International Journal of Computer Science & Communication (ISSN: 0973-7391)
Volume 10 • Issue 2 pp. 180-189 March 2019 - Sept 2019 www.csjournals.com

# Enhancement of Image Quality during Integration of Wavelet and Huffman Compression Mechanism

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**Abstract:** The integration of Huffman and wavelet mechanism has been proposed in the research work. These two compression mechanism have been used in order to increase the compression ratio and decrease the image size. The content has been compressed as dual layer. At first layer the content is compression using Huffman and at second layer contents has been compressed using wavelet mechanism. There have been two performance parameters that have been considered to calculate performance of graphical content compression algorithm. One is Peak Signal to Noise Ratio & second is Mean square error. In the research work, a chart has been proposed which represented the comparison between traditional wavelet based and Huffman based image compression with proposed algorithm considering file size and its PSNR value after decompression. The proposed work has been supposed to provide better compression ratio and PSNR value.
**Keywords:** Image Compression, Huffman, Wavelet Mechanism, PSNR, Mean square error

## [1] INTRODUCTION

The procedure performed to reduce size of graphical contents is known as graphical contents compression. There are two mechanisms to compress image. One is lossy mechanism where quality of graphical contents is degraded. The second mechanism is lossless where quality graphical contents are retained even after graphical contents size reduction.

The graphical contents compression in case of jpeg is represented below. Here step by step jpeg compression & jpeg decompression has been represented. The raw graphical contents data is sent for subsampling after color space conversion. Then DCT is applied to quantize data.

Image compression is known as one sort data compression. It has been used on digital graphic. It has been done in orderto decrease cost paidto store such graphical content & transmission. The Algorithms are used with visual conception & statistical properties of graphics. Such are used in order to offer superior results. Image compression is capable to minimize size in bytes of a graphics file. In this process there is not any chance ofdecrement in quality of graphical contents. If there would be graphic content in sort size, user could store aot of data in available size of disk & memory space. There would be decrement in transmission of such compressed data via Internet. It reduces downloaded time from Web pages.

## [2] IMAGE COMPRESSION USING HUFFMAN CODING

Huffman coding is one of basic compression methods that have proven useful in graphical contents & video compression standards. When applying Huffman encoding technique on an Image, source symbols could be either pixel intensities of Image, or output of an intensity mapping function.

Prerequisites: Huffman Coding | File Handling

The first step of Huffman coding technique is to reduce input graphical contents to ordered histogram, where probability of occurrence of a certain pixel intensity value is as

prob_pixel = numpix/totalnum

## [3] OBJECTIVE

The objective of the research work has been presented here such as

1. The proposed work is supposed to study Huffman based compression mechanism along with its limitation.
2. This research would focus on wavelet based image compression. This compression technique would be integrated. The objective of integration is to increase compression ratio in proposed work.
3. Research would compress content two layers. At first layer image is supposed to be compressed with help of Huffman. While at second layer image would be compressed with help of wavelet mechanism. Similarly image is supposed to be decompressed by wavelet mechanism. Afterward it would be decompressed with support of Huffman decompression.
4. Final image is supposed to be adjusted to increase its PSNR value. This would assure image quality.

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## [4] WAVELETS IMAGE PROCESSING

A wavelet is a wave-like oscillation with amplitude. It starts at zero, increases. After that it decreases back to zero. It has been basically visualized as a "brief oscillation" as one recorded. It has been done by a seismograph / heart monitor. Basically, wavelets are intentionally crafted to have specific properties. Such make them beneficial for signal processing. With the use of a "reverse, shift, multiply & integrate" technique called convolution, wavelets could be combined with known portions of a damaged signal to extract information from unknown portions.

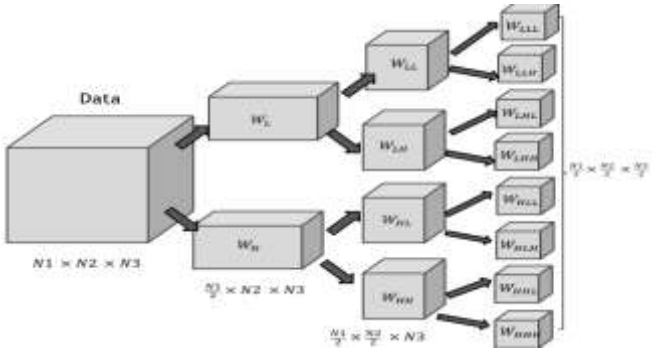


**Fig1W**avelets Image Processing

## [5] RESULT AND DISCUSSION

Here in this chapter the updated Huffman algorithm to compression an image has been performed. Here jpeg image has been taken and matlab script has been applied on it.

**Fig 2** Original image for compression

**Original File before applying compression algorithm**

To view the size of actual image right clicks on image and view properties.

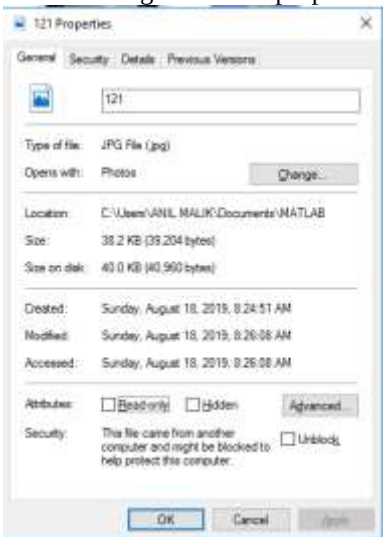


**Fig 3** Size of original File

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### 5.2 RUNNING SCRIPT

Before running script following points must be considered.

1. The Code and image must be placed in common folder.
2. The Compressed image would stored in that folder
3. The decompress image would stored in that folder.

In order to run the script user have to type following command.

#### 5.2.1 Huffman based compression

**Fig 4** Huffman based compress and decompress image

Size of File after applying compression algorithm

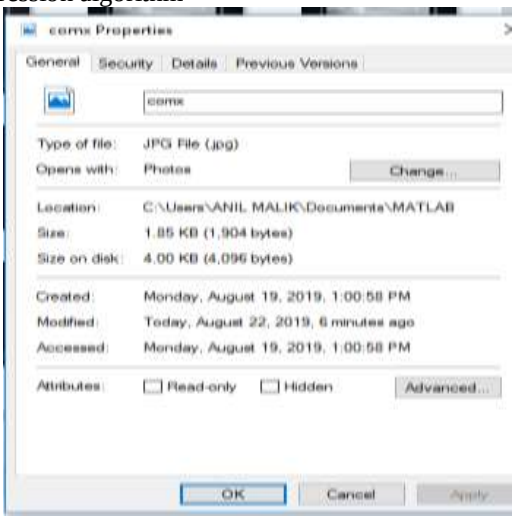


**Fig 5** Size of File after applying compression algorithm

Size of File after decompression of image

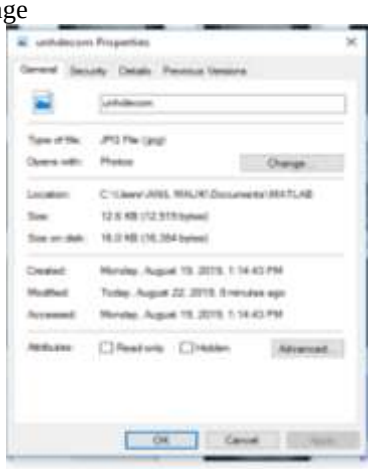

**Fig 6** Size of File after decompression of image

### 5.2.2 Wavlet based compression decompression

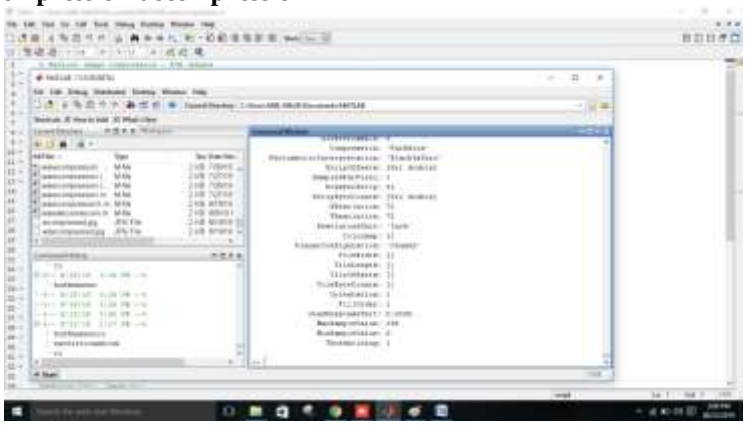

**Fig 7** File compression using Wavelet

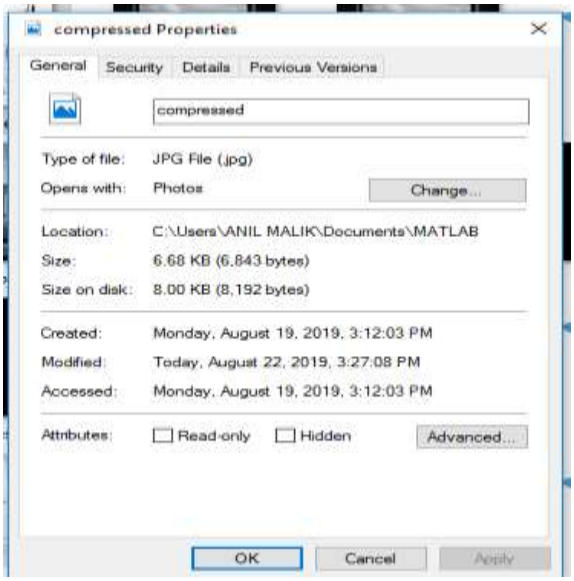


**Fig 8** Size of file after compression using Wavlet mechanism

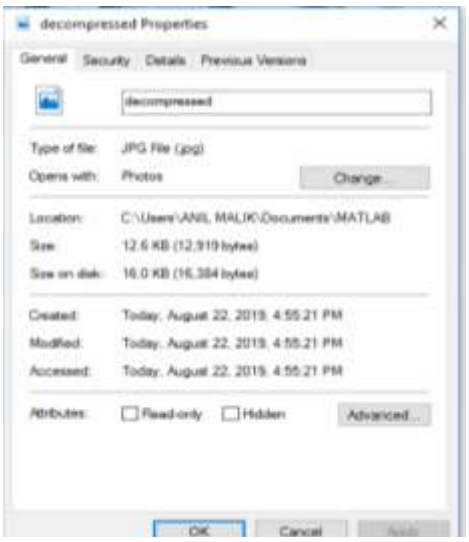


**Fig 9** Size of File after decompression using Wavlet mechanism

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### 5.2.3 Proposed file compression implementation

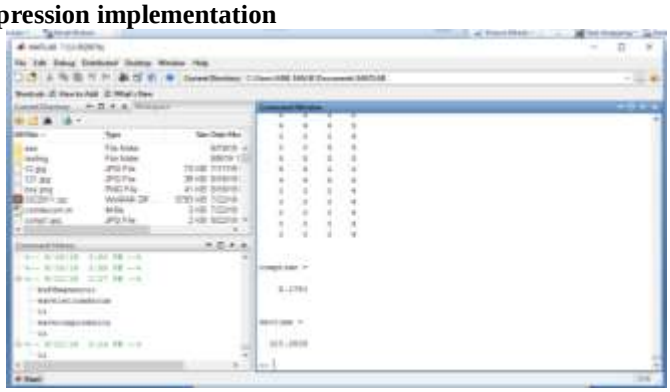

**Fig 10** File compression using proposed model

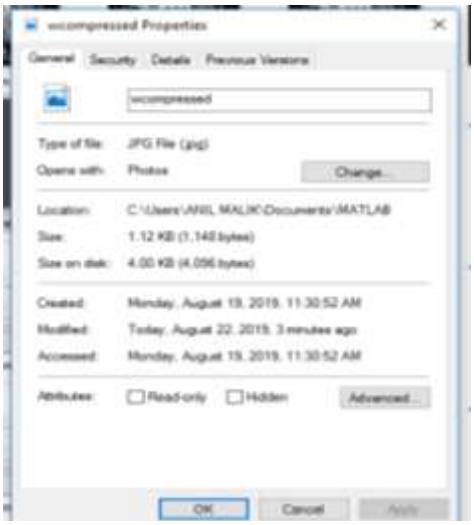

**Fig 11** Size of file after compression using proposed mechanism

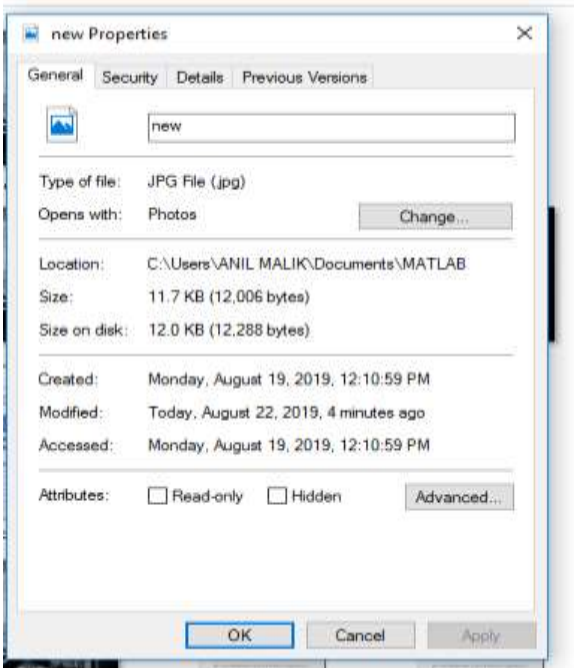


**Fig 12** Size of File after decompression using proposed mechanism

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### 5.3 PSNR CALCULATION

**Result After Checking PsnrOf Compressed Image**

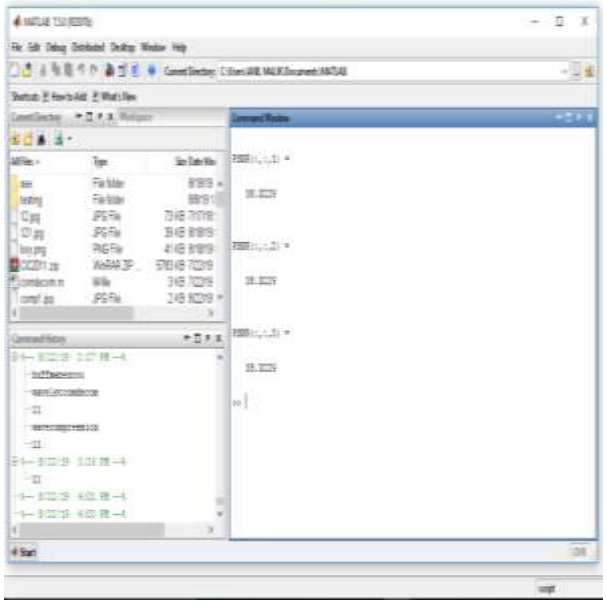

**Fig 13** Histogram of decoded image

### 5.4 PSNR CALCULATION OF DECODED IMAGE

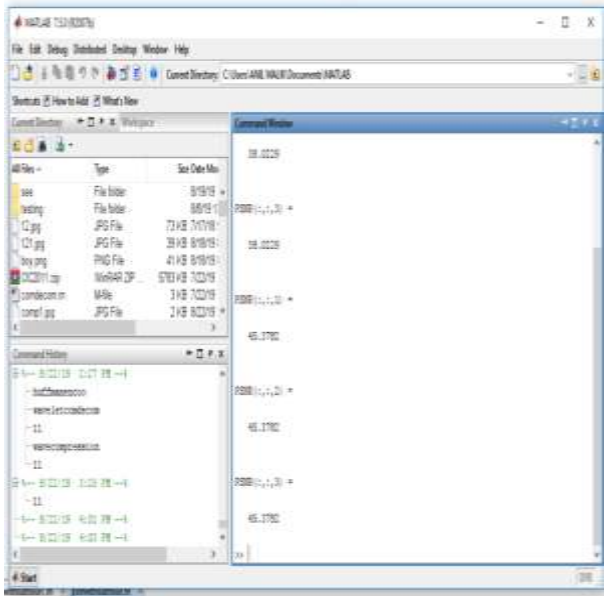

**Fig 14** PSNR of Decoded Image

PSNR is generally used to check quality of reconstruction of lossy& lossless compression. Signal in this case is original data & noise is error introduced by compression. At the time of comparing compression codecs PSNR is considered an *approximation* to human perception of reconstruction quality. Higher PSNR usually represents that reconstruction is of higher quality and in many cases it could be not. PSNR is most easily defined through mean squared error.

### 5.5 MATRIX CHART TO COMPARE THE TRADITIONAL AND PROPOSED WORK

The following chart has represented the comparison between traditional wavelet based and Huffman based image compression with proposed algorithm considering file size after decompression as well as its PSNR value. Moreover the compression time and decompression time in all cases have been discussed here.

**Table:1** Matrix chart to compare the traditional and proposed work

| | **Original File** | **wavelet CODE** | **Huffman** | **PROPOSED ALGO** |
|---|---|---|---|---|
| Original file size | 38.2 | **38.2** | 38.2 | 38.2 |
| File name (After compression) | 121.jpg | **compressed.jpg** | comx.jpg | wdecompressed.jpg |
| File size (compressed) | NA | **6.68** | 1.85 | 1.12 |
| File size (Decompressed) | NA | **12.6** | 12.6 | 11.7 |
| Psnr 1 | | **inf** | 38.022 | 45.37 |
| Compression ratio | NA | **43.54** | | |
| Compression time | NA | | 12.29 | 12.55 |
| Decompression time | NA | | 121.87 | 129.40 |

## [6] CONCLUSION

At all, it has been concluded that in proposed work, the graphical contents have been compressed using Huffman compression module. Then compression of content has been made with the use of wavelet compression techniques. The wavelet decompression is performed afterward. Then content decompressed is transferred to Huffman decompression module. Final image is restored. The result image produced has better quality as compare to traditional compression techniques. The wavelet based image compression has been integrated in order to increase the compression ratio in proposed work. The content has been compressed as dual layer. At first layer the compression of content has been made using Huffman and at second layer contents has been compressed using wavelet mechanism. In same way the contents have been decompressed by wavelet mechanism. After that it has been decompressed with the use of Huffman decompression. At final step the decompressed image has been processed in order to increase its PSNR value to assure better quality.

## [7] FUTURE SCOPE

This research would focus on wavelet based image compression. This compression technique would be integrated. The objective of integration is to increase compression ratio in proposed work. The proposed work is supposed to study Huffman based compression mechanism along with its limitation. Research would compress content two layers. At first layer image is supposed to be compressed with help of Huffman. While at second layer image would be compressed with help of wavelet mechanism. Similarly image is supposed to be decompressed by wavelet mechanism. Afterward it would be decompressed with support of Huffman decompression. Final image is supposed to be adjusted to increase its PSNR value. This would assure image quality.

## REFERENCE

1. Khan, Umhara & Mairaj, Sanna & Nazeer, Tamanna & Ahmed, Suhaib. (2017). Wavelet Based Image Compression Techniques: Comparative Analysis and Performance Evaluation. International Journal of Emerging Technologies in Engineering Research. 5. 9-13.
2. Nedhal Mohammad Al-Shereefi "Image Compression Using Wavelet Transform " Babylon University/Collage of Science/Department of Physics,Journal of Babylon University/Pure and Applied Sciences/ No.(4)/ Vol.(21): 2013
3. Rachit Patel ,Virendra Kumar "A Fast and Improved Image Compression Technique U sing Huffman Coding "This fUll-text paper was peer-reviewed and accepted to be presented at the IEEE WiSPNET 2016 conference.
4. Ali Tariq Bhatti, Dr. Jung Kim(2015), "Implementation of Lossless Huffman Coding: Image compression using K-Means algorithm and comparison vs. Random numbers and Message" International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056 Volume: 02 Issue: 05 | Aug-2015
5. Azariadis, P. (2001), "Computer graphics representation & transformation of geometric entities using dual unit vectors & line transformations", International Journal of Scientific and Research Publications, Volume 2, Issue 12, 2001

6. Banerjee, P.(2014) "Designing & Implementation of Efficient Fuzzy Logic Based Fractal Image Compression Technique within DCT Domain Using Quadtree Algorithm",
7. Chen D. and Ramli R., "Preserving Brightness in Histogram Equalization Based Contrast Enhancement Techniques", Computer Journal of Digital Signal Processing, Vol. 14, No. 5, pp. 413-428, 2004.
8. Dash, T., & Nayak, T. (2012), "Non-Correlated Character Recognition using Artificial Neural Network", In Proceedings of National Conference on Dynamics and Prospects of Data Mining: Theory and Practices (pp. 79-83). India: OITS-BLS, 2012.
9. Deodhare, D., Suri, N. R., & Amit, R. (2005), "Preprocessing and Image Enhancement Algorithms for a Form-based Intelligent Character Recognition System", International Journal of Computer Science and Application, 2(2), 131-144, 2005.
10. **Donchev, S.(2000) "Adaptive threshold-gradient method for segmentation of areas & objects of grey scale images"** International Journal of Scientific and Research Publications, Volume 08, Issue 11, **2000**
11. Dr. Muna F. and Dr. Nedhal Abdul Majied Al Saiyd(2005) **"**Medical Colored Image Enhancement Using Wavelet", Ubiquitous Computing and Communication Journal, Vol. 6, pp.1-8, November 2005.
12. Dhariwal,S. (2011) "Comparative Analysis of Various Image Enhancement Techniques", IJECT, Vol.2, Issue 3, pp. 91-95, September 2011.
13. Felzenszwalbs, P. F., & Huttenlocher, D. P. (2004), "Efficient Graph-Based Image Segmentation", International Journal of Computer Vision, 59(2), 167-181, 2004.
14. Kaur, K., & Sharma, M. (2013), "A Method for Binary Image Thinning using Gradient and Watershed Algorithm", International Journal of Advanced Research in Computer Science and Software Engineering, 3(1), 287-290, 2013.
15. Khan, K., Siddique, M., Aamir, M., & Khan, R. (2012), "An Efficient Method for Urdu Language Text Search in Image Based Urdu Text", International Journal of Computer Science Issues, 9(2), 523-527, 2012.
16. Kranthi, S., Pranathi, K., & Srisaila, A. (2011), "Automatic Number Plate Recognition" International Journal of Advancements in Technology, 2(3), 408-422, 2011.
17. Kumar, P.(2012), "Double Huffman Coding", International Journal of Advanced Research in Computer Science and Software Engineering Volume 2, Issue 8, August 2012
18. Kaur, M.(2015) A Litreature Survey On Lossless Image Compression International Journal Of Advanced Research In Computer And Communication EngineeringVol. 4, Issue 3, March 2015
19. Kabir *H.*, (2010), "Brightness Preserving Image Contrast Enhancement Using Weighted Mixture of Global and Local Transformation Functions", The International Arab Journal of Information Technology, Vol. 7, No. 4, pp. 403-410, October 2010.
20. Kumar, V. and Bansal, H.(2011) "Performance Evaluation of Contrast Enhancement Techniques for Digital Images", IJECT Vol.2. Issue 1, pp. 23-27, March 2011.
21. **Leszczyński, M.(2010), "Image preprocessing for illumination invariant face verification",** *International Journal of Advanced Research in Computer Science and Software Engineering*, Vol. 5, Issue 6, pp. 283-288, **2010**
22. Maini, R., & Aggarwal, H. (2009), "Study and Comparison of Various Image Edge Detection Techniques", International Journal of Image Processing, 3(1), 1-11, 2009.
23. Maini, R., & Aggarwal, H. (2010), "A Comprehensive Review of Image Enhancement Techniques", Jounal of Computing, 2(3), 8-13, 2010.
24. Maji, S., & Malik, J. (2009), "Object detection using a max-margin hough transform", IEEE Conference on Computer Vision and Pattern Recognition (pp. 1038-1045), 2009.
25. Mittal, A., & Dubey, S. K. (2013), "Analysis of MRI Images of Rheumatoid Arthritis through Morphological Image Processing Techniques", International Journal of Computer Science Issues, 10(2), 118-122, 2013.
26. Malwinder Kaur A. (2015), "Litreature Survey On Lossless Image Compression", International Journal Of Advanced Research In Computer And Communication Engineering Vol. 4, Issue 3, March 2015
27. **Mythili, C.and V. Kavitha "Various types of noise within images especially within digital color image",** International Journal of Advanced Research in Computer Science and Software Engineering Volume 2, Issue 8, **2011**
28. Parker, J. R. (2010), "Algorithms for image processing and computer vision", *International Journal of Computer Applications*, Vol. 140, No. 2, pp. 1-15, ISBN 0975-8887, 2010.
29. Pandey,N. & Agrawal, H.(2014) "Hybrid Image Compression Based On Fuzzy Logic Technology" Computer Journal of Digital Signal Processing, Vol. 14, No. 5, pp. 413-428, 2014

30. Pradeep, J., Srinivasan, E., & Himavathi, S. (2011), "Diagonal based feature extraction for handwritten alphabets recognition system using neural network", International Journal of Computer Science & Information Technology, 3(1), 27-38, 2011.
31. Preeti Banerjee "Designing & Implementation of Efficient Fuzzy Logic Based Fractal Image Compression Technique within DCT Domain Using Quadtree Algorithm" International Journal of Advanced Research in Computer Science and Software Engineering Volume 2, Issue 8, 2014
32. . Hai Lin-peng, Chen Chong "Research on Coordinate Transformation Method within Three-dimensional Reconstruction of Architecture" 2010
33. Samantaray, R. K., Panda, S., & Pradhan, D. (2011), "Application of Digital Image Processing and Analysis in Healthcare Based on Medical Palmistry", IJCA Special Issue on Intelligent Systems and Data Processing, 56-59, 2011.
34. Saxena A. ,H. (2014), "Three Dimensional Transformations In Computer Graphics", International Journal of Computer Science & Information Technology, 2014
35. Sharma, D. V., Saini, G., & Joshi, M. (2012), "Statistical Feature Extraction Methods for Isolated Handwritten Gurumukhi Script", International Journal of Engineering Research and Application, 2(4), 380-384, 2012.
36. Solomon, C., & Breckon, T. (2011), "Fundamentals of Digital Image Processing", A practical approach with examples in Matlab. John Wiley & Sons, 2011.
37. **Saha,S., Chandrajit, p., Paul, P.(2014) "Brief experience on journey all over hardware developments for image processing & it's applications on Cryptography" ,** *International Journal of Enhanced Research in Science Technology & Engineering*, Vol. 3, Issue 5, pp. 275-279, ISSN: 2319-7463, May 2014.
38. **Singh, S., Bansal, R.K, Bansal, S.(2012) "Comparative Study & Implementation of Image Processing Techniques Using MATLAB"** International Journal of Advanced Research in Computer Science and Software Engineering, Volume 2, Issue 3, March 2012
39. **Sato,M.(2000) "Gradient magnitude based region growing algorithm for accurate segmentation"**, International Journal of Scientific and Research Publications, Volume 5, Issue 12, 2000.
40. Shapi, A., Sulaiman, R.(2010) "Geometric Transformation Technique for Total Hip Implant within Digital Medical Images" International Journal of Advanced Research in Computer Science and Software Engineering Volume 2, Issue 8, 2010
41. Sakuldee, R. and Udomhunsakul, S.(2007) "Objective Performance of Compressed Image Quality Assessments", International Journal of Electrical and Computer Engineering, vol. 2, no. 4, pp. 258-267, 2007.
42. Shapi'I A., Sulaiman R., Mohammad K. H. (2010), "Geometric Transformation Technique for Total Hip Implant within Digital Medical Images", International Journal of Electrical and Computer Engineering, vol. 2, no. 4, pp. 258-267, 2010
43. **Saha S., Pal C.,(2000), "Brief experience on journey all over hardware developments for image processing & it's applications on Cryptography"** International Journal of Advanced Research in Computer Science and Software Engineering Volume 5, Issue 8, 2000
44. WANG Zhiming, W. and TAO Jianhua(2006) "A Fast Implementation of Adaptive Histogram Equalization", International Conference on Signal Processing, ICSP, 2006.
45. **Yanab, C.C.(2008) "Study on methods of noise reduction within a stripped image",** *International Journal of Advanced Research in Computer Science and Software Engineering*, Vol. 5, Issue 6, pp. 283-288, 2008
46. Yeganeh *H.(2008)* "A Novel Approach for Contrast Enhancement Based on Histogram Equalization" International Conference on Computer and Communication Engineering, ICCCE, pp. 256 – 260, 13-15 May, 2008.
47. Yoon, H.(2009) "Image Contrast Enhancement based Sub-histogram Equalization Technique without Over-equalization Noise", World Academy of Science, Engineering and Technology, Vol. 50, pp.176-182, 2009.
48. Marcus J. Nadenau and Julien Reichel(1997) "Opponent Color, Human Vision and Wavelets for Image Compression"
49. Hidenori Sakanashi, Mehrdad Salami(1998) "Evolvable Hardware Chip for High Precision Printer Image Compression"
50. M. Klimesh, V. Stanton, and D. Watola (2001) "Hardware Implementation of a Lossless Image Compression Algorithm Using a Field Programmable Gate Array"
51. M Saenz, P Salama, K Shen,(2001) "An Evaluation of Color Embedded Wavelet Image Compression Techniques"

52. William A. Pearlman(2002) "Trends of Tree-Based,Set-Partitioning Compression Techniques in Still and Moving Image Systems"
53. Anna Linderhed (2004) "Image Compression based on Empirical Mode Decomposition"
54. John Kominek(2006) "Algorithm for Fast Fractal Image Compression"
55. Matthew J. Zukoski (2006) "A novel approach to medical image compression" Int. J. Bioinformatics Research and Applications, Vol. 2, No. 1, 2006
56. P. Raviraj and 2M.Y. Sanavullah(2007) "The Modified 2D-Haar Wavelet Transformation in Image Compression" Middle-East Journal of Scientific Research 2 (2): 73-78, 2007
57. Alex Fukunaga and Andre Stechert(2008) "Evolving Nonlinear Predictive Models for Lossless Image Compression with Genetic Programming"
58. Ahmed Nabil belbachir and Peter Michael(2010) "The Contour let Transform For Image Compression"
59. David Varodayan, Anne Aaron, and Bernd Girod (2010) "Exploiting Spatial Correlation in Pixel-Domain Distributed Image Compression"
60. G. K. Kharate, V. H. Patil (2010) "Color Image Compression Based On Wavelet Packet Best Tree" IJCSI International Journal of Computer Science Issues, Vol. 7, Issue 2, No 3, March 2010
61. Nidhi Sethi, Ram Krishna (2011), "Image Compression Using Haar Wavelet Transform", International Journal of Advanced Research in Computer Science, Volume 2, No. 4, July-August 2011
62. Anitha s(2011) " Image Compression Using Discrete Cosine Transform & Discrete Wavelet Transform" International Journal of Scientific & Engineering Research Volume 2, Issue 8, August-2011
63. Proch´azka, J. Pt´aˇcek, and I. (2012) "Wavelet Transform in Signal and Image Restoration"
64. M. Mozammel Hoque Chowdhury and Amina Khatun(2012) "Image Compression Using Discrete Wavelet Transform" International Journal of Computer Science Issues, Vol. 9, Issue 4, No 1, July 2012
65. P.Ashok Babu & Dr. K.V.S.V.R.Prasad (2012), "A Lossy Color Image Compression Using Integer Wavelet" Global Journal of Computer Science & Technology Graphics & Vision Volume 12 Issue 15 Versions 1.0 Year 2012
66. Rehna V. J and Jeya Kumar M. K (2012) "Wavelet Based Image Coding Schemes: A Recent Survey" International Journal on Soft Computing (IJSC) Vol.3, No.3, August 2012
67. Akshay Kekre(2013) "Image Compression Using Wavelet Transform And Differential Pulse Code Modulation Technique" International Journal of Engineering Research & Technology (IJERT) Vol. 2 Issue 7, July – 2013
68. Miss. S.S. Tamboli1, Dr. V. R. Udupi (2013), "Image compression using haar Wavelet transform", International Journal of Advanced Research in Computer & Communication Engineering Vol. 2, Issue 8, August 2013
69. T.Karthikeyan, B.Praburaj, K.Kesavapandian (2014) "Wavelet Based Image Compression Algorithms – A Study" International Journal of Advanced Computer Research (ISSN (print): 2249-7277 ISSN (online): 2277-7970) Volume-4 Number-1 Issue-14 March-2014
70. Dr. Vineet Richariya Mrs. Shweta Shrivastava Naman Agrawal (2014), "Image Compression Technique Using Different Wavelet Function", International Journal of Research in Computer & Communication Technology, Vol 3, Issue 5, May- 2014
71. Neha Pandey, Himani Agrawal (2014) wrote research paper on "Hybrid Image Compression Based on Fuzzy Logic Technology"
72. Preeti Banerjee (2014) made research on "Designing & Implementation of Efficient Fuzzy Logic Based Fractal Image Compression Technique within DCT Domain Using Quadtree Algorithm"[28]
73. Ali Tariq Bhatti, Dr. Jung Kim(2015) Implementation of Lossless Huffman Coding: Image compression using K-Means algorithm and comparison vs. Random numbers and Message[1]
74. MalwinderKaur(2015)A Literature Survey On Lossless Image Compression [23]
75. Er. Kiran Bala, Varinderjit Kaur (2016), "Advance digital image compression using fast wavelet transforms comparative analysis with DWT", International Journal of Engineering Sciences & Research Technology Bala et al., 5(7): July, 2016
76. Anurag, Sonia Rani(2017) "JPEG Compression Using MATLAB" 2017 IJEDR | Volume 5, Issue 2
77. Dr. Vijaya Kumar C N, Kumar D(2017) " Performance Analysis of Image Compression Using Discrete Wavelet Transform" International Journal of Advanced Research in Computer Science and Software Engineering Volume 7, Issue 3, March 2017