INTERNATIONAL JOURNAL OF TECHNO-ENGINEERING
IJTE
ISSN: 2057-5688

EDGE DETECTION AND HIGH DENSITY IMPULSE NOISE REMOVAL IN SAR IMAGES USING THE DWT-SVM-NN TECHNIQUE

Murthoty Satheesh Babu, Research Scholar, Department of Electronics and communication Engineering, Monad University, Hapur, U.P.
Dr.Jaidev Sharma, Associate Professor, Supervisor, Department of Electronics and communication Engineering, Monad University, Hapur, U.P.

Abstract:
In the realm of image processing, picture de-noising is a well-known inverse problem. The major source of noisy photographs during image collection or transmission is an unfavorable photographic environment or a noisy transmission channel. In order to eliminate impulsive noise from the pictures, the Discrete Wavelet Transform- Support Vector Machine-Neural Network (DWT-SVM-NN) approach is presented in this research. Peak signal-to-noise +(PSNR), computing speed, and other factors will also be improved in this effort. Mean The DWTSVM-NN approach will result in a reduction in Square Error (MSE) value. Finally, compared to the current approaches, the DWT-SVM-NN method will increase the accuracy of the impulse noise.

1. Introduction

During capture and transmission, additive noise typically taints digital images, resulting in observable picture quality deterioration. Removing noise from the original picture is the primary objective of image de-noising techniques. To regulate the picture de-noising impact in image processing, several techniques have recently been put into practice. The picture de-noising method may alternatively use the spatial or transmission domain [1]. Impulse noise develops during the signal acquisition step as a result of bit mistake in the picture transmission. Impulse noise comes in two varieties: random valued noise and salt & pepper noise. Image corruption caused by salt and pepper noise may result in pixel values

ISSN: 2057-5688

that are either at the maximum or lowest range of gray. The picture is tainted with salt and pepper noise as the nonlinear filter is applied to reconstruct the original images, [2]. A low level approach used to solve an issue in image processing is picture de-noising. Due to the different probability distributions of noise in the de-noising issue, the image is tainted by mixed Gaussian impulse noise, which makes it more challenging. De-noising difficulties must be well understood and used in order to produce a suitable image[3]. The swam optimization technique is used in wavelet threshold optimization as well as picture optimization to lessen de-noising. The Gaussian filter, adjacent filter, and non-local means filter are only a few of the efficient de-noising filters used in image processing. A wide noise variance may be maintained via a high peak signal to noise ratio [4].

One of the de-noising techniques that is gaining popularity in image processing is the combination of empirical mode decomposition (EMD) and variation mode decomposition (VMD), and this technique was created by Huang. Eleven commonly used image processing methods are employed to conduct a comparative evaluation. These methods include non-local means, non-local patch regression, non-local means, winner filter, fourth partial differential equation, linear complex diffusion process, and nonlinear complex diffusion process.

When compared to EMD, the linear complex diffusion process (LCDP) and the VMD domain process performed better [5]. Image de-noising is used to build the Multi-scale Wavelet Threshold (MWT) and Bilateral Filter (BF) methods. Wavelet change degrades the picture into multistate sub-bands. Bilateral filter is then used to estimate sub-bands from the top scale to the bottom scale. Reconstructed from the filtered sub-bands, the lower scale sub-bands are estimated using a reverse approach. For a de-noised picture, sub-bands are recreated at all scales. The processing time for wavelet threshold is substantially shorter in this suggested method's disadvantage than bilateral filter [6].

Medical image processing has a lot of difficulties when de-noising. The minimum-mean-square-error GGMM is utilized to model the noisy medical picture. Edge information, notably gray

ISSN: 2057-5688

level picture using Generalized Gaussian Mixture Model GGMM, delivers competitive de-noising performance. The disadvantages of this method are the bigger data sets it offers for examining different impacts in pictures [7].The wavelet approach uses two types of noise with computed radiography images: poison noise and Gaussian noise. It is based on the denoising of computed radiography images. The wavelet approach, which is utilized in toxic and Gaussian noise, is the foundation of computed radiography in picture de-noising. Maximum Mean Square Error (MMSE) is measured in computed radiography, and noise is decreased using a Gaussian filter [8].An essential step in image processing is picture de-noising. Noise lowers the quality of the picture. This is not immediately obvious. A common problem in the area of low level image processing is picture de-noising. To solve this issue, DWT feature extraction will be employed, which offers quick multi-resolution picture signal analysis to provide high-quality images [9]. The neural network is used to improve the quality of photographs. To turn noisy patches into noise-free images, the BM3D method is used [10].This research uses DWT for feature extraction, SVM and NN for classification to address this issue. In order to improve optimal picture quality in image processing over current approaches, PSNR, Structural Similarity Index values of the image (SSIM), and Mean square error (MSE) are all raised.

2. PROBLEM DEFINITION

Following are some of the aspects that may have an impact on how the picture is sensed during image capture or transmission.1) The environment in which the picture was sensed. 2) Lighting circumstances (low level situations necessitate high gain amplification).3) Sensor temperature (high temperature requires higher noise amplification).

a) PSNR comparison

The 256x256-pixel feedback picture that Lena and Rice choose has a concentration level. However, the PSNR value varies depending on the computational complexity and technique used.

b) Reduction of noise The strategy that has been suggested is one that is often used to minimize picture noise, and it

ISSN: 2057-5688

carefully addresses both low density and high density impulse noise.

Edge detection (c) The amount of RAM required for storing is minimal. For greater improvement of original photographs, the edge map may be used to recover the original images. The Wavelet Transform for Automatic Edge Detection in SAR Images is a technique for edge improvement.

d) Processing Speed To achieve the goal of picture de-noising, many methods are utilized in image processing. Nonlocal Means (NLM) filtering is regarded as a difficult approach in image processing and has a very poor computational speed. Today, it is reduced by the use of various processing methods and processes.

f) SER (Signal to Error Ratio) Both the extracted logo picture and the received output exhibit the effects of scaling factors on the values of SER. Noise affects the processed picture during image capture. Additive, impulsive, and multiplicative noise are the three categories of typical noise models.

3. A SURVEY OF THE LITERATURE

According to L. Shao et al. [11], they used sparse representation or nonlocal means filtering techniques. Good noise cancellation and sparse vector aid in signal cleaning The drawbacks are that computational time is short in comparison to other assessment techniques. According to Cong-Hua et al. [12], the Generalized Gaussian Mixture Model (GGMM) successfully de-noises a picture using edge information. These approaches have the benefit of minimizing MSE. The drawback was that it offered bigger datasets for examining different impacts in photos. Orthogonal frequency division multiplex (OFDM) is often appropriate in adaptive white Gaussian noise (AWGN) and frequency selective channels, as in Al-Naffouri, et al. [13]. Impulse noise has a significant influence on which is performing. However, they accomplish fast computing speed, excellent spectral efficiency, and low complexity. This method's drawbacks include the need for a linear transmit circuit, sensitivity to frequency synchronization issues, and high peak to average power ratios (PAPR). That is impacted by insufficient power efficiency. They use bi-dimensional empirical mode

ISSN: 2057-5688

decomposition techniques, according to Donoho, D.L., et al. [14]. These techniques have the advantages of greatly reducing noise and processing time. For picture de-noising, Rudin. L. I. et al. [15] use an effective combination model of the second-order ROF model with a straightforward fourth-order partial differential equation (PDE). Less processing time and less blockly effort are the benefits. The picture noise is not a perfect reduction of the restrictions.

4 METHODOLOGY

DWT-SVM-NN

The goal of the DWT-SVM-NN approach is to improve and enhance the original picture. The INR-DWTNN approach employs the feature extraction method DWT. During the testing and training phases, the picture is classified using SVM and NN classifiers. In order to improve picture quality over current techniques of image processing, PSNR, Structural Similarity Index values of the image (SSIM), and MSE are enhanced. The three processes in the following structure are as follows: 1) Preprocessing, 2) Feature extraction, and 3) Classification algorithm.

Pre-processing (a) Pre-processing is the procedure of converting the input picture to our practical format in accordance with the needs of our project. Our project's input receives that pre-processing output. Three pre-processing techniques, including RGB to gray, contrast enhancement, and fuzzy filter (FF), were employed in our study. The supplied picture will be transformed to grayscale images using the RGB to gray technique. The picture will next undergo contrast enhancement, which improves the image's quality and produces a noise-free image.

Feature Extraction (b) The best traits and those that are suitable for categorization are identified by this division. The removal of features from the de-noising pictures has included the use of many feature gathering techniques. A method of dimensionality reduction known as feature extraction effectively depicts the visually appealing portions of a picture as a compact feature vector. We utilized the DWT approach to extract the features in our methodology.

b) Method of Classification Regardless of whether the question image de-noising is coordinated with the enrolled

ISSN: 2057-5688

image de-noising or not, SVM and NN classifier are used to offer the results. The best computational classifiers when compared to other classifiers are SVM and NN. Particular procedures, such the training and testing portions, are indicated in the block diagram and are commonly followed while processing images.

5 POSSIBLE RESULTS

i) Accuracy: Exactness is the general accuracy of certain image de-noising models, and within the accuracy, mean, variance, and standard deviation values improve as well.

ii) Mean square error (MSE): A measure of the usual absolute difference between a classifier's predicted result and the actual outcome.

iii) Noise density: Combining SVM and NN instructions with a fuzzy filter produces the greatest results, regardless of whether the picture is noise-free, however the computationally challenging quality is also reduced.

iv) Peak signal-to-noise ratio (PSNR): Peak PSNR signals improve the suggested techniques' accuracy.

v) Structural Similarity Index Value for picture (SSIM): As noise is removed from the original picture, SSIM values rise.

6 Conclusion

The DWT-SVM-NN approach will be employed in this research study to improve PSNR, accelerate computation, and lower MSE values during the capture and transmission of images. The feature extraction value is performed using the DWT and SVM algorithms. The value will be taken from the feature using this approach. The classification approach, which uses NNT, increases the de-noising image's accuracy. Finally, the DWT-SVM-NN technique will outperform the traditional method in terms of all performance metrics including PSNR, MSE, and accuracy.

7 References

[1] Verma, Rajiv, and Rajoo Pandey. "A statistical approach to adaptive search region selection for NLM-based image denoising algorithm." Multimedia Tools and Applications (2016): 1-18.

[2] Esakkirajan, S., T. Veerakumar, Adabala N. Subramanyam, and C. H. PremChand. "Removal of high density salt and pepper noise through modified decision based unsymmetric trimmed

median filter." IEEE Signal processing letters 18, no. 5 (2011): 287-290.

[3] Zhou, Yingyue, Maosong Lin, Su Xu, HongbinZang, Hongsen He, Qiang Li, and JinGuo. "An image denoising algorithm for mixed noise combining nonlocal means filter and sparse representation technique." Journal of Visual Communication and Image Representation 41 (2016): 74-86.

[4] Liu, Du-jin, Siming Li, Shuxia Sun, and Zhaoyu Ding. "Application of Fast Particle Swarm Optimization Algorithm in Image Denoising." In Recent Advances in Computer Science andInformation Engineering, pp. 559-566. Springer Berlin Heidelberg, 2012.

[5] Lahmiri, Salim. "Denoising techniques in adaptive multi-resolution domains with applications to biomedical images." Healthcare Technology Letters (2016).

[6] Shi, Wenxuan, Jie Li, and Minyuan Wu. "An image denoising method based on multiscale wavelet thresholding and bilateral filtering." Wuhan University Journal of Natural Sciences 15.2 (2010):148-152.

[7] Cong-Hua, Xie, Chang Jin-Yi, and Xu Wen-Bin. "Medical image denoising by generalised Gaussian mixture modelling with edge information." IET Image Processing 8.8 (2014): 464-476.

[8] Hua, Chun-jian, and Ying Chen. "Wavelet-based CR image denoising by exploiting inner-scale dependency." Advanced Intelligent Computing Theories and Applications. With Aspects of Theoretical and Methodological Issues (2007): 978-985.

[9] Asamwar, Rohini S., Kishor M. Bhurchandi, and Abhay S. Gandhi. "Interpolation of images using discrete wavelet transform to simulate image resizing as in human vision." International Journal of Automation and Computing 7.1 (2010): 9-16.

[10] Burger, Harold C., Christian J. Schuler, and Stefan Harmeling. "Image denoising: Can plain neural networks compete with BM3D?." Computer Vision and Pattern Recognition (CVPR), 2012 IEEE Conference on. IEEE, 2012.

[11] Jia, Yuanyuan, Ali Gholipour, Zhongshi He, and Simon K. Warfield. "A New Sparse Representation Framework for Reconstruction of an Isotropic High Spatial Resolution MR Volume From Orthogonal Anisotropic Resolution Scans." IEEE Transactions on Medical Imaging 36, no. 5 (2017): 1182-1193.

ISSN: 2057-5688

[12] Al-Naffouri, Tareq Y., Ahmed A. Quadeer, and Giuseppe Caire. "Impulse noise estimation and removal for OFDM systems." IEEE Transactions on Communications 62.3 (2014): 976-989.

[13] Lahmiri, Salim. "Image denoising in bidimensional e mpirical mode decomposition domain: the role of Student's probability distribution function." Healthcare technology letters 3.1 (2015): 67-71.

[14] Xu, Yi-ping. "A combination model for image denoising". Acta Mathematicae Applicatae Sinica, English Series 32.3 (2016): 781-792.