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FEATURE DETECTION USING IMAGE PROCESSING

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Abstract:
Efficiency of an Image is often affected by noises. Noise occurs mostly during capture and transmission of an image. Noise removal techniques plays a very huge role in image processing. The results of the noise removal techniques have a well-built influence on the quality of an image. Image processing using matlab allows a much wider range of algorithms to implement the input data, which helps in removal of noise and signal distortion during processing of images. Selection of filter to remove noise depends on the type of the noise in the image. Image noise reduction techniques include several linear and non linear filtering methods. Impulse noise cannot be removed effectively using linear filter as they tends to blur the edges of an image. Conversely non linear filters deals effectively in removing impulsive noise. One of the most trendy methods is Wiener filter. Images usually comprises of four types of noise Gaussian noise , Salt & Pepper noise, Speckle noise and Rician noise is used and image de-noising performed for diverse noise by Mean filter, Median filter and Wiener filter followed by the results are compared with all noises. Excluding adobe photoshop this project propose for windows application ,which makes user friendly application removal of noise from an image. The area of digital image processing belongs to processing of digital images by using digital computer. Digital images are form of visual information captured or transmitted using camera or other imaging system. The received image might be corrupted due to the presence of noise. It becomes necessary

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to bring out the original image before applying to different applications. Various kinds of noises exist in an image and a variety of noise reduction techniques are available to perform de-noising. Selection of the de-noising algorithm depends on the application. Gaussian noise, speckle noise, salt & pepper noise, shot noise are types of noises that are present in an image. The principle approach of image de-noising is filtering. Available filters to de-noise an image are median filter, Gaussian filter, average filter, wiener filter and many more. The resulting image from this approach is either blurred or over smoothed due to losses. To overcome the drawback of filtering approach, a mathematical function is developed known as wavelet transform. It decomposes an image into its frequency components and subsequently reconstructs with high precision.

INTRODUCTION

Noise is the result of errors in the image due to varied intensities of a pixel of a real image. Noise is a random variation of image Intensity and visible as grains in the image. It may arise in the image as effects of basic physics-like photon nature of light or thermal energy of heat inside the image sensors. It may produce at the time of capturing or image transmission. Noise means, the pixels in the image show different intensity values instead of true pixel values. During image acquisition or transmission, several factors are responsible for introducing noise in the image. Depending on the type of disturbance.

The number of pixels corrupted in the image will decide the quantification of the noise. The principal sources of noise in the digital image are:

a) The imaging sensor may be affected by environmental conditions during image acquisition.

b) Insufficient Light levels and sensor temperature may introduce the noise in the image.

c) Interference in the transmission channel may also corrupt the image.

d) If dust particles are present on the scanner screen, they can also introduce noise in the image.

figure 1 image with noise

TYPES OF NOISE

Noise is the result of errors in the image due to varied intensities of a pixel of a real image. Noise is a random variation of image

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Intensity and visible as grains in the image. It may arise in the image as effects of basic physics-like photon nature of light or thermal energy of heat inside the image sensors. It may produce at the time of capturing or image transmission.The different types of noise are

- **Gaussian noise**
- **Salt and Pepper noise**
- **Speckle noise**
- **Poisson noise**

GAUSSIAN NOISE

Principal sources of Gaussian noise in digital images arise during acquisition.A special case is *white Gaussian noise*, in which the values at any pair of times are identicallydistributed and statisticallyindependent (andhence uncorrelated).In communicationchannel testing and modelling, Gaussian noise is used as additive white noise to generate additive white Gaussian noise.This noise model is additive in nature and follow Gaussian distribution. Meaning that each pixel in the noisy image is the sum of the true pixel value and a random, Gaussian distributed noise value. The noise is independent of intensity of pixel value at each point.

- SYNTAX:

imnoise(Img,'Gaussian',0.,0.03);

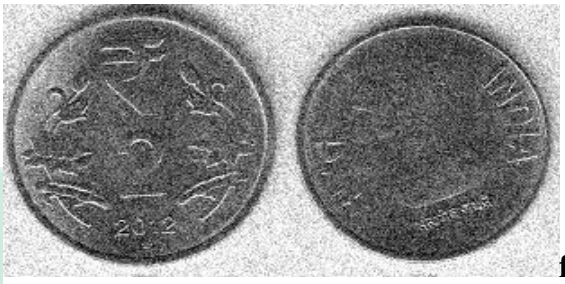

figure 2 image before removal and after removal of Gaussian noise

SALT AND PEPPER NOISE

In salt and pepper noise (sparse light and dark disturbances), pixels in the image are very different in color or intensity unlike their surrounding pixels. Salt and pepper degradation can be caused by sharp and sudden disturbance in the image signal. Generally this type of noise will only affect a small number of image pixels. When viewed, the image contains dark and white dots, hence the term salt and pepper noise. Typical sources include flecks of dust inside the camera and overheated or faulty (Charge-coupled device) CCD elements. An image containing salt-and-pepper noise will have dark pixels in bright regions and vice versa. This type of noise can be caused by dead pixels, analog-todigital converter errors and bit errors in transmission.Black and white dots appear in the image as a result of this noise and hence salt and pepper noise. An image containing salt-and-pepper noise will have dark pixels in bright regions and bright pixels in dark regions.This type of noise can be caused by dead pixels, analog-

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to-digital converter errors, bit errors in transmission, etc..

SYNTAX:

noise_image = imnoise(Img,'salt & pepper', 0.5)

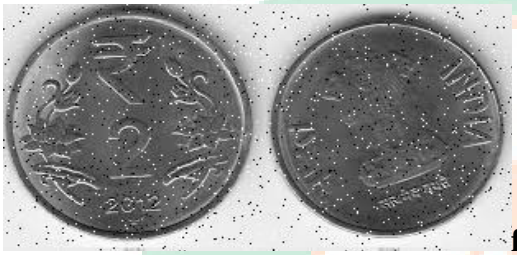

figure 3 image before and after removal of salt and pepper noise

SPECKLE NOISE

This noise can be modeled by random value multiplications with pixel values of the image and can be expressed as J = I + n*I Where, J is the speckle noise distribution image, I is the input image and *n* is the uniform noise image by mean *o* and variance *v*. This noise deteriorates thequality of active radar and Synthetic aperture radar (SAR).This noise is originated because of coherent processing of back scattered signals from multiple distributed points. Iradar system this type of noise is noticed when the returned signal from the object having size less than or equal to a single image processing unit, shows sudden fluctuations. Mean filters are good for Gaussian noise and uniform noise. Satellite images are usually degraded by noise during image acquisition and transmission process. The main purpose of the noise reduction technique is to remove speckle noise by retaining the important feature of the images. Speckle is mainly a form of multiplicative noise, which occurs when a sound wave pulse arbitrarily interferes with the small particles or objects on a scale comparable to the sound wavelength

SYNTAX:

noise_image = imnoise(In,'speckle',den);

RICIAN NOISE

Rician noise is the noise that can cause, when number of photons sensed by the sensor is not sufficient to provide detectable statistical information.This noise has root mean square value proportional to square root intensity of the image. Different pixels are suffered by independent noise values. At practical grounds the photon noise and other sensor based noise corrupt the signal at different proportions.

figure 4 image with rician noise

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CONCLUSION

The noise removal algorithm for gray scale images corrupted by additive Gaussian noise is made more effective and simple using weinner filter .The performance of robust open-close sequence filter have been evaluated and compared with the performance of other nonlinear filters and wavelet transforms. The morphological residue detector powerfully determinates the additive Gaussian noise with a low percentage error. The simulation results indicate that the robust open close filter performs better than other nonlinear filtering techniques & wavelet transforms for noise removal from gray scale images. The simulation results also indicate that the robust open close filter also provides better PSNR as compared to other non linear techniques used. Experimental results presented, insists to conclude that weinner and median filters performed well. Whereas averaging and minimum filters performed worst. Median is the best choice of removing the Salt and pepper noise.

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