AN IMAGE COMPRESSION ALGORITHM FOR NEXT GENERATION NETWORKS

[1]Shalini Kumari and [2]Arun Mishra
[1]M Tech Scholar, Department of Electronics and Communication Engineering,
[2]Assistant Professor, Department of Electronics and Communication Engineering,
RKDF University, Gandhinagar, Bhopal

Abstract: *Current advancements in information-focused digital sound, picture, and video-based (sight and sound) web applications have reinforced the need for more efficient methods. A vast amount of data has emerged with the advancement of innovation and the entry into the digital age. Overseeing such a vast quantity of data can frequently lead to issues. To make practical use of computerized data, it must be placed and recovered in an efficient manner with a clear objective .Image compression techniques play a vital role to achieve this objective.*

Keywords— *Image , Compression, DCT ,Wavelet, NGN*

I. INTRODUCTION

The amount of information associated with visual data is so vast that storing it would need a very high capacity limit. Although certain storage media have severe restrictions, their entrance speeds are typically inversely proportionate to their capacity. Reducing the amount of data lost while transferring or storing photographs is the aim of picture information compression techniques.

1.1 COMPRESSION TECHNIQUES

There are various methods for characterizing compression strategies

The data in the duplicated image serves as the foundation for the main arrangement. Compression techniques come in two flavors: lossy and lossless. The image that is reproduced after lossless compression is numerically exact replica of the original image, pixel by pixel.

The second order of different coding methods is determined by the space where the compression method is connected. The two categories of coding are predictive and transform. Using data that has already been provided or is now accessible, predictive coding forecasts future values and codes the variations. This is done within the image or geographic area, so it may be quickly applied and customized to fit the image's unique characteristics. Differential Pulse Code Modulation (DPCM) is one specific use case for predictive coding.

1.2 IMAGE COMPRESSION THEORY

The implicit presumption of the reduction process is the removal of redundant data or content that either offers no significant information at all or merely repeats already known information. Redundancy in data is the primary issue with digital picture compression.

The compression ratio, or CR, is defined as follows.

$$C_R = n1/n2 \qquad 1.1$$

In that case relative data redundancy (RD) of the initial data set can be defined as follows.

$$R_D = 1 - 1/C_R \qquad 1.2$$

When n2 = n1, then C_R= 1 and hence R_D=0

1.3 A TYPICAL IMAGE CODER

How does a classic picture coder look like? A usual lossy image compression system exposed in figure, which consist of three closely associated components:

(a) Source Encoder or Linear Transforms

(b) Quantizer

(c) Entropy Encoder

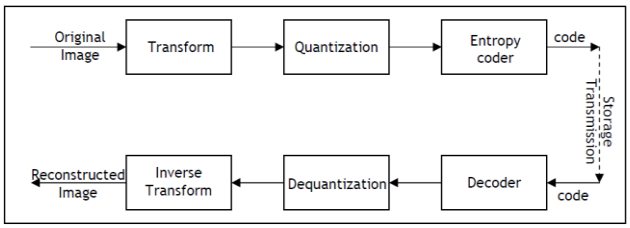

Fig 1: A Typical Image Coder

One of the several transformations that converts the data into a linear combination of weighted premise capacity is the Discrete Cosine Transform.

II. LITERATURE REVIEW

Shannon Fano Algorithm

The technique of data compression involves using compression to create a very helpful method that is used in the.rar or zip file formats for implode compression [2]. The Model Sim SE 6.4 simulator can be used to implement the Shannon Fano method in VHDL code, which compresses the data. The following equation can be used to determine the quantity of data that is compressed when applying these algorithms.

Amount of Compression (Ratio Compression) =

$$\frac{Amount\ Data\ Bits\ Before\ Compression}{Amount\ Data\ Bits\ After\ Compression}$$

We remark that using compression for data can improve with encryption.

Run Length Encoding

RLE (Run Length Encoding) algorithm is one algorithm that
can be used to compress data so that the size of the data produced is lower than the actual size. The example discussed
this time is the cost and return of data from a sentence. RLE (Run Length Encoding) is the easiest form of lossless data compression technique where a series of data with the same value in sequence will be saved into a data. This algorithm is very useful in data that has a lot of data with the same values in sequence like icon files, line drawings, and animations. This algorithm is not suitable for normal data because it will increase.
Flowchart Run Length Encoding Algorithm was given Fig.2.

Fig. 2: Flowchart Diagram Compression Data With RLE

Lempel Ziv Welch

In general the LZW algorithm is a lossless compression algorithm and uses a dictionary. LZW compression will form a dictionary during the compression process takes place.. LZW algorithm can be implemented in many compression
applications. In this experiment [5] have provided a comparison between the conventional LZW coding and proposed MLZW coding [5]. Compression result in term of dictionary. Output from LZW algorithm is amount of bit or code word compression result must be small than file before compression. Algorithm is adapted for Unicode standard, it may be used very easily for any Bangla compression text [5]

Concept from this algorithm is to find the new dictionary from
a new character. LZW method use variable word width dictionary to balance the compression and decompression file.
Flowchart Lempel Ziv Welch Algorithm was given Figure 3

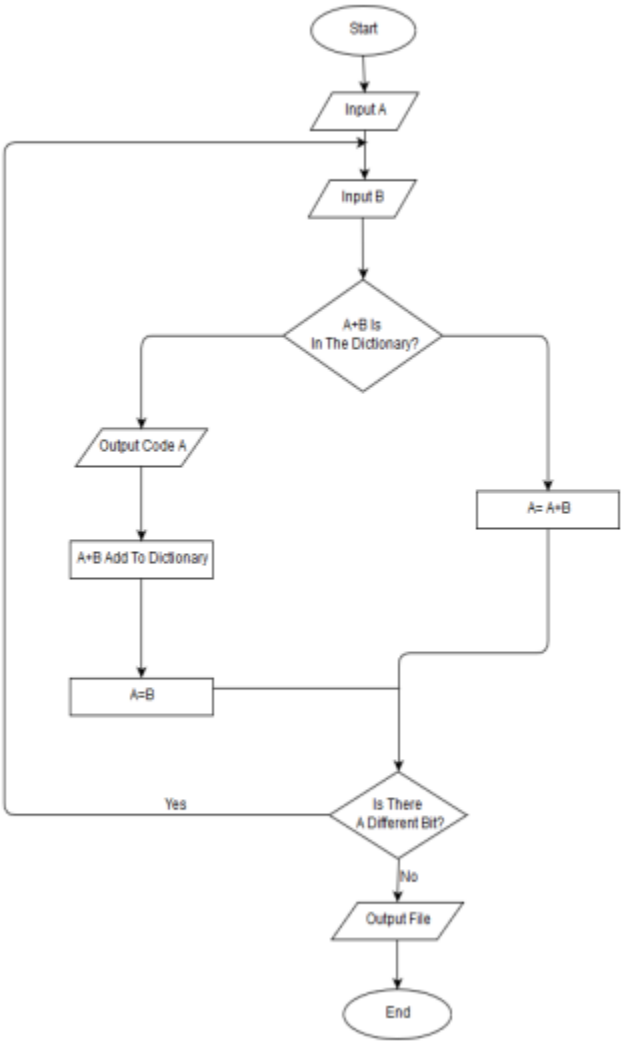

Fig. 3: Flowchart Diagram Compression Data With LZW

III. THE DISCRETE COSINE TRANSFORM

A quick transform that turns data into a linear collection of weighted premise functions—typically frequencies, much as sine waves—is the discrete cosine transform. It is a cozy and popular method of image compression that offers better energy compaction for highly linked data than DFT and WHT.

Either creating a stylistic theme that unites the pixels in each subpicture or compressing as much information as is reasonably possible into the fewer number of transform coefficients are the two main objectives of the transformation process.

3.1 COMPRESSION PROCEDURE

We essentially reconstruct each line of the original image using the inverse DCT, padding each column with as many zeroes as the number of discarded coefficients, in order to recreate the original image. After examining the image at several frequency bands, we may reconstruct the original image by utilizing solely the coefficients of that particular band. The compression techniques are as follows

Step 1: Convert the raw image into a signal (a string of integers).

Step 2: Process the signal into a series of transform coefficients w

.

Step 3: Modify transform coefficients from w to another sequence w´ by using a threshold.

Step 4: Convert w' to a sequence q by using quantization.

Step 5: Pack q into a sequence e using entropy coding.

IV. EXPERIMENTAL RESULTS

The algorithm for picture compression using WT uses averaging and differencing to shape the wavelet. Then we use the threshold system to lessen the number of coefficients. Inverse transform is then connected to get the compacted mage.

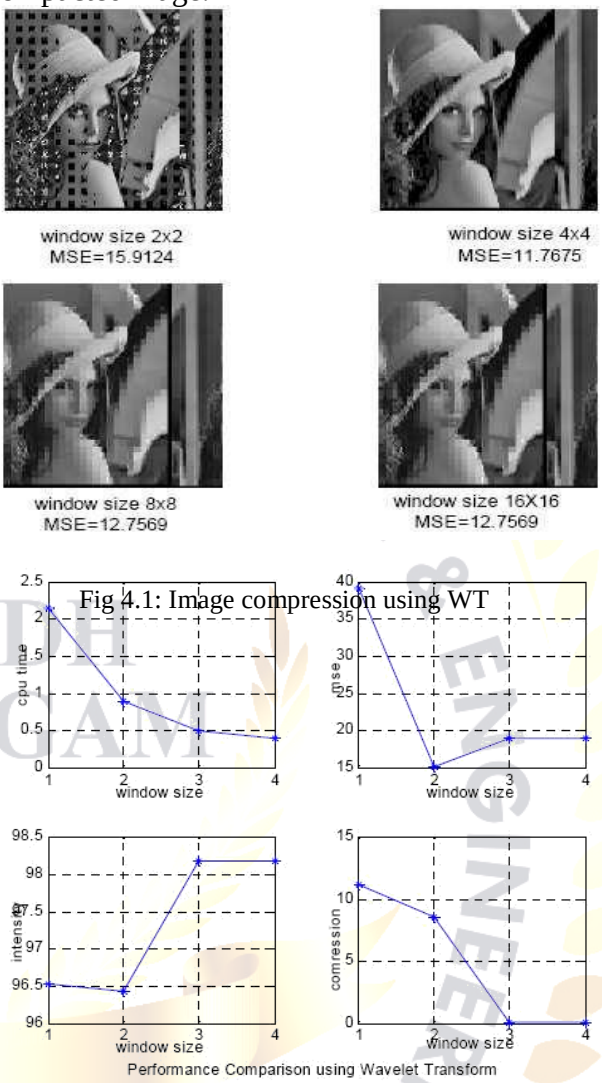

Fig 4.1: Image compression using WT

Fig 4.2: The Intensity, CPU Time, Compression Ratio and Mean Square Error for WT

V. CONCLUSION

The Discrete Cosine Transform is still a popular and useful method for digital image compression even though the Wavelet-based Transform yielded better results in terms of attributes like RMS error, image intensity, and execution time because, in comparison to other approaches, it can convey the majority of the data in the fewest number of pixels. Wavelet-based transformations are therefore frequently employed as an image compression technique.

REFERENCES

[1] Xiaoyu Ruan and Rajendra Katti , "Using Improved Shannon Fado Elias Codes Data Encryption" *Proceedings of ISIT Conference*, North Dakota State University Fargo, July 9-14, 2006.

[2] Mr.Mahesh Vaidya, Mr.Ekjot Singh Walia, and Mr. Aditya Gupta, "Data Compression Using Shannon *Fano Algorithm implemented by VHDLIEEE International Conference on Advances in Engineering & Technology Research*, August 01-02, 2014.

[3] Lung-Jen Lee, Wang-Dauh Tseng, Rung-Bin Lin, and Cheng-Ho Chang, "Pattern Run-Length for Test Data compression", *IEEE Transaction on Computer-Aded Design of Integrated Circuits And System*, Vol.31, No.4,April,2012.

[4] Mohammad Arif, R.S.Anand, "Run Length Encoding for Speech Data Comprassion", *IEEE International Conference on Computional Intelligence and Computing Research*, 2012.

[5] Linkon Barua, Pranab Kumar Dhar, Lamia Alam, and Isao Echizen, " Bangla Text Compression Based on Modified Lempel-Ziv-Welch Algorithm", *International Conference on Electrical, Computer and Communication Engineering* (*ECCE*), Bangladesh, February 16-8,2017. International Journal of Applied Engineering Research ISSN 0973-4562 Volume 12, Number 19 (2017) pp. 8956-8963

[6] G.R.Gnana King, C.Seldev Christoper, And N.Albert Singh, "Coumpound Image Compression Using Parallel Lempel Ziv-Welch Algorithm", *IET Chennati Fourth International Conference on Sustainable Energy andIntelligent S ystem*, Chennati, December 12-14, 2013.

[7] Haoqi Ren, " A data Comprssion Technique based on Resersed Leading Bits Coding and Huffman Coding", *International Conference on Communication and Networking*, China, 2015.

[8] Djuned Fernando Djusdek, Hudan Studiawan, and Tohari Ahmad, " Adaptive Image Compression Using Adaptive Huffman and LZW", *International Conference on Information, Communication Technology and System*, 2016.

[9] Tsutomu Kawabata, " Enumerative Implementation of Lempel-Ziv-77 Algorithm", *ISIT*, Toronto, Canada, July 6-11, 2008.

[10] Adrian Traian Murgan, Radu Radescu, " A Comparison of Algorthm for Lossless Data Compression Using the Lempel-Ziv-Welch Type Methods", Bucharest.

[11] Victor Amrizal, " Implementasi Algoritma Kompresi Data Huffamn Untuk Memperkecil Ukuran File MP3 Player", 2-14,2010.

[12] Cut Try Utari, " Implementasi Algoritma Run Length Encoding Untuk Perancangan Aplikasi Kompresi dan Dekompresi File Citra", *Jurnal TIMES, Vol.V No.2*, 24- 31, 2016.

[13] M.VidyaSagar, J.S, Rose Victor, "Modified Run Length Encoding Scheme for High Data Compression Rate", Vijayawada, December 2013

.

[14] K. Ashok Babu and V. Satish Kumar, "Implementation of Data Compression Using Huffman Coding", *International Conference on Methods and Models in Computer Science*, India, 2010.

[15] Harry Fernando, "Kompresi data dengan algoritma Huffman dan algoritma lainnya", ITB, Bandung.

[16] Mohammed Al-laham1 & Ibrahiem M. M. El Emary, "Comparative Study between Various Algorithms of Data Compression Techniques", *IJCSNS International Journal of Computer Science and Network Security*, Jordan, April 2007.

[17] S.R.Kodituwakku and U.S.Amarasinghe, "Comparison of Lossless Data Compression Algorithms for Text", *Indian Journal of Computer Science and Engineering, Sri Lanka*.

[18] Rhen Anjerome Bedruz and Ana Riza F. Quiros, "Comparison of Huffman Algorithm and Lempel-Ziv Algorithm for Audio, Image and Text Compression", *IEEE International Conference Humanoid, Nanotechnology, Information Technology Communication and Control, Environment and Management (HNICEM)*. Philippines, 9-12 December 2015.

[19] Jaishri Tiwari and Dr. Ritesh Sadiwala, "Personality prediction from Five-Factor Facial Traits using Deep learning " Journal of Integrated Science and Technology: Vol. 11 No. 4 (2023)

[20] Hemant Rajoriya, Ritesh Sadiwala, "Deep compressive sensing and reconstruction algorithm in wireless Internet of Things" , Journal of Integrated Science and Technology: Vol. 11 No. 2 (2023)

[21] C. Oswald, Anirban I Ghosh and B.Sivaselvan, "Knowledge Engineering Perspective of Text Compression", *IEEE INDICON*, India, 2015. *Communication Technology (ICoICT)*, Indonesia, 2015

[22] International Journal of Advanced Research in Computer Science and Software Engineering, india, July 2015

[23] Tanvi Patel, Kruti Dangarwala,Judith Angela, and Poonam Choudhary, "Survey of Text Compression Algorithms", International Journal of Engineering Research & Technology (IJERT), India, March 2015

[24] Shmuel T. Klein and Dana Shapira, "On Improving Tunstall Codes" *Information Processing & Management*, Israel, September 2011.

[25] Mohammad Hosseini, "A Survey of Data Compression Algorithms and their Applications", Applications of Advanced Algorithms, At Simon Fraser University, Canada, January 2012

[26] Ajay Kumar Barapatre, Ritesh Sadiwala, "Energy and resources management for Multiple Access in Massive IOT network", Journal of Integrated Science and Technology: Vol. 11 No. 3 (2023)

[27] Jayant Y. Hande, Ritesh Sadiwala, "Optimization of energy consumption and routing in MANET using Artificial Neural Network , Journal of Integrated Science and Technology", Vol. 12 No. 1 (2024)

[28] Chandan Kumar Roy, Ritesh Sadiwala, "Smart internet of things (IoT) based healthcare framework environment for Chikungunya disease diagnosis", Journal of Integrated Science and Technology: Vol. 12 No. 4 (2024)

[29] Maria Roslin Apriani Neta, "Perbandingan Algoritma Kompresi Terhadap Objek Citra Menggunakan JAVA", Seminar Nasional Teknologi Informasi & Komunikasi Terapan 2013 (SEMANTIK 2013), Semarang, November 2013.

[30] Dr. Shabana Mehfz1, Usha Tiwad, "A Tunstall Based Lossless Compression Algorithm for Wireless Sensor Networks", *India Conference (INDICON)*, 2015 Annual IEEE, India, 2015.

[31] Dr. Ahmad Odat, Dr. Mohammed Otair and Mahmoud Al-Khalayleh, "Comparative Study between LM-DH Technique and Huffman Coding Technique", *International Journal of Applied Engineering Research*, India.

[32] Yupeng Tai, Haibin Wang, " A Fast Algorithm for Calculating Minumum Redudancy Prefix Codes with Unsorted Alphabet", *International CHINACOM*, China.

[33] H.Hashempour,L.Schiano, and F.Lombardi , "ErrorResilient Test Data Compression Using Tunstall Code", Boston Mass 02115