Volume 5, Issue 3, March 2015 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Estimating Enhanced Parameter of Metallic Surfaces Using Hole Filling in Image Processing

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Abstract:- Edge characterizes boundaries. Edge detection techniques for partitioning the digital image of corroded metallic objects into corroded and non-corroded regions. In this paper we introduce a hole filling technique for image processing that deals with corroded metallic surfaces.This hole filling techniques in image processing used to calculate the parameters of corroded region. By using this concept we calculate the accuracy in all parameters which are we calculate in image processing .

Keywords-Image segmentation, , Edge criteria, digital image processing, Image edge detection; Algorithm.

I. INTRODUCTION

Edges define the boundaries between regions in an image, which helps for segmentation and object recognition. In other words, an edge is the boundary between an object and the background. Basic edge detection operators like Roberts, Sobel, Prewitt, , and Laplacian are experimented by various researchers. The edge of image is the most fundamental characteristic of the image. The edge detection for images is the important research content in the field of image processing, so its detection algorithm is the research hotspot in this field. The edge is a set of those pixels whose grey have step change and rooftop change, and it exists between object and background, object and object, region and region, and between element and element. Edge always indwells in two neighboring areas having different grey level. It is the result of grey level being discontinuous. Edge detection is a kind of method of image segmentation based on range non-continuity. Image edge detection is one of the basal contents in the image processing and analysis, and also is a kind of issues which are unable to be resolved completely. Typically, the two colours used for a binary image are black and white; though any two colours can be used. A gray scale is a digital image, in which the value of each pixel is a single value that carries colour intensity information. Gray scale or so-called monochromatic images are composed exclusively of shades of gray, varying from black (lowest intensity) to white (highest intensity).

II. EDGE DETECTION METHODS

It used the three operations:

1. differentiation
2. smoothing
3. labelling.

Differentiation consists in evaluating the desired derivatives of the image.

Smoothing lies in reducing noise and regularizing the numerical difference values.

Labelling used to localized the edge of an image and increasing the signal-to-noise ratio (SNR) of the detected edges by suppressing false edges. Labelling is used in the end of detection to localized the position, but the order in which differentiation and smoothing are run depends on their properties. Smoothing and differentiation of an image are realized only by filtering the image with the differentiation of the smoothing filter.

III. EDGE DETECTION STEPS

Filtering	Filtering refers to suppressing noise as much noise as possible without destroying the true edges.
Enhancement	This refers to emphasizing pixels with changing the local intensity (sharpening).
Detection	This refers to determining, which edge pixels should be discarded as noise and which should be retained (usually, thres-holding provides the criterion used for detection).
Localization	This refers to locating the edge and estimating the edge orientation.

IV. KEY EDGE DETECTION TECHNIQUES

The key techniques for edge detection are:

1. Gradient based edge detection:

In this method, it find the edges by look for the maximum and minimum in the first derivative of the image.

2. Laplacian based edge detection:

The Laplacian method searches for zero crossings in the second derivative of the image to detect the edges in image.

3. Sobel operator:

The Sobel operator consists of a pair of 3×3 convolution kernels. One kernel is simply the other rotated by 90°. These kernels are designed to respond maximally to edges running vertically and horizontally relative to the pixel of an image, When we use the kernel concept than it shows the two perpendicular orientations. When we use the Kernel as an input of an image than it provides the different values of the gradient component in each orientation (Gx and Gy).

$$|G| = \sqrt{\mathrm{G_X^2}} + \sqrt{\mathrm{G_Y^2}}$$

4. Canny:

In 1986 Canny proposed this algorithm in digital image. This technique is rather old but is still used because of its precision to detect the edges. The main part of this technique that is used by canny is reduce the chances of different types of outputs of an single edge. Canny is localized the images in proper condition that represents that detected edges are very close to the original edge.

5. Formulation of the problem:-

Identifying regions of interest in a scene/image plays an indispensable preliminary processing role for semantic analysis and many other advanced tasks. However, the detection of features in a large proportion of natural images encounters severe challenges due to their inherent complexity. The simplest case might be the detection of objects in an image with distinct and homogeneous foreground regions. In this case, little or no prior image modification is necessary to achieve satisfactory results. This approach is ineffective for a broader range of images in which there is a degree of noise, regions are not as readily discernable from the background, or the transition from foreground object to background object is not sufficiently abrupt. For example, consider a corroded surface image

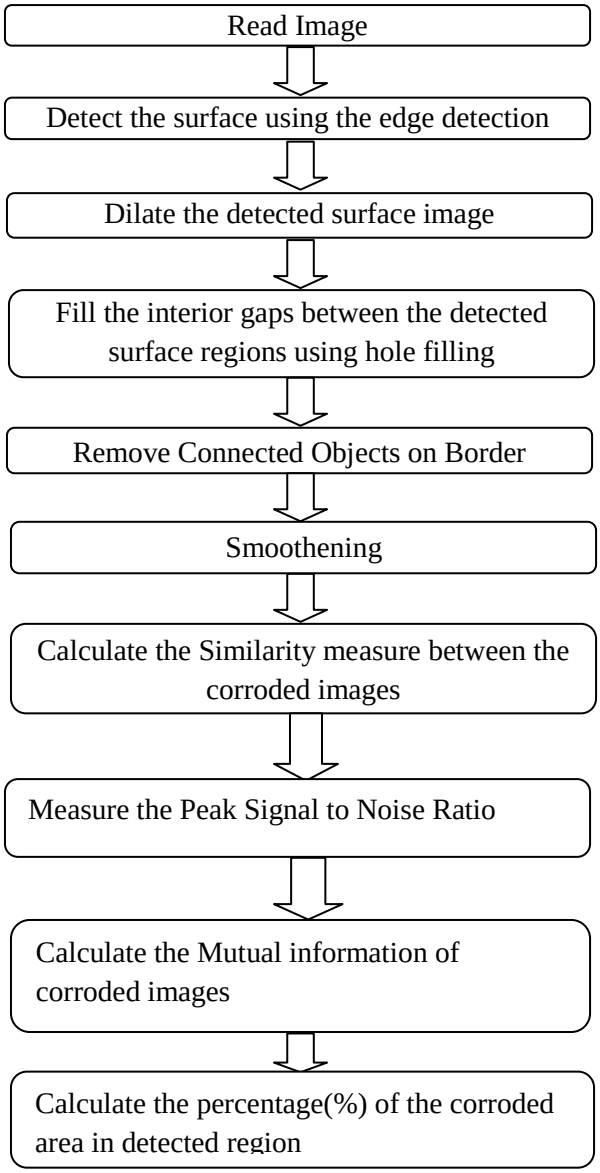
Fig:-Corroded metal sheeting in a marine environment.

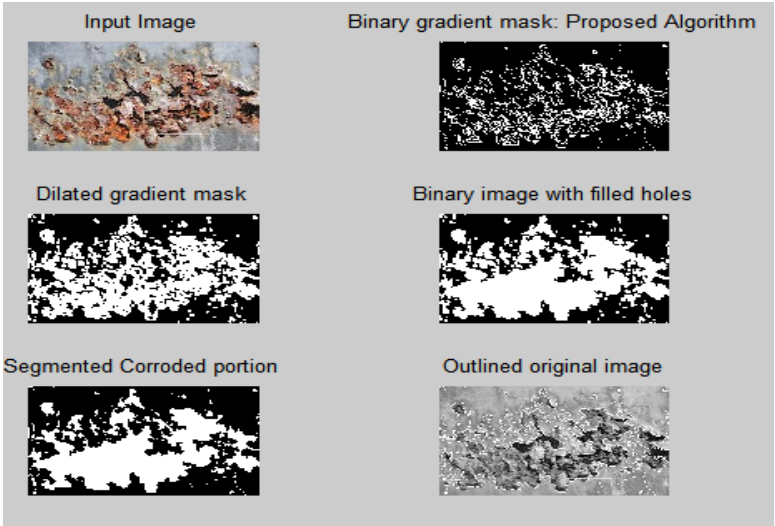
V. PROPOSED WORK

Methodology

The methodology used in this dissertation for partitioning the digital image of corroded metallic objects into corroded and non-corroded region. The developed model shown in Fig.is implemented using Matlab. The key steps involved are discussed below.

Step 1: The first step is to read the digital image of the metallic surface and minimize the effect of lightning on it (if exists). The digital image is read using the 'imread' command. If the image is colored, then it is converted to grayscale.





SM = 0.1898
PSNR Value = 8.256
Mutual Information =4.9368
Percentage of the corroded area =80.7168%

VI. RESULTS

In particularly, the results obtained are divided into the following three parts:

1. The first part discusses the efficiency of the proposed edge detection algorithm based on morphological erosion operation.
2. The second part investigates the accuracy of the proposed corrosion based algorithm using various edge detection algorithms (including the proposed edge detection algorithm) on the images of objects with known area.
3. In the third part, the corrosion detection algorithm is tested for various real pictures of corroded surfaces.

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