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“AN ANALYTICAL DESIGN OF IMAGE PROCESSING ALGORITHMS FOR OPTIMIZING INSTANT IMAGE QUALITY”

“An Analytical Design of Image Processing Algorithms for Optimizing Instant Image Quality”

Girish Padhan[1] Dr. Yash Pal Singh[2]

[1]Jodhpur National University, Rajasthan

[2]Director, Klsiet, Chandok, Bijnor

Abstract – Image restoration is a very dynamic area of research. The main objective is to improve the general quality of an image or remove errors/defects. Different methods from linear algebra or partial differential equations are used for this rationale. This paper is based on the image processing and its different functions to analyze the noise. Image analysis software will be useful in a wide range of different application environments

Keywords: Image processing, Image restoration, digital, noise function

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1. INTRODUCTION

Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. Usually **Image processing** system includes treating images as two dimensional signals while applying already set signal processing methods to them.

It is among rapidly growing technologies today, with its applications in various aspects of a business. Image Processing forms core research area within engineering and computer science disciplines too.

Image processing basically includes the following three steps.

- Importing the image with optical scanner or by digital photography.
- Analyzing and manipulating the image which includes data compression and image enhancement and spotting patterns that are not to human eyes like satellite photographs.
- ·Output is the last stage in which result can be altered image or report that is based on image analysis.

1.1 Principle of Image processing

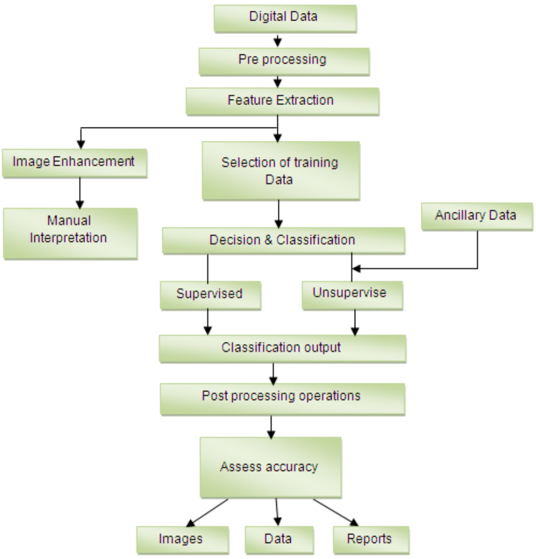
The principle of image processing is divided into 5 groups. They are:

1. Visualization - Observe the objects that are not visible.
2. Image sharpening and restoration - To create a better image.
3. Image retrieval - Seek for the image of interest.
4. Measurement of pattern – Measures various objects in an image.
5. Image Recognition – Distinguish the objects in an image.

1.2 Types of Image processing

The two types of **methods used for Image Processing** are **Analog and Digital** Image Processing. Analog or visual techniques of image processing can be used for the hard copies like printouts and photographs. Image analysts use various fundamentals of interpretation while using these visual techniques. The image processing is not just confined to area that has to be studied but on knowledge of analyst. Association is another important tool in image processing through visual techniques. So analysts apply a combination of personal knowledge and collateral data to image processing.

Digital Processing techniques help in manipulation of the digital images by using computers. As raw data from imaging sensors from satellite platform contains deficiencies. To get over such flaws and to get originality of information, it has to undergo various phases of processing. The three general phases that all types of data have to undergo while using digital technique are Pre- processing, enhancement and display, information extraction.



Wireless and mobile networks are quickly becoming the networks of choice, not only because of large bandwidth, but due to the flexibility and freedom they offer. Option way out to the trouble of accessing information in remote areas where wired network are inaccessible is offered by Wireless Networking Technology. Wireless Networking has changed the way people communicate and share information by eliminating the boundaries of distance and location. Although Wireless Networking is regarded as Networking Future but still there are some unsolved issues which is preventing the wide adaption of Wireless Technologies. In this paper we have tried to discuss two latest wireless technologies: Wi-Fi. The objective in this paper is to describe the technologies as well as the benefits and risks involved in their security implementation.

2. IMAGE RESTORATION

Image restoration is a very dynamic area of research. The main objective is to improve the general quality of an image or remove errors/defects. Different methods from linear algebra or partial differential equations are used for this rationale.

Image restoration is the process of taking a corrupted/noisy image and preparing the clean original image. Corruption may come in various forms such as motion, blur and camera resolution problem. The area of image restoration (sometimes referred to as image de-blurring or image de-convolution) is concerned with the estimation and reconstruction of the uncorrupted image from a blurred and noisy one. Mainly, it tries to perform an operation on the image that is the inverse of the imperfections in the image formation system. In the use of image restoration methods, the characteristics of the degrading system and the noise are assumed to be known a priori. In practical situations, however, one may not be able to obtain this information directly from the image formation process. The goal of blur identification is to estimate the attributes of the imperfect imaging system from the observed degraded image itself prior to the restoration process. The combination of identification and image restoration, blur is frequently referred as blind image de-convolution.

To make an image better: Image sharpening and image restoration-

- Pattern measurement: Measure the interesting objects in an image.
- Image recognition or image understanding: Distinguish or recognize the objects in an image.
- Image retrieval: Search for the image of interest.
- Visualization: Objects which are not seen.

The image point coordinate computation of the corresponding ground point plays as a fundamental link in many photogrammetric applications such as the generation of popular images and the image generation as well as the popular images based stereoscopic measurement and mapping. Nevertheless, compared with the traditional frame-based photos or CCD matrix images, the airborne linear push broom images have a much more complex situation to be faced with. It is well known that airborne linear sensors such as ADS40 have the capacity to provide continuous long "pixel carpet" with a GSD (Ground Sample Distance) resolution up to centimeter level (Sandau et al., 2000) and image strips simultaneously captured by line sensors with forward, nadir and backward viewing-angles along the flight have a high-overlapping ground cover, thus inducing the mass data characteristic of airborne linear push broom images, which leads to a really high burden on image data processing. Moreover, due to the push broom imaging mode, each scan line captured by line sensor owns six exterior orientation parameters (EOPs) at corresponding exposure moment, that is, the image point coordinates will not be accurately calculated through the rigorous mathematical sensor model i.e. co linearity equations until reasonable EOPs are determined. Therefore the best scan line search issue will have a heavy effect on efficiency of object-to-image coordinate computation.

3. OVERVIEW OF EXSITING ALGORITHMS

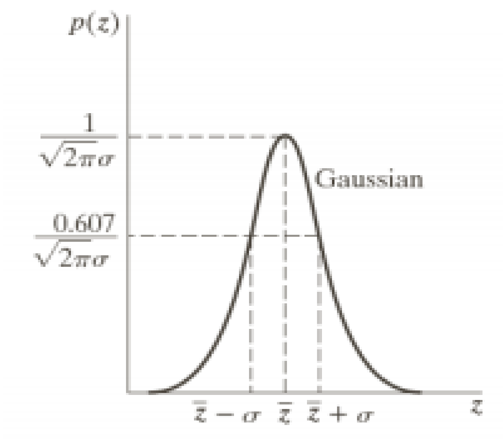
For airborne linear push broom sensors, the sensor model can be approximately considered to be parallel projection in the push broom forward direction, derived from the relatively small field angle of line sensor; whereas in the linear sensor direction, the geometric sensor model of central perspective images is strictly conformed to, that is, co linearity equations are still used to mathematically describe the coordinates relationship between object space and image space (Zhang et al., 2004; Zhang, 2005). One of the mathematical forms of the co linearity equations can be expressed as (Wolf and Dewitt, 2000).

Important Noise Probability Density Functions:-

1. Gaussian (Normal) Noise:-

Probability Density Function (PDF) of a Gaussian random variable z:

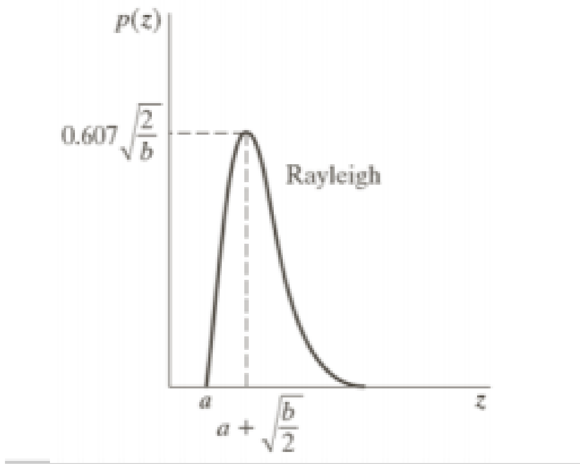
$$p(z) = \frac{1}{\sqrt{2\pi}\sigma} e^{-(z-\bar{z})^2/2\sigma^2}$$



2. Rayleigh Noise:-

$$p(z) = \begin{cases} \frac{2}{b}(z-a)e^{(z-a)^2/b} & \text{for } z \geq a \\ 0 & \text{for } z < a \end{cases}$$

Mean: $\bar{z} = a + \sqrt{\pi b/4}$ Variance: $\sigma^2 = \frac{b(4-\pi)}{4}$

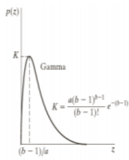


3. Erlang (Gamma) Noise:-

Erlang (Gamma) Noise

$$p(z) = \begin{cases} \frac{a^b z^{b-1}}{(b-1)!} e^{-az} & \text{for } z \geq 0 \\ 0 & \text{for } z < 0 \end{cases} \quad a > 0, \ b \text{ positive integer}$$

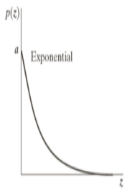
Mean: $\bar{z} = \frac{b}{a}$ Variance: $\sigma^2 = \frac{b}{a^2}$



Exponential Noise

$$p(z) = \begin{cases} ae^{-az} & \text{for } z \geq 0 \\ 0 & \text{for } z < 0 \end{cases}$$

(cf. Erlang noise with $b = 1$) $a > 0$

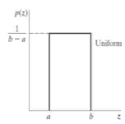


4.Uniform Noise

Uniform Noise

$$p(z) = \begin{cases} \frac{1}{b-a} & \text{if } a \leq z \leq b \\ 0 & \text{otherwise} \end{cases}$$

Mean: $\bar{z} = \frac{a+b}{2}$ Variance: $\sigma^2 = \frac{(b-a)^2}{12}$

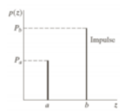


5. Bipolar impulse noise (salt-and-pepper)

Bipolar impulse noise (salt-and-pepper)

$$p(z) = \begin{cases} P_a & \text{for } z = a \\ P_b & \text{for } z = b \\ 0 & \text{otherwise} \end{cases}$$

$P_a = P_b \Rightarrow$ *unipolar* noise



These Issues related to noise will be overcome by Spatial Domain Filtering.

When the only degradation is noise, the corrupted image is:

G(x,y) = F(x,y) + N(x,y)

Girish Padhan[1] Dr. Yash Pal Singh[2]

$G(u,v) = F(u,v) + N(u,v)$

When only additive noises present: spatial filtering

CONCLUSION -

Image analysis software will be useful in a wide range of different application environments including medicine, material sciences, biology, forensic laboratories, class room settings, etc. The Scope Plus software is designed for acquisition of color and grayscale digital raster images formed not only in a light microscope. And in addition, for those with a transmission or scanning electron microscope, the Scope Plus software can be equally useful for the storing and analyzing of images.

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