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Satellite Image Denoising Using Discrete Cosine Transform

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Abstract

The process of adding and removing the noises to an image is said to be as Image denoising. The process can be used in many image applications. This paper presents a method of satellite image denoising scheme using a wavelet transform called as Discrete Cosine Transform (DCT). The noise that is added in this scheme is the salt and pepper noise. By using hard thresholding method in the noise image the co-ordinates of the image can be changed and the original image can be retrieved by removing the noise. This can be done by Inverse Discrete Cosine Transform (IDCT). The performance measures of the proposed system can be done by measuring the PRNR values of the denoised image.

Keywords*: Image denoising, DCT, salt and pepper, IDCT, PSNR.*

1. Introduction

Image denoising is one of a significant image processing task, in the field of computer applications. There are many a type of denoising methods are available and some of them are reviewed below.

1.2. Background

A denoising method called bidirectional low rank representation along with cluster adaptive dictionary is discussed in [1]. In order to represent a SPM a cluster adaptive dictionary is used. By this the fine formation of the image can be represented. A wavelet noise removing from infrared imaged system based generic Gaussian as well as the posterior probability calculation is discussed in [2]. The maximum posterior probability calculation is used to get the denoised signal from the function of the probability distribution so that the maximum posterior probability calculation is based on generalized Gaussian distribution.

Affine non local means denoising method discussed in [3] will effectively exploit the self similarities invariant that are present in the images. This makes the similar patches that exist in the images to undergo a transformation that makes the patches to perform a patch comparison automatically for the adaptation of both shape and size of the patches. In order to minimize the staircase that appears in the total variation a new variation model is discussed in [4]. To measure the piecewise constant component the model used the BV semi norm technique.

A sonar image noise reduction auto encoder technique is discussed in Image super resolution reconstruction using iterative adaptive regularization method and genetic algorithm [5-7] and is based on the convolutional neural network to make the sonar image with good quality. This makes the recognition much easy so as it a superior quality of sonar image can be obtained over a single continuous image. An alternating minimization scheme based on the Lagrangian optimization is explained in Image Super Resolution Using Wavelet Transformation Based Genetic Algorithm [8] to solve the non convex Laplacian matrix. Also for the sparse coding the method makes use of the Eigen vectors as the initial dictionary for the normalized graph Laplacian matrix. Study of different techniques for removal of speckle noise from images, used in biomedical applications, such as Spatial and frequency domain filter and a modified algorithm for speckle noise reduction using wavelet based multi resolutional analysis and thresholding function is presented in [9] incorporating diverse wavelets such as Haar, Coiflets, Daubechies and Symlets. In order to get sparsity and texture preservation, denoising result of sparse based method through curvelet transform is processed by later. To use sparse based curvelet transform denoising method to remove rician noise in MR images, use forward and

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inverse variance-stabilizing transformations is presented in [10]. Image Denoising Based on K-means Singular Value Decomposition is discussed in [11]. A Sparse Representation Image Denoising Method Based on Orthogonal Matching Pursuit. The sparse representation of the image can better extract the nature of the image, and use a way as concise as possible to express the image is explained in [12].

1.3. The Problem

Several noise removal techniques have been developed so far each having its own advantages and disadvantages. The image denoising for satellite image is a difficult problem in the image processing. For this task, DCT technique is introduced into image denoising.

2. Proposed Solution

Our methodology is a type of an image denoising process by means of the DCT wavelet transform. Our system is of three steps like addition of salt and pepper noise to the original images and the decomposing it by means of DCT transform. After a hard thresholding method is used to change the co-ordinates of the noise image and by inversing the process of transform the original image can be obtained by using IDCT process. The block diagram of our approach is as shown is Figure 1.

2.1. DCT Decomposition

As said in the proposed methodology the image denoising approach starts by adding the noise to the original image. The noise that is used here is the salt and pepper noise that is added to the original image. Then the original image becomes the noisy image that contains the noise with it. Then the noised image is decomposed by means of the transform called DCT process. Here the image gets decomposed into a number of decomposition levels so as to alter its co-ordinates values much easier.

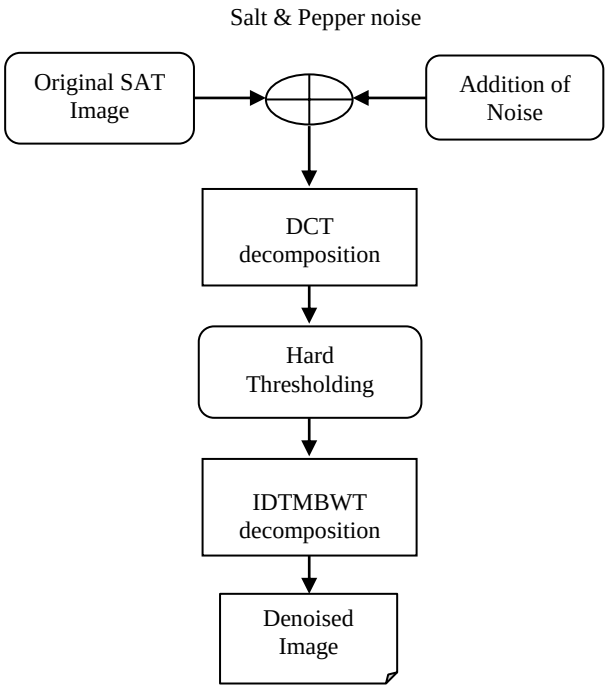


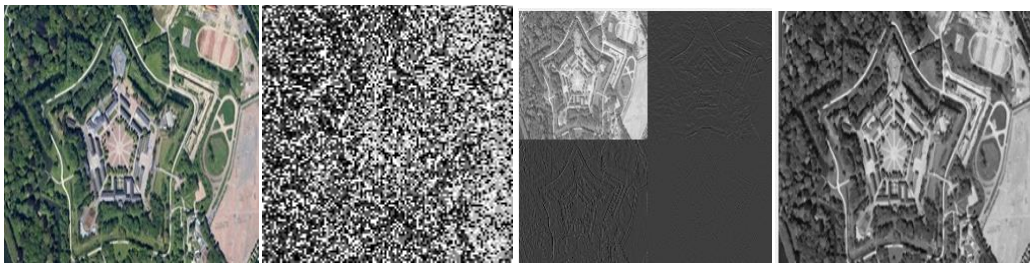
Figure 1. Block diagram of proposed Image Denoising Scheme

2.2. Denoising the Image by IDCT Decomposition

The decomposed image that is obtained from the DCT decomposition step will be of the noise present within it. By using the hard thresholding method the co-ordinate of the image can be changed. By doing this some of the co-ordinate values can be altered for the removal of noise. The process of retrieving back the denoised image from the decomposed output can be done by using the inverse process of DCT known as IDCT transform. In thisthe images are re-decomposed and the noises are removed and the original image is obtained in the form of denoised image.

3. Results and Discussion

The results and intervention of our system is discussed from the images shown. Here the images shows that how the original image look like and how it is changed after the noises are added to it and then the output of the system is obtained by means of the denoised images as shown in Figure 2. The system is tested with the original database image present in the network which is used in many of the image denoising methods.



(a) (b) (c) (d)

Figure 2 (a) Original image (b) Salt and pepper image (c) DCT decomposition image (d) Denoised image

The output images are shown for our proposed system based on the DCT based image denoising. From this image we can understand the steps step by process of our system that how the noise is added to an image and how it is denoised.

4. Conclusion

Our proposed system is a type of an image denoising system based DCT wavelet transform. In this the salt and pepper noise is added to the original image and is decomposed by the wavelet called DCT wavelets. Then by hard thresholding method the co-ordinated of the images are changed and the removal of the noises can be done by IDCT by retrieving the denoised image as the output of our system. Then by measuring the performance of the output image by means of PSNR values, better results can be obtained for our image denoising system.

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