Microscopic Image Denoising And Sharpening Techniques

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Abstract

Microscopic images like some microorganism images contain different type of noises which reduce the quality of the images. Removing noise is a difficult task. Noise removal is an issue of image processing. Images containing noise degrade the quality of the images. Different types of noise should be known to improve the quality of microscopic image.

Keywords—**Salt & Pepper Noise; Wavelets; PSNR; MSE**

I. INTRODUCTION

In this paper, a review of different methods of sharpening of noisy image is presented. The proposed method includes two steps: suppressing the noise step and sharpening step. Medicine and biotechnology are very popular area where images of microorganism are used. To diagnose some disease which is related to fungus, analysis of microorganism is required. To identify different types of microorganism, qualitative analysis is required [1].It is very difficult to do analysis of microscopic images because of the noise which comes due system noise, motion of the object and condition of the environment [2]. There are number of algorithms for noise removal.

II. NOISE SOURCES IN MICROSCOPY AND MICROSCOPIC IMAGES

In method of microscopy there are two general types of noise: intrinsic or statistical noise and measurement noise. Measurement noise can have both random and patterned components. In fact, the statistical noise associated with the patterned noise signal cannot be removed entirely and; in addition, the process of trying to remove the patterned noise may itself introduce additional random noise. Finally, there is noise associated with the signal detected from other than the plane of focus. This is referred to as "image noise" [3].The primary undesirable signal components (noise), which degrade the performance of a CCD imaging device by lowering signal-to-noise ratio are;

A. PHOTON NOISE

This is also called as shot noise that occurs from the variation of the photons which are falling on the CCD. Photoelectrons generated in the semiconductor device constitute the signal, the magnitude of which is disturbed by fluctuations that follow the Poisson statistical distribution of photons incident on the CCD at a given location. That's why the photon noise or measurement variation is equal to the square-root of the signal [4].

B. DARK NOISE

Dark noise comes from statistical variation in the number of electrons thermally generated in the silicon structure of the CCD, which is highly dependent on device temperature but independent of photon-induced signal. Dark current is the rate of generation of thermal electrons at a particular CCD temperature. The dark current reduces quickly by cooling the CCD [5].The electronic noise due to the thermal motion of electrons in resistive circuits is called as white Gaussian noise with zero mean value.

C. READ NOISE

This is a combination of two type of noise; first the system noise components which arises in the process of converting CCD charge carriers into a voltage signal and second is analog-to-digital conversion. Photo electronic noise is due statistical nature of light and of the photo electronic conversion process that takes place in image sensor. At low light levels, photo electronic noise is often modeled as random with a Poisson density function. At high levels, the Poisson distribution approaches the Gaussian.

Images originally recorded on photographic film are degraded by noise called film grain noise, also called as Gaussian white noise. The electronically recorded images from different types of microscope are affected by all these types of noise. Image noise is generally regarded as unwanted product of image capture. Image noise can be taken as differently on the basis of different criterion. The criterion includes the cause of image noise