Detection and Morphological Operation Using Filtering Techniques Using Laplacian Algorithm

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Abstract--- An image is made up of grid of pixels. It has a distinct height and width counted in terms of pixels. In this image Processing is a technique in which images are given a new shape. In this research work remote sensing images have been used to extract key point features in an image. For which image is converted into grey scale image. Noise is the disturbance that occurs in an image. Due to noise image novelty has been disturbed. In order to overcome this problem Salt and pepper noise is added with that Filters are used to remove all unwanted disturbance present in the image. In this work Wiener Filter is used to remove the blare from the image. In grey scale image the connected pixels that lay on the boundary between the regions. To detect the boundary in gray scale image edge detection is the best way to process the image which has been implemented to perform the action in the image. Based on Morphological operation each edge is detected from the image which has ultimately leads to segmentation. Using Image segmentation one can segment the necessary region needed for output. Dilation and Erosion has been used to perform the basic image operations on shape. Now based on Laplacian of Gaussian (LoG) algorithm the interested feature has been extracted.
Keywords: Remote Sensing images, Feature Extraction, Wiener filter, Laplacian of Gaussian (LoG) Algorithm**.**

I. INTRODUCTION

Image Processing refers to the processing of visual information sources such as images for some specific task, as per the application requirements. Image processing is used in images to get information about the features using algorithms. The remote sensing [3] can be described as the activities of recording, observing, perceiving objects or events at faraway places. Conversation is one of the important processes in image processing. The remote sensing image is converted to gray scale image in order to get better quality results. Noise is a disturbance which causes fluctuations in the pixel values. Noise can be viewed in multiple ways. Traditionally there are various types of noises which can be implemented in an image. Such as Gaussian noise, salt and pepper noise and spackle noise. In this paper salt and pepper noise is implemented [2] to the gray image. Denoising is another important technique for removing the noise form images. Some of the filters which are used to remove noise are linear filtering, adaptive filtering and median filtering. The Wiener filter is one of type of Adaptive filtering technique which is an optimal filter which is used for removing noise. It not only restores the image, but also removes noise by image smoothing [5]. A reasonable definition of an edge requires the ability to measure grey level transitions in a meaningful manner. The concept segmentation commonly means finding objects of interest in the image.

Mathematical morphology helps mainly to segment images of texture or images of particles. Morphological operations relate a structuring component to an input image, creating an output image of the similar size. In a morphological operation, the value of each pixel in the output image is based on an association of the equivalent pixel in the input image with its neighbors. By selecting the size and shape of the neighborhood, a morphological operation that is perceptive to specific shapes in the input image is created. Fundamental operations of mathematical morphology are dilation and erosion [11].Feature extraction is a process in which a large data set is analysed with less resources. Different key point extraction methods for detecting the object and then to decrease the number of establish key points using a self-sufficient measure for information content. Finally the Laplacian of Gaussian (LoG) algorithm is implemented for the feature extraction.

II. NOISE MODELS

There are various types of noise in images that can corrupt an image. They are Gaussian noise, speckle noise and salt and pepper noise. In this paper only salt and pepper noise is implemented**.**

A. Salt and Pepper Noise

Noise is unwanted particles which reduces the quality of image. It is caused by a sudden disturbance in the image signal. This is known by various names such as shot noise, Impulse noise and binary noise. This noise appears like the black and white dots in the image. Salt and Pepper noise can be expressed by

$$P(x) = \begin{cases} P1, & x=A \\ p2, & x=B \\ 0, & \text{otherwise} \end{cases}$$

Where P1, P2 are the probabilities Density Function (PDF), P(x) is distribution of Salt and Pepper noise in the image and A, B are the array size image.

III. METHODOLOGIES

A digital image is a two dimensional array of tiny cube regions called as pixels. The figure describes the architecture process.
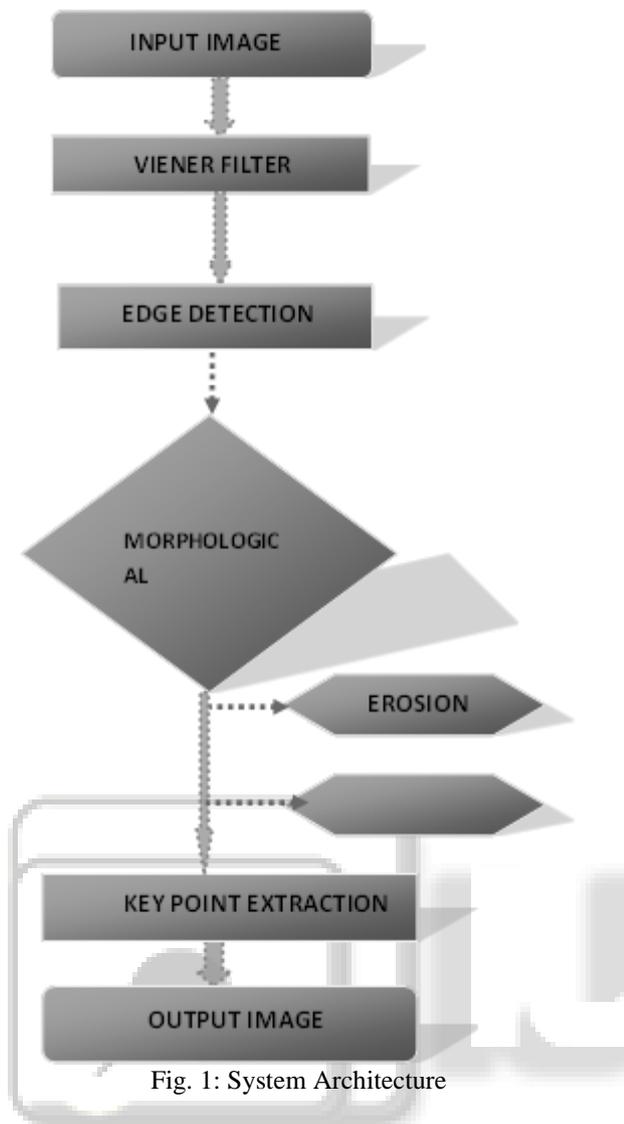
Fig. 1: System Architecture

IV. WIENER FILTER

Filters are used to remove the disturbances in the image due to which we get a clearer image Adaptive filter is used for edge conserved image denoising and deblurring. To design a Wiener filter, an estimation of the original and the additive noise is required wiener filter finds an estimate f^(x, y) of the original image f(x,y).Such that the mean square error is minimized.[6]The minimized error is given as

$$e^2 = E\{f(x, y) - f^\wedge(x, y)^2\}$$

An adaptive filter replaces the pixel values and decides the pixel to be changed by analyzing the median. If the median is distorted by the noise, it takes itself by explaining the median over larger regions.

V. EDGE DETECTION

The Edge Detection process is implemented in all kinds of edge detections. In this paper we have the prewitt edge detection method. Image intensity is often equal to scene radiance in which physical edges are represented by the change in the intensity function.

A. Prewitt Edge Detection

The Prewitt method takes the central difference of the neighboring pixels; this difference can be represented

Mathematically as [8]

$$\partial f/\partial x = f(x+1) - f(x-1)/2$$

The operator calculates the gradient of the image intensity at each point .Prewitt edge detection method is mainly used in the detection of the horizontal and vertical edges in an image. This method gives us a clearer view of the edges in the image using which the objects in the image are clearly identified.

VI. MORPHOLOGICAL SEGMENTATION

Image Segmentation has emerged as an important phase in image-based applications. Morphology is processing of an image based on the shapes. The basic operations of the mathematical morphology are Dilation and Erosion. Dilation increases an object to the nearby pixels of the region. Erosion shrinks the object. Erosion and dilation are not invertible operations; their combinations constitutes new operations-Opening and Closing [11]. In this paper has been used strel and Diamond function along with the Dilation and erosion method.

A. Dilation

Dilation can be considered as a union operation of all the translations of the image A caused by the elements specified in the structuring elements B. The dilation operator is commutative, that is A+B. It's also known as Murkowski addition. The value of the output pixel is the maximum value of all the pixels in the inputs nearer pixels. For dilation, the output is given by

$$G(x_0, y_0) = \begin{cases} I & \text{for} \quad z>0 \\ g(x_0, y_0) & \text{otherwise} \end{cases}$$

Let the number of pixels in the structuring element be k. let the number of pixels of value in the input image be z. let the pixel coordinate beneath the origin of the structuring element be (x_0, y_0). The dilation of an image f by a structuring element s (denoted f s) produces a new binary image (g = f s) with ones in all locations (x, y) of a structuring element's origin at which that structuring elements hits the input image f, i.e. g(x, y) = 1 if s hits f and 0 otherwise, repeating for all pixel coordinates (x, y). Dilation has the opposite effect to erosion -- it increases a layer of pixels in the inner and outer borders.

B. Erosion

The objective of this operator is to make an object smaller by removing its outer layer of pixels. If a black Pixel has a white neighbour, then all the pixels are made white. The erosion of a binary image f by a structuring element s (denoted f s) gives a new binary image (g = f s) with one of the locations of (x, y) structuring element's beginning at which that structuring element suites the input image f, i.e. g(x, y) = 1 is s suites f and 0 otherwise, reoccurring pixel coordinates (x, y). The output of the erosion operation is

$$g(x_0,y_0)= \begin{cases} 1 \text{ for } z=k \\ 0 \text{ for } z<k \end{cases}$$

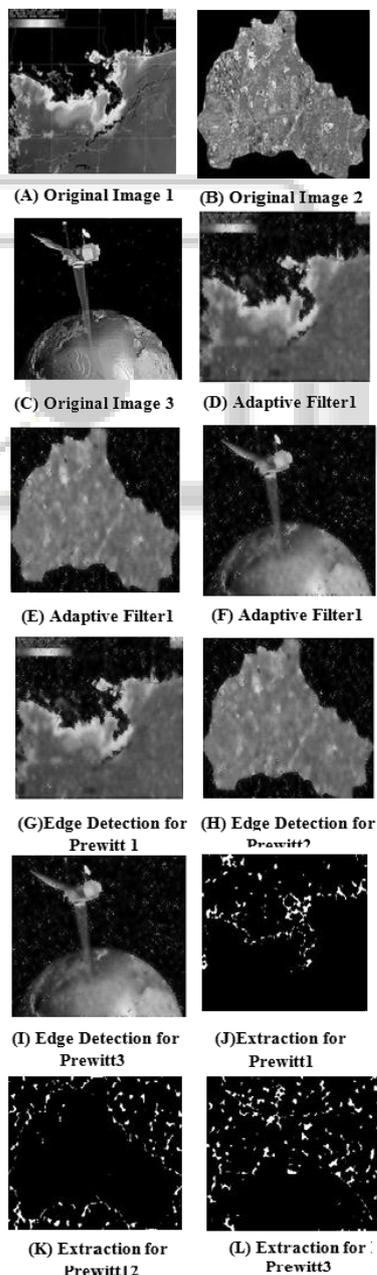Let the number of pixels in the structuring element be k. let

the number of pixels of value in the input image be z. let the pixel coordinate beneath the origin of the structuring element be (x_0, y_0).

VII. FEATURE EXTRACTION

Feature extraction is a special form of dimensionality reduction. Feature Extraction is a process in which a large data set is analyzed with less resource. In this paper has been used Key Point Extraction, and also used Laplacian of Gaussian (LoG) algorithm [12]. Feature extraction is a general name for methods of constructing combinations of the variables to get about these troubles though at rest relating the data with satisfactory correctness [13].

VIII. RESULT

The following figure shows the experimental results of the proposed work. The Remote Sensing image is taken as the input image. This proposed work is done using MATLAB.2010 version

(A) Original Image 1   (B) Original Image 2

(C) Original Image 3   (D) Adaptive Filter1

(E) Adaptive Filter1   (F) Adaptive Filter1

(G)Edge Detection for Prewitt 1   (H) Edge Detection for Prewitt2

(I) Edge Detection for Prewitt3   (J)Extraction for Prewitt1

(K) Extraction for Prewitt12   (L) Extraction for Prewitt3

IX. CONCLUSION

Extraction the features is one of the important technique in image processing. The shape or colour can be extracted from an image in the name of feature extraction. In this paper various Remote sensing images are used in order get better quality results. One of the segmentation techniques is used to partition the image. Mathematical morphological operations are implemented for the various operations based on shape. Finally the Laplacian of Gaussian (LoG) Algorithm is implemented for extraction the features from the remote sensing images with quality results.

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