OPEN ACCESS

International
Journal
Of Modern Engineering Research (IJMER)

Improved Histogram Equivalence Technique For Handling Salt And Pepper Noise

Krittika[1], Shivani[2], Sunita[3]
[1]Assistant Professor (C.Sc.)S.R.S.P.M GND University College, Niari
[2]M.Sc. (Computer Science)S.R.P.A Adarsh Bhartiya College, Pathankot
[3]M.Sc.(IT)S.S.M College, Dinanagar

ABSTRACT:-*The image processing plays important role in expressing the clarity of collected data. Problem will arise when the image is corrupted by the noise present within the image. The proposed paper deals with the Salt and Pepper noise present within the image. The effect of such noise will be corruption in terms of spots introduced in an image. The primary reason for such noise is temperature. The median filter will be used in order to resolve the problem present within the image. But the median filter will be useless when the temperature increases beyond certain level. In order to resolve the problem histogram equivalence strategy is implemented. Histogram equivalence is used in order to remove the spikes introduced within the image because of salt and pepper noise.*

Keywords:- *Noise, Salt and Pepper, Temperature, Histogram Equivalence, Spikes*

I. INTRODUCTION

The image processing provides graphical representation of object to be represented. The interface which is provided is known as GUI. The Graphical user interface will present the information in a manner which is easy to understand. The area such as medical line uses such image processing techniques in order to analyze the abnormal behaviour like diseases, of the image concerned. [1] State-of-the-art schemes for reversible data hiding (RDH) usually consist of two steps: first construct a host sequence with a sharp histogram via prediction errors, and then embed messages by modifying the histogram with methods, such as difference expansion and histogram shift. In this paper, we focus on the second stage, and propose a histogram modification method for RDH, which embeds the message by recursively utilizing the decompression and compression processes of an entropy coder. We prove that, for independent identically distributed (i.i.d.) gray-scale host signals, the proposed method asymptotically approaches the rate-distortion bound of RDH as long as perfect compression can be realized, i.e., the entropy coder can approach entropy. Therefore, this method establishes the equivalency between reversible data hiding and lossless data compression. Experiments show that this coding method can be used to improve the performance of previous RDH schemes and the improvements are more significant for larger images. The image presented has to be converted into greyscale in order to perform the operation of histogram equivalence.

The greyscale images are used for better observing the problems present within the images. The greyscale images are converted back to original form by the use of database which is used in order to encode the coloured images. The image processing will require techniques in order to enhance the image for introducing clarity in the analysis process. During the analysis process pixel values are going to be analysed. Pixel is phosphorus dot which will glow when the electron beam strikes on it. The pixel will have horizontal and vertical position associated with it. The intensity values will be disturbed when the noise is introduced within the image.

The intensity hike in the image will cause the distortion which will be handled by the use of histogram equivalence process. The implementation of the proposed system is done by use of tool known as MATLAB. The digital image processing tools are provided within the MATLAB for handling noise present within the image.

II. RELATED WORK

The histogram will be a bar chart in which various pixel intensities are plotted. [2]the multidimensional queries are considered in this case. The multidimensional queries deal with the geographical images and VLSI databases. The limits are specified in this case. Within the specified bounds image areas are searched. In this paper an algorithm for generating equi depth multidimensional histograms are generated. The pattern present within the image is analyzed in this case. [3] Histogram-based template matching is an important method to search the globe optimization exhaustively. However, this method is commonly algorithmic complex. In this paper, the proposed work is to replace the traditional histogram-based method with equivalent histogram-based method, which distinctly improves the matching efficiency. We first introduce the equivalent histogram on the basis of the relative centralization of the template's colour information and prove the equivalence. Then, we discuss the application of equivalent histogram in the current algorithms and analyze the algorithmic complexity. The equivalent histogram calculates the histograms and their distances according to the relative centralization of colour information, which decreases the memory and computation spending from the calculation of redundant information. [4] Noise removal from within the image is considered in this case. Analog to digital conversion strategies are followed. After conversion histogram is generated and image is analyzed.

III. PROBLEM DEFINATION

The noise present within the image is the problem which must be handled in order to analyze the image in practical situations. The most common type of error which is present within the image is salt and pepper noise. The problem is partially solved by the use of median filter but the problem start to occur when temperature increases beyond certain level. In order to solve the problem histogram equivalence mechanism is suggested.

IV. PROPOSED MODEL

The proposed system takes the image and converts it into the greyscale form. The original image intensities values are stored within the buffer. The buffer will help in restoring the image to its original values. The salt and pepper noise will be handled in the proposed paper. The image when infected with this type of noise will have uneven intensity hikes at various portion of the image.

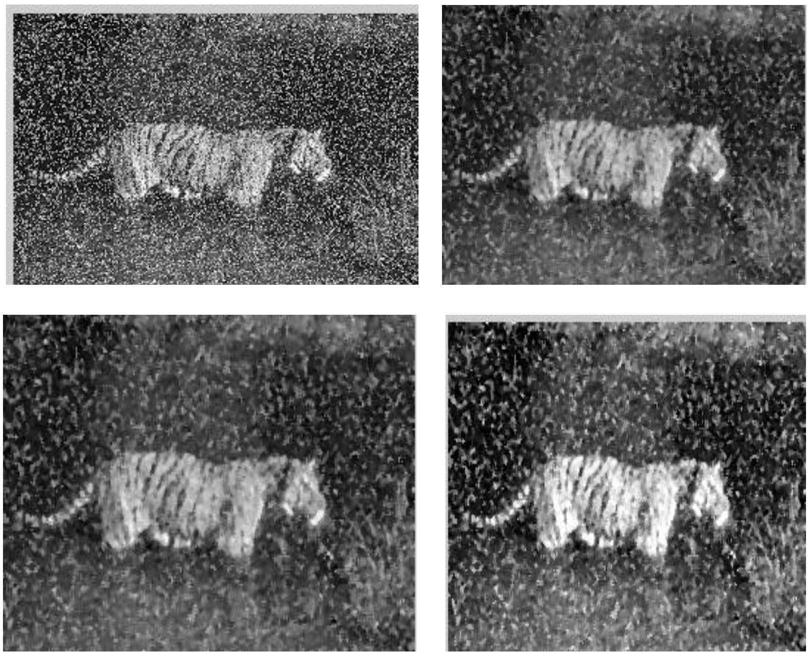

Fig 1: Showing the various levels of salt and pepper noise present within the image.

The histogram equivalence strategy is used in order to enhance the contrast. The contrast enhancement can be used in the proposed system in order to hide the problems caused by the salt and pepper noise. In order to described the concept of histogram equivalence 8 bit gray level image will be considered.

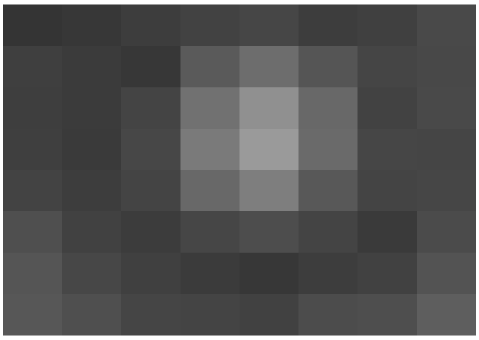

Fig 2: Showing the 8 bit Gray Level Image

This 8 bit greyscale image has following values associated with it.

$$\begin{bmatrix} 52 & 55 & 61 & 66 & 70 & 61 & 64 & 73 \\ 63 & 59 & 55 & 90 & 109 & 85 & 69 & 72 \\ 62 & 59 & 68 & 113 & 144 & 104 & 66 & 73 \\ 63 & 58 & 71 & 122 & 154 & 106 & 70 & 69 \\ 67 & 61 & 68 & 104 & 126 & 88 & 68 & 70 \\ 79 & 65 & 60 & 70 & 77 & 68 & 58 & 75 \\ 85 & 71 & 64 & 59 & 55 & 61 & 65 & 83 \\ 87 & 79 & 69 & 68 & 65 & 76 & 78 & 94 \end{bmatrix}$$

Table 1: Showing values of the gray scale image

The histogram for the above image will be as listed below

Value	Count	Value	Count	Value	Count	Value	Count	Value	Count
52	1	64	2	72	1	85	2	113	1
55	3	65	3	73	2	87	1	122	1
58	2	66	2	75	1	88	1	126	1
59	3	67	1	76	1	90	1	144	1
60	1	68	5	77	1	94	1	154	1
61	4	69	3	78	1	104	2		
62	1	70	4	79	2	106	1		
63	2	71	2	83	1	109	1		

Table 2: Showing the histogram values of 8 bit gray scale image

The cumulative frequency will be calculated and equivalence will be achieved by the use of following formula
$h(v)=round(cdf(v)-cdf_{min})/((M*N)-cdf_{min})*(L-1)$
After applying the above formula the contrast associated with the image will be enhanced. The equalized histogram will be as follows

$$\begin{bmatrix} 0 & 12 & 53 & 93 & 146 & 53 & 73 & 166 \\ 65 & 32 & 12 & 215 & 235 & 202 & 130 & 158 \\ 57 & 32 & 117 & 239 & 251 & 227 & 93 & 166 \\ 65 & 20 & 154 & 243 & 255 & 231 & 146 & 130 \\ 97 & 53 & 117 & 227 & 247 & 210 & 117 & 146 \\ 190 & 85 & 36 & 146 & 178 & 117 & 20 & 170 \\ 202 & 154 & 73 & 32 & 12 & 53 & 85 & 194 \\ 206 & 190 & 130 & 117 & 85 & 174 & 182 & 219 \end{bmatrix}$$

Table 3: Showing the histogram equivalence image

4.1proposed Algorithm

The proposed algorithm consist median filter and histogram equivalence strategy. The median filter will be used in order to handle the salt and pepper noise. If the temperature rises and salt and pepper noise is profound then histogram equivalence comes into utilization

Algorithm HisMedian(Image)

a) Receive the image
b) Convert it into Gray scale form
c) Add Salt and Pepper noise

I=Noise('salt and pepper',0.2)
d) Use Median filter
X=MedianF(I)
e) If(Improved(X))then
No need of Hist Eq
Else
Histeq(X)
f) Output the Modified image

The proposed algorithm will enhance the clarity of the image even in the presence of fog within the image. A will decide whether there exists fog within the image or not. The proposed work will enhance the image by the use of unique values of the pixels so that overlapping of the pixel can be reduced.
The proposed algorithm will use the median filter in order to enhance the given image. The problem will start to appear when temperature increases. The proposed algorithm will use redundancy handling mechanism in order to remove the fog from within the image.

V. Results

The proposed model indicates the better result as compared to the old model. The results produced through the proposed model is as listed below

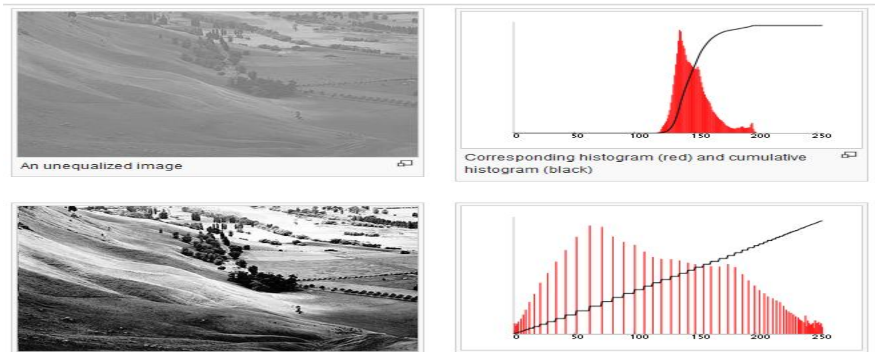

Fig 3: Showing the result of the proposed model on the image having salt and pepper noise

The histogram corresponding to the original and the modified image through contrast enhancement strategy will be as follows

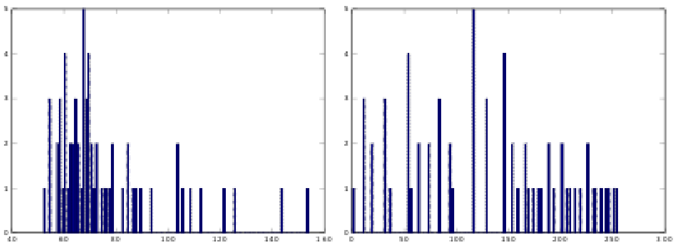

Fig 4: Showing the histogram of the original and improved image.

The tabular representation of the existing and system showing the entropy, compression ration etc is describe in the following section

Existing System	Entropy	Redundancy	Compression Ratio	Brightness Error
Image1	4.233	10%	2.3	0.67
Image2	5.021	11%	2.34	0.76
Image3	4.343	9%	2.5	0.987
Image4	5.345	9.5%	2.3	0.676
Image5	3.435	11.5%	2.43	0.565
Image6	4.445	8.9%	2.54	0.455
Image7	5.676	10%	2.67	0.789

Table:4 Showing the values obtained through the existing system

The same set of constraints are implemented on the proposed system and obtained values are described in the following table

Images	Entropy	Redundancy	Compression Ratio	Brightness Error
Image 1	5.233	5%	3.3	0.57
Image 2	5.921	6%	3.34	0.56
Image 3	5.343	7%	3.5	0.687
Image 4	6.345	5%	3.3	0.576
Image 5	5.435	4%	3.43	0.465
Image 6	5.445	4%	3.54	0.355
Image 7	6.676	6%	3.67	0.689

Table 5: Showing the values of the proposed system.

From the above tabular representations it is clear that the proposed system produces better result as compared to the existing system.

VI. CONCLUSION

The proposed model combines the use of median filter along with the histogram equivalence technique in order to form modified histogram equivalence technique. The technique can be used in order to eliminate the salt and pepper noise from within the image. The median filter is useless when temperature rises beyond certain level. This problem is tackled in the proposed system. This system produces better results as compared to the previous system. In the future other types of filter may be combined in order to generate better result as compared to existing system.

REFERENCES

[1]. W. Zhang, X. Hu, X. Li, and N. Yu, "Recursive histogram modification: establishing equivalency between reversible data hiding and lossless data compression.," IEEE Trans. Image Process., vol. 22, no. 7, pp. 2775–85, Jul. 2013.

[2]. M. Muralikrishna and D. J. DeWitt, "Equi-depth multidimensional histograms," ACM SIGMOD Rec., vol. 17, no. 3, pp. 28–36, Jun. 1988.

[3]. W. Yu, X. Tian, Z. Hou, and C. Han, "Swift template matching based on equivalent histogram," pp. 2413–2419.

[4]. P. Carbone and D. Petri, "Noise sensitivity of the ADC histogram test," in IMTC/98 Conference Proceedings. IEEE Instrumentation and Measurement Technology Conference. Where Instrumentation is Going (Cat. No.98CH36222), 1, pp. 88–91.

[5]. Y. Xiao, Z. Cao, and T. Zhang, "Entropic thresholding based on gray-level spatial correlation histogram," in 2008 19th International Conference on Pattern Recognition, 2008, pp. 1–4.

[6]. A. Fernández, M. X. Álvarez, and F. Bianconi, "Texture Description Through Histograms of Equivalent Patterns," J. Math. Imaging Vis., vol. 45, no. 1, pp. 76–102, Sep. 2012.

[7]. K. Gu, G. Zhai, S. Wang, M. Liu, J. Zhoi, and W. Lin, "A general histogram modification framework for efficient contrast enhancement," in 2015 IEEE International Symposium on Circuits and Systems (ISCAS), 2015, pp. 2816–2819.

[8]. M. Mese and P. P. Vaidyanathan, "Optimal histogram modification with MSE metric," in 2001 IEEE International Conference on Acoustics, Speech, and Signal Processing. Proceedings (Cat. No.01CH37221), 2001, vol. 3, pp. 1665–1668.

[9]. K. Lenc and A. Vedaldi, "Understanding image representations by measuring their equivariance and equivalence," in 2015 IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2015, pp. 991–999.

[10]. N. V. M. K. Raja and K. S. Bhanu, "Content Bases Image Search And Retrieval Using Indexing By KMeans Clustering Technique," vol. 2, no. 5, pp. 2181–2189, 2013.

[11]. "Image Compression."

[12]. X. Zhang, F. Ding, Z. Tang, and C. Yu, "Salt and pepper noise removal with image inpainting," AEU - Int. J. Electron. Commun., vol. 69, no. 1, pp. 307–313, Jan. 2015.

[13]. A. H. Pilevar, S. Saien, M. Khandel, and B. Mansoori, "A new filter to remove salt and pepper noise in color images," Signal, Image Video Process., vol. 9, no. 4, pp. 779–786, Jul. 2013.

[14]. E. J. Leavline, D. A. Antony, and G. Singh, "Salt and Pepper Noise Detection and Removal in Gray Scale Images : An Experimental Analysis," vol. 6, no. 5, pp. 343–352, 2013.

[15]. P. S. J. Sree, P. Kumar, R. Siddavatam, and R. Verma, "Salt-and-pepper noise removal by adaptive median-based lifting filter using second-generation wavelets," Signal, Image Video Process., vol. 7, no. 1, pp. 111–118, Feb. 2011.

[16]. P. S. Jayasree, P. Raj, P. Kumar, R. Siddavatam, and S. P. Ghrera, "A fast novel algorithm for salt and pepper image noise cancellation using cardinal B-splines," Signal, Image Video Process., vol. 7, no. 6, pp. 1145–1157, Aug. 2012.

[17]. Y. Zhang, Y. Liu, X. Li, and C. Zhang, "Salt and pepper noise removal in surveillance video based on low-rank matrix recovery," Comput. Vis. Media, vol. 1, no. 1, pp. 59–68, Aug. 2015.

[18]. M. Elad and M. Aharon, "Image denoising via sparse and redundant representations over learned dictionaries.," IEEE Trans. Image Process., vol. 15, no. 12, pp. 3736–45, 2006.

[19]. K. L. Wu, "Analysis of parameter selections for fuzzy c-means," Pattern Recognit., vol. 45, no. 1, pp. 407–415, 2012.

[20]. S. Stolevski, "Hybrid PCA Algorithm for Image Compression," pp. 685–688, 2010.

[21]. K.-L. Wu and M.-S. Yang, "Alternative c-means clustering algorithms," Pattern Recognit., vol. 35, no. 10, pp. 2267–2278, 2002.

[22]. S. Sankar Bhunia, M. M. Hassan, H. S. Albakr, H. Al-Dossari, P.-C. J. Chung, N. Bui, M. Zorzi, S. M. Riazul Islam, M. Humaun Kabir, M. Hossain, L. Catarinucci, D. de Donno, L. Mainetti, L. Palano, L. Patrono, M. L. Stefanizzi, L. Tarricone, F. Nasri, N. Moussa, A. Mtibaa, L. M. R. Tarouco, L. M. Bertholdo, L. Z. Granville, L. M. R. Arbiza, F. Carbone, M. Marotta, J. J. C. de Santanna, F. Hu, D. Xie, S. Shen, J. Mohammed, C.-H. Lung, A. Ocneanu, A. Thakral, C. Jones, A. Adler, M. Maksimovic, V. Vujovic, B. Perisic, V. M. Rohokale, N. R. Prasad, R. Prasad, A. H. Pilevar, S. Saien, M. Khandel, B. Mansoori, P. S. J. Sree, P. Kumar, R. Siddavatam, R. Verma, P. S. Jayasree, P. Raj, P. Kumar, R. Siddavatam, S. P. Ghrera, Y. Zhang, Y. Liu, X. X. Li, C. Zhang, W. Leesakul, P. Townend, J. Xu, P. Puzio, R. Molva, M. Onen, S. Loureiro, X. X. Zhang, J. Zhang, F. Rashid, A. Miri, I. Woungang, C.-I. Fan, S.-Y. Huang, W.-C. Hsu, W. K. Ng, Y. Wen, H. Zhu, F. Rashid, A. Miri, I. Woungang, X. X. Li, J. Li, F. Huang, K. He, C. Huang, H. Zhou, J. Shi, X. Wang, F. Dan, H. Nagarajaiah, S. Upadhyaya, V. Gopal, G. Zhu, X. X. Zhang, L. Wang, Y. Zhu, X. Dong, R. Miguel, R. Chen, Y. Mu, G. Yang, F. Guo, J. Li, Y. K. Li, X. Chen, P. P. C. Lee, W. Lou, C. Wang, Q. Wang, K. Ren, N. Cao, J. Li, K. Ren, and W. Lou, "Advances in Artificial Intelligence," in Signal, Image and Video Processing, 2015, vol. 1, no. 4, pp. 1–6.

[23]. E. The, "Chapter 2," pp. 32–54.

[24]. D. Kumar and Sonal, "A Study Of Various Image Compression," Conf. Challenges Oppor. Inf. Technol., pp. 1–5, 2007.