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Color Image Enhancement Using Optimized Histogram Technique

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Abstract: Color image enhancement is a complex and challenging process with several applications. It is quite difficult to maintain the color of the provided image in every circumstance. This work uses a relatively simple improvement technique that optimally preserves the hue and range of the R, G, and B channels of a color image. The first stage is to use meaningful rigid ordering of pixels, meaning that the pixels are aligned in a fixed way, to transform the intensity image to the target intensity. After the image has been enhanced, applying the new algorithms to it should fit the target intensity in the image. This research presents an investigation of new methods that increase color and compares them to a well-known histogram-based approach that preserves the hue and range of a color image. The outcomes show that, in comparison to other approaches, the algorithms in this study provide substantially superior enhancement. These algorithms, though relatively simple, produce very good results when Hue and range preservation are important.

Keywords: color image enhancement, optimizer, DWT, Fuzzy image, Fuzzification

1. Introduction

Enhancing any image's visual appeal or providing automated image processing skills for "better" representation are the two main objectives of image processing. It also makes background data analysis easier, which is necessary to understand object behavior. We are unable to clearly discern things from the dark background due to low contrast. Techniques for improving images can be divided into two main categories (*a*) Enhancing images with spatial data (*b*) Enhancement of frequency based domain images. The image is directly used in the spatially based domain image enhancing procedure. Real-time implementation is encouraged because the spatial-based domain approach has a low level of complexity and is conceptually simple. Explain the mathematical functions that are based on frequency domain image enhancement or signals with respect to frequency and that rely only on the image's transform coefficients, such as the discrete cosine transform, the discrete wavelet transforms (DWT), and the Fourier desecrate transform. The main objective of this method is to enhance the image by changing the transform coefficients. The inability to efficiently improve every component of an image at once and the difficulty in automating the photo enhancement process are its two key limitations.

Fuzzy image processing has been a novel idea in theory. It is a combination of several techniques for processing fuzzy images. Once consider the definition that follows an attempt to define the boundaries: All techniques for understanding, representing, and processing images fall under the domain of fuzzy image processing [4]. The images, their elements, and their properties as indistinct sets. The representation and processing are determined by the selected fuzzy technique and the problem at hand. Processing fuzzy images consists of these three main steps: membership value adjustment, image fuzzing, and, if necessary, image defuzzification. Image Fuzzification and Membership Modification are the two primary processes. As a result, the steps involved in processing images with fuzzy techniques are decoding the results back into image data and converting the image data into fuzzy data. Enhancing image quality and protecting the secret image

with bit shift and RSA encryption are the main objectives of this effort. MATLAB is used to apply the approach, and the PSNR and MSE values are employed to assess the quality of the image. The quality of the image shouldn't be affected so much after the data has been hidden that it is impossible for the human eye to recognize it. This is necessary in order for the image to cover the image, with a high PSNR and a low MSE.
This work has been divide into five section. In section one, introduction has been introduced about the work. In section two, related study has been discussed about the work. In section three, discussed methodology and dataset used in the proposed work. In section four, result has been discussed in brief. In section five, conclusion has been discussed.

2. Related Study

Image augmentation is described by Tarun Maheshwari [1] as enhancing how viewers perceiveimages. With the aid of several image improvement algorithms, it can lessen impulsive noise and sharpen the edges. Fuzzy techniques can be used to handle an imperfect image that can berepresented as a fuzzy set. A form of fuzzy logic that can be applied to process human knowledge is fuzzy if-then rules. The fuzzy image processing theory, which consists of the three steps of image fuzzification, membership value modification, and image defuzzification,is the result of adding up all of these techniques.
Fabrizio Russo [2] recommended the FIRE operators for image processing. Fuzzy reasoning is used to understand image data by a class of nonlinear operators known as fuzzy inference guided by else-action (FIRE) operators. Edge detection and nonlinear filtering of noisy imagesare two critical areas of study and application, and the most recent developments in the field ofFIRE operators are discussed in this work. A new family of filters for images deformed by impulse noise is shown initially. Since piecewise linear fuzzy sets are used, the suggested approach may combine noise cancellation and detail preservation.
Additionally, a method using genetic algorithms to automatically create the fuzzy rule foundation is discussed. Then, we propose a novel class of noise-protected edge detection operators. By carefully choosing fuzzy sets and fuzzy aggregation approaches, these operatorsmay detect edges in images that have been affected by different noise distributions. Numerous experimental findings demonstrate that the proposed operators outperform alternative strategies in the literature.
Huijuan Xu and H.D. Cheng [3] devised a novel fuzzy logic method for contrast augmentation.One of the most crucial problems in image processing, pattern recognition, and computer visionis contrast enhancement. The methods of contrast enhancement that are most frequently utilized has been divided into two categories: indirect approaches and direct methods. The principal waythat indirect techniques alter histograms is by giving new values to the initial intensity levels. Two well-liked techniques for indirect contrast augmentation are histogram specification and histogram equalization. The histogram modification method, however, just widens the intensity's worldwide distribution. Direct contrast enhancement techniques work by establishing a standard for measuring contrast and then enhancing the image by raising the contrast value. Both a global and local contrast measurement is possible. When an image contains text, it makes more senseto define a local contrast. In areas such as pattern recognition and image processing, fuzzy logichas various uses.
In order to deal with the uncertainty in the images brought on by ambiguity and/or imprecision,fuzzy set theory is a valuable technique. In this study, we offer a brand-new adaptive direct fuzzy contrast enhancement technique based on fuzzy set theory and the fuzzy entropyprinciple. On a large number of photos, we have experimented. The experimental findings show how well the suggested algorithm works to both enhance contrast and avoid over- enhancement.
Digital Image Enhancement using Fuzzy Rule-Based was proposed by M. Mozammel HoqueChowdhury, Md. Ezharul Islam, Nasima Begum, and Md. Al-Amin Bhuiyan [4]. With fuzzy rule-based filtering, this method for image enhancement offers a fresh perspective. The fuzzy filter performs better than other non-linear approaches and can express knowledge in an intelligible manner. Noise reduction, edge enhancement, and contrast improvement are examples of picture enhancement types.The enhancement method presented here uses fuzzy set theory to lessen image noise and booststhe contrast of important image structures. The fuzzy method may effectively handle vagueness and ambiguity in many image processing applications when compared to other methods. The approach uses fuzzy if-then rules and can represent and analyse human knowledge.Night Color Image Enhancement was proposed by Limei Cai Jiansheng Qian School of Information and Electrical Engineering China University of Mining and Technology in Xuzhou, China [5]. employing a fuzzy set Because of the uneven distribution of light at night,night-time photographs typically have poor quality. The approach that is suggested in this papermakes use of a fuzzy set to improve the night-time colour photographs. Using this technique, the dark areas are emphasised, the glaring areas are subdued, the contrast is adjusted, the luminance is then evened out, and more details are highlighted. A Fuzzy Operator

for the Enhancement of Blurred and Noisy Images was proposed by FabrizioRusso and Giovanni Ramponi [6]. A brand-new class of operators called rule-based fuzzy operators was created expressly to use approximate reasoning in digital image processing. Thismethod demonstrates how a fuzzy operator that can conduct detail sharpening but is noise- insensitive can be created. The results of using the suggested technique to improve an actual photograph are shown. Processing instructions can be represented in terms of human-like reasoning thanks to fuzzy rules.Faculty members from the Department of Computer Engineering at Pimpri Chinchwad College of Engineering in Pune, India, and Prof. Mrs. Preethi S.J. and Prof. Mrs. K. Rajeswaric[7] recommended changing the Membership Function for Image Enhancement utilising fuzzylogic. The goal of this technique is to use a fuzzy logic-based approach to improve the visual appeal of a digital image by introducing the ramp membership function and changing the membership function using the square and cube operators. The suggested algorithm can be used to improve medical photos to facilitate diagnosis or to improve the visual appeal of colourphotographs that were taken in low light and poor contrast conditions. The approach can beused as a pre-treatment method for many images processing tasks, such as finger print recognition. Gray scale images in the spatial domain were the subject of enhancement techniques proposedby Suneetha and Dr. T. Venkateswarlu [8]. In every field where images need to be comprehended and evaluated, image enhancement is essential. Numerous photos, including those used in medicine, satellite imagery, microscopy, aerial photography, and even real-worldphotographs, have inadequate contrast and noise levels. To improve the visual quality of an image, the contrast must be improved and noise must be eliminated. The choice of image enhancing techniques is influenced by the picture modality, the task at hand, and the viewing environment. A fuzzy logic-based picture sharpening algorithm was put out by Zhiguo Gui and Yi Liu [9]. The problem of improving the spatial local contrast of images with nonlinear modules is addressed by the proposed method. In comparison to the linear non sharp masking technique, the suggested method that uses undedicated discrete fuzzy logic has substantially lower noise sensitivity and allows for the production of perceptually pleasing outcomes. The proposed methodology also performs well in comparison to other algorithms that have recently been researched to enhance the functionality of the unsharp masking approach. Additionally, outcomes are displayed and discussed on various visuals. El-Osery and M. Jamshidi's suggestion enhancing analog and digital images with fuzzy expert systems. There are many different fields and specialties that use image enhancement. The development of computers, microcontrollers, and DSP boards has expanded the possibilities for digital image processing and created numerous opportunities for the creation and application of novel, cutting-edge methods. This research contrasts the novel methods that use knowledge-based (fuzzy expert) systems that may simulate the behavior of a human expert with picture enhancement via alteration of the probability density function of the grey levels.

3. Implantation Detail

The background picture needs to load before the method is permitted to used. Skin color detection is then carried out if the cover image is biometric; if not, edge detection is employed. The compressed secret image is then created by loading the secret image and applying the DWT algorithm to it. This image is then encrypted using the RSA with bit shift technique. An encrypted image is then placed into the edge pixels of the cover image. This method of data concealment is more secure since it only uses the edge pixels in the secret image and prevents the data from being dispersed over the whole cover image. The image has good image quality since the cover image has less distortion.

Figure 1. Skin tone levels

In this work PSNR and MSE has been estimate for the color image enhancement.

4. Results and Discussion

The experiment's results are utilized to show how useful the proposed hybrid coding system is taken for the experiment purpose. The suggested strategy was put into practice in MATLAB (version 7.10), and the suggested hybrid coding system was evaluated using colored images. Among the sample images used in the study were those of Lena, Barbara, Baboon, and Peppers. The quality of the reconstructed images was evaluated using the PSNR, SSIM, and UIQI values, and the suggested hybrid scheme's compression efficiency was evaluated in terms of the compression ratio. Below is sample output from the suggested method:

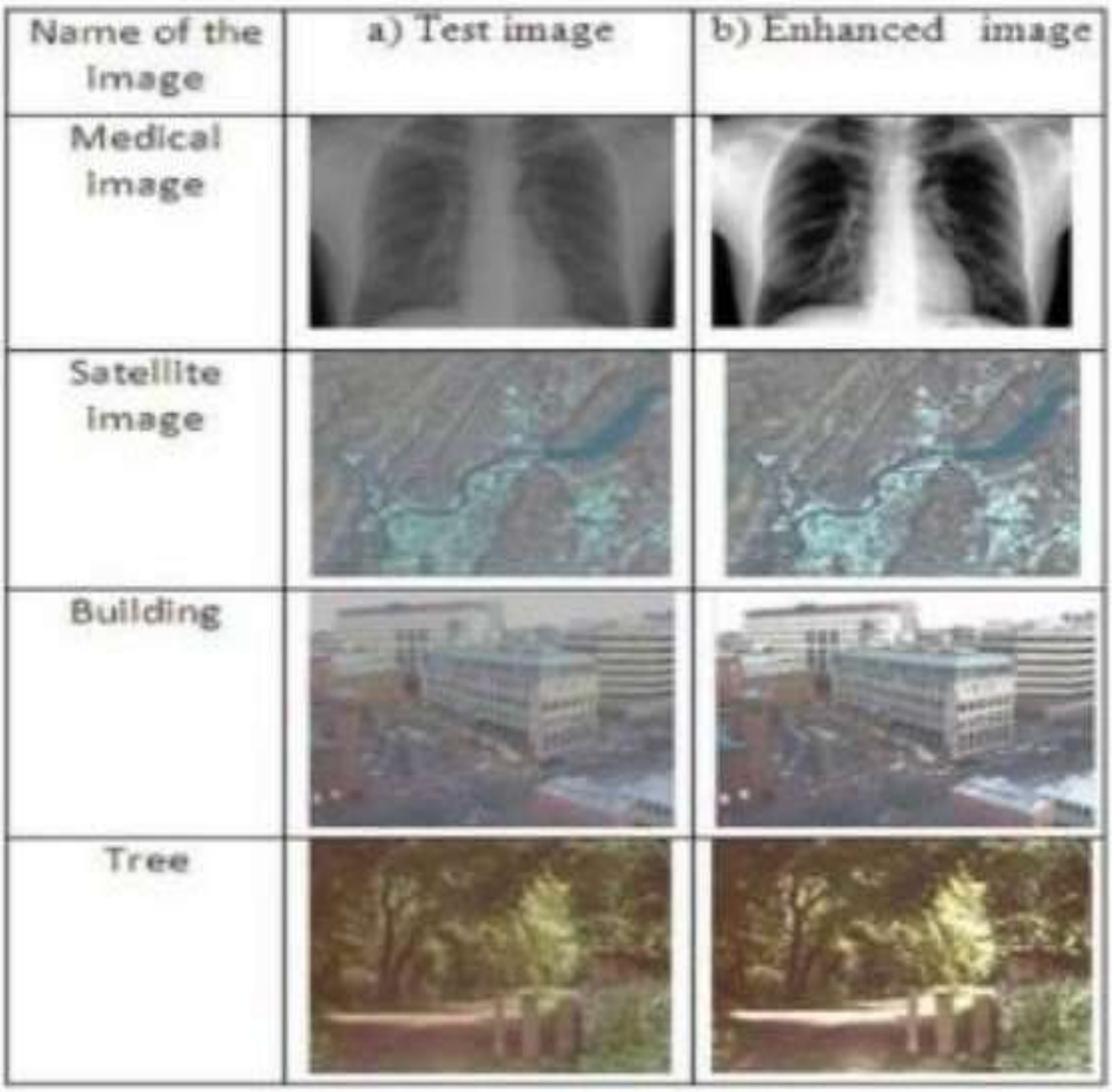

Figure 2- The testing eligibility, tracing and indexing

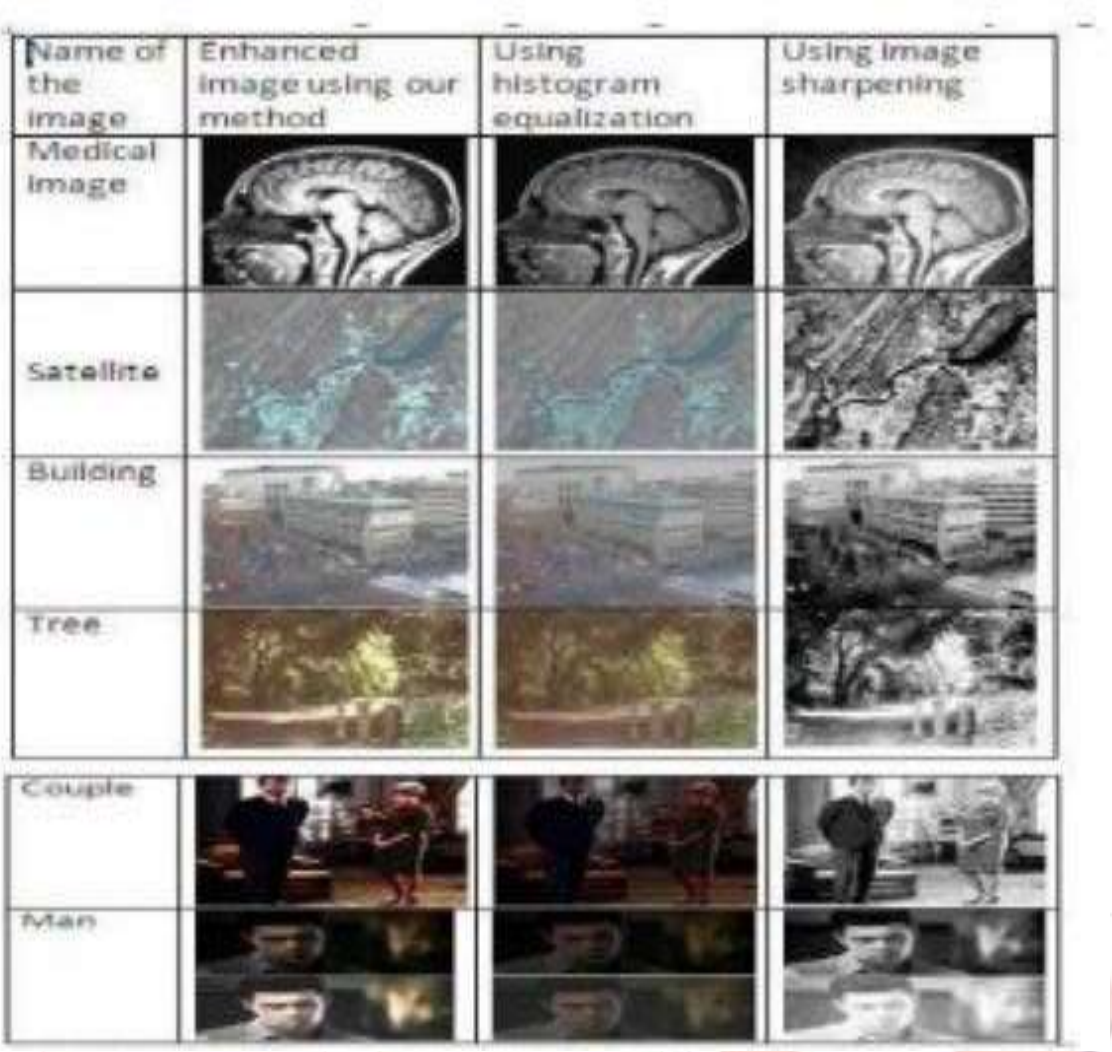

Figure 3. - Number of bits transfer vs all node in different cluster.

The PSNR comparison of various photos using the suggested method and other approaches is shown in the table below. When compared to alternative strategies, Table 1 shows that the suggested method effectively compresses the photos. The suggested method outperforms other current methods including block truncation coding, singular value decomposition, and Gaussian pyramid techniques in terms of PSNR values.

5. Conclusion

A fast and efficient fuzzy logic method for enhancing color images has been proposed. A comparative analysis shows that the suggested Fuzzy Logic method has improved visual quality and raised PSNR and CII values. The process is computationally faster when compared to the sophisticated enhancing techniques available today. Therefore, it can be concluded that the recommended approach has yielded superior results for the best visual perception of images through the use of an uncomplicated vocabulary. A novel method based on fuzzy logic and homomorphic filtering has been developed with the aim of enhancing images.

After a logarithmic transformation of the low contrast input image, fuzzy operations are used to produce an enhanced high contrast image. Parameter analysis like entropy and CII are performed on the enhanced output image. The recommended system performs better than the current literature, according to the parameter analysis. Then compare and contrast the two approaches this thesis provided for grayscale photos. Fuzzy logic with homomorphic filtering has a greater performance value in terms of CII, entropy, and time.

References

[1] Tarun Mahashwari, Ijrrest International Journal of Research Review Engineering Science & Technology (ISSN2278 - 6643) Volume – 2,Issue – 2,June- 2013.

[2] Russo, F. ; Dipartimento di Elettrotecnica Elettronica ed Inf., Trieste Univ., Italy; Ramponi, G., "Edge extraction by FIRE operators," in IEEE Proc. Of 3rd conference World congress on Computational intelligence, pp. 249-253,vol 1, 1994.

[3] H.D. Cheng, Huijuan Xu, "novel fuzzy logic approach to contrast enhancement," in IEEE proc. vol 33,pp. 809-819 ,2000

[4] Chowdhury, M.M.H., Chowdhury, M.M.H., "Digital image enhancement with fuzzy rulebased filtering," in IEEE proc. Of 10th international conference on computer and information technology, pp.1-3, 2007
[5] Limei Cai Jiansheng Qian, "Night Color Image Enhancement Using Fuzzy Set," in IEEE proc of 4th international conference on Mining and Technology
[6] Fabrizio Russo and Giovanni Ramponi, "A Fuzzy Operator for the Enhancement of Blurred and Noisy Images," in IEEE transaction on Image Processing ,PP.1169-1174,vol. 4,1995
[7] Prof. Mrs. Preethi S.J, Prof. Mrs. K. Rajeswari, "Membership Function modification for Image Enhancement using fuzzy logic," International Journal of Emerging Trends & Technology in Computer Science, Volume 2, Issue 2, March – April 2013
[8] I. Suneetha, Dr. T. Venkateswarlu, "Enhancement Techniques for Gray scale Images in Spatial Domain," International Journal of Emerging Technology and Advanced Engineering Website: www.ijetae.com (ISSN 2250-2459, Volume 2, Issue 4, April 2012)
[9]
[10] Zhiguo Gui, Yi Liu, "An image sharpening algorithm based on fuzzy logic," Second IEEE International Caracas Conference on Devices, Circuits and Systems, 1998,pp.211-216.
[11] Introduction to image processing using fuzzy technique by Sivanandan, S.Sumthi and S.N Deepa.