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Research Article

OBJECT DETECTION AND IMAGE DENOISING TECHNIQUES USING WAVELET ANALYSIS

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ABSTRACT

Some Image processing techniques are used for simulation where MRI and fingerprint images are analyzed at different scales using wavelet transform to get finer details of the image. Object detection techniques that includes image de-blurring and de-noising of images based on wavelet transform has been investigated in this paper. Comparison is done by evaluating PSNR of different methods. It is observed that proposed method of de-blurring that uses wavelet transform provides high PSNR.

INTRODUCTION

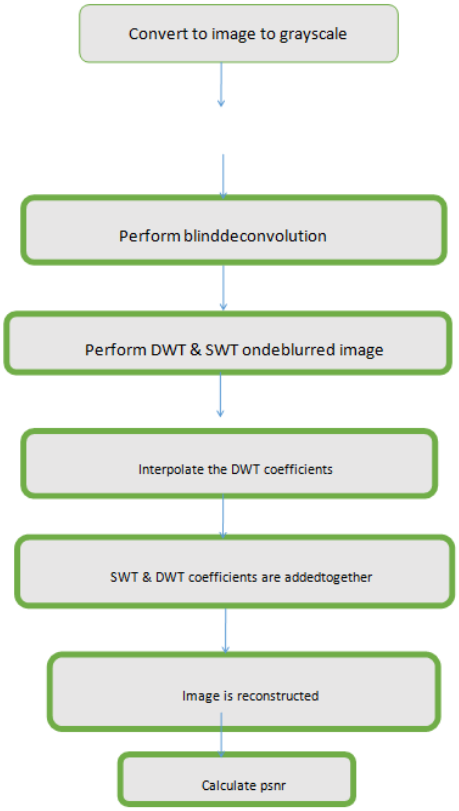
Image processing techniques

Object detection is a technique by which we can identify an object in the form of an image. Image information is extracted from them, which can be used for the different tasks like extracting malign tissues from body scans or detection of cancerous cells etc.

When we are analyzing an image, image segmentation is done. In Image, segmentation digital image is partitioned into multiple segments. One method to perform segmentation is edge detection. Edge detection improves the image readability.

De-blurring Technique

Blind convolution is used to remove of blur from an image[1]. Here we use Wavelet transform at the output of blind deconvolution. SWT (Stationary wavelet transform)can be used to enhance the image [2]. Interpolation is applied on the sub bands produced by DWT (Discrete wavelet transform), to match their sizes with SWT (Stationary wavelet transform) sub bands. Sub bands of SWT and DWT are added together and finally image is reconstructed using IDWT. Results are compared on the basis of Peak Signal to Noise Ratio, which is calculated for all the methods used. Here median filter calculates pixel value for output image.



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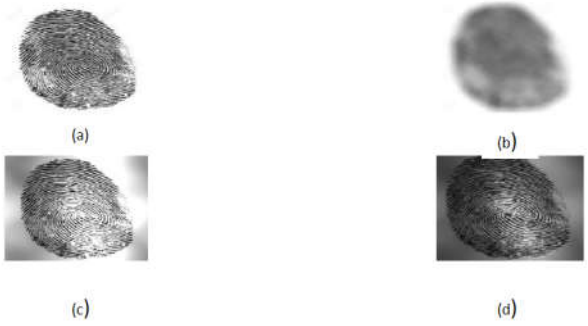
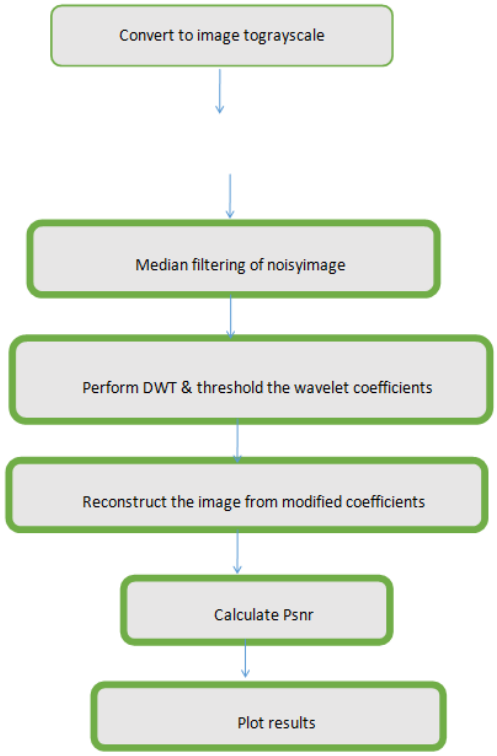


Fig.(a) Input Fingerprint image (b) Blur image (c) Blind de-convolved image (d) Reconstructed image



Denoising techniques

Filtering is a technique for modifying or enhancing an image. For example, if we can filter an image to emphasize certain features or remove other features. We have used median filtering for noise removal, which is compared with wavelet de-noising method. The median filter works by moving through the image pixel by pixel.

Wavelet based De-noising Technique

In this work we are using stationary wavelet transform and discrete wavelet transform [8,9], along with blind de-convolution [2, 3], to enhance image resolution. Sub bands of image produced by SWT and DWT[3,4] are interpolated. Finally, we combine all sub bands by using IDWT.

Discrete Wavelet transform

The two-dimensional signal, i.e. an image is first analyzed into low frequency and high frequency sub bands through FIR analysis filters along the rows (vertically) and then down sampled by factors of two.

Each of the resulting sub bands are then analyzed into the low and high frequency sub bands [5,6,3].

These sub bands are generally expressed as LL, LH, HL and HH, where the first letter indicates the filter applied in the horizontal direction [5,6] ("L" for low-pass and "H" for high-pass) and the second letter indicates the filter applied in the vertical direction. LL is approximation coefficients and LH, HL, HH are detail coefficients.

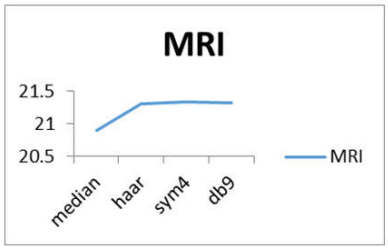
RESULTS

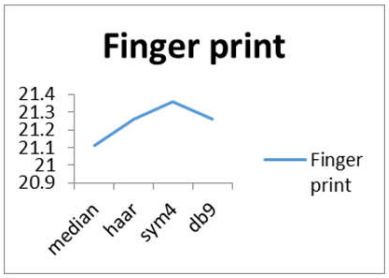
Peak signal-to-noise ratio (psnr) is calculated for the different wavelets used for MRI image and fingerprintimages.

De-noising Results

Fig. (a) Input Fingerprint (b) Noisy image (c) Median filtered image (d) Reconstructed image

Fig (a) Input MRI (b) Noisy image (c) Median filtered image (d) Reconstructed image





Filtering is a technique for modifying or enhancing an image. For example, we can filter an image to emphasize certain features or remove other features.

We have used median filtering for noise removal, which is compared with wavelet de-noising method. The median filter works by moving through the image pixel by pixel, replacing each value with the median value of neighboring pixels.

CONCLUSIONS

In the proposed approach of noise removal from images, we found that there is not much difference in the psnr value of output provided by median filter and wavelet method, but quality of image is far better in wavelet method.

In the proposed approach of blur removal from images, we found that symlet wavelet of order 4 gave better results compared to all other wavelets as well as blind deconvolution method.

Applications

Medical images are contaminated with blur, which are some of the major sources of image quality degradation. The proposed technique can be used to reduce blur in medical images. Image denoising finds applications in medical imaging where the physical requirements for high quality imaging are needed for analyzing images. Magnetic resonance imaging (MRI) is increasingly being used in medical settings because of its ability to produce high quality images of the inside of the human body. Wavelet based decomposition of image leads to image enhancement by making a fusion of two images. It issued in the enhancement of satellite images.

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