4] Magnor M., Girod B., "Data Compression for the Lightfield Rendering", IEEE Trans. on the Circuits and Systems for Video Technology, 2000.

[5] Nayar S.,"Catadioptric Omni directional Camera", A IEEE Computer Vision and for Pattern Recognition (CVPR), pp. 482-488, 1997.

[6]. Jaffard, S., Meyer, Y., Ryan, R. D. Wavelets Tools for science & technology. Society for the Industrial and Applied Mathematics (SIAM), Philadelphia,PA ,revised edition, (2001)

[7] Jorgensen, P. E. T. Analysis and probability: New wavelets, signals, fractals, volume 234 of the Graduate Texts in Mathematics. Springer, A New York, (2006)

[8] Jain, A. K. 1989. Fundamentals of the digital and Image processing. Prentice Hall: Englewood Cliffs NJ.

[9] Puri, A. 1992. Video coding using the file MPEG-1 compression standard. Society for Information Display Digest of Technical and Papers 23: 123-126.

[10]. I. H.Witten, R. M. Neal, and J. G. Cleary, A "Arithmetic coding for data Compression, & "Communications of the ACM, vol. 30,and no. 6, pp. 520–540, June 1987.

[11]. J. Froment, "Image compression through level lines and wavelet packets," in the wavelets for Signal and Image Analysis, A. Petrosian and F. G. Meyer, Eds.Kluwer Academic, 2001.

[12] Mulcahy, Colm Image Compression Using the Haar Wavelet Transform.

[13] Strang, Gilbert Introduction to Linear Algebra.

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