EXTRACTION OF EDGE DETECTION USING DIGITAL IMAGE PROCESSING TECHNIQUES

Libin Jacob P[1], Jebin Bose S[2]

[1]*Assistant Professor, Department of Computer Science and Engineering, Bethlahem Institute of Engineering, karungal*

[2]*M.E Computer Science and Engineering, Noorul Islam Centre for Higher Education, Kumaracoil*

Abstract - Digital image Processing is one of the basic and important tool in the image processing and computer vision. In this paper we discuss about the extraction of a digital image edge using different digital image processing techniques. Edge detection is the most common technique for detecting discontinuities in intensity values. The input image or actual image have some noise that may cause the of quality of the digital image. Firstly, wavelet transform is used to remove noises from the image collected. Secondly, some edge detection operators such as Differential edge detection, Log edge detection, canny edge detection and Binary morphology are analyzed. And then according to the simulation results, the advantages and disadvantages of these edge detection operators are compared. It is shown that the Binary morphology operator can obtain better edge feature. Finally, in order to gain clear and integral image profile, the method of ordering closed is given. After experimentation, edge detection method proposed in this paper is feasible.

Key Words: Image, Digital image, Edge, boundary, Edge detection, wavelet denoising, differential operators, and binary morphology

1.INTRODUCTION

An edge in a digital image is a boundary or contour at which a significant change occurs in some physical aspect of an image, such as the surface reflectance, illumination or the distances of the visible surfaces from the viewer. Changes in physical aspects manifest themselves in a variety of ways, including changes in color, intensity and Texture. 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 so far [1]. When image is acquired, the factors such as the projection, mix, aberrance and noise are produced. These factors bring on image feature is blur and distortion, consequently it is very difficult to extract image feature. Moreover, due to such factors it is also difficult to detect edge. The method of image edge and outline characteristic's detection and extraction has been research hot in the domain of image processing and analysis technique.Detecting edges is very useful in a number of contexts. For example in a typical image understanding task such as object identification, an essential step is to an image into different regions corresponded to different objects in the scene. Edge detection is the first step in the image segmentation. Edge feature extraction has been applied in many areas widely. This paper mainly discusses about advantages and disadvantages of several edge detection operators applied in the cable insulation parameter measurement. In order to gain more legible image outline, firstly the acquired image is filtered and denoised. In the process of denoising, wavelet transformation is used. And then different operators are applied to detect edge including Differential operator, Log operator, Canny operator and Binary morphology operator. Finally the edge pixels of image are connected using the method of bordering closed. Then a clear and complete image outline will be obtained.

2. IMAGE DENOISING

As we all know, the actual gathered images contain noises in the process of formation, transmission, reception and processing. Noises deteriorate the quality of the image. They make image blur. And many important features are covered up. This brings lots of difficulties to the analysis. Therefore, the main purpose is to remove noises of the image in the stage of pretreatment. The traditional denoising method is the use of a low-pass or band-pass filter to denoise. Its shortcoming is that the signal is blurred when noises are removed. There is irreconcilable contradiction between removing noise and edge maintenance.Yet wavelet analysis has been proved to be a powerful tool for image processing [2]. Because Wavelet denoising uses a different frequency band-pass filters on the signal filtering. It removes the coefficients of some scales which mainly reflect the noise frequency. Then the coefficient of every remaining scale is integrated for inverse transform, so that noise can be suppressed well. So wavelet analysis widely used in many aspects such as image compression, image denoising [3][4], etc.

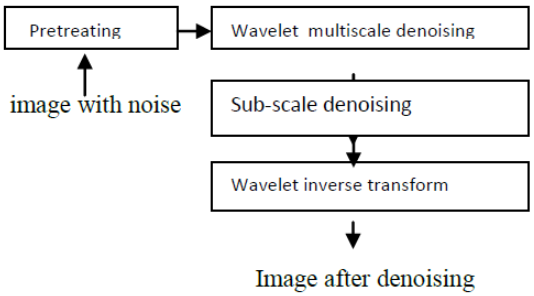

fig1: Sketch of removing image noises with wavelet transformation

The basic process of denoising making use of wavelet transform is shown in Fig1, its main steps are [3][4] as follows: *1)* Image is preprocessed (such as the gray-scaleadjustment, etc.). *2)* Wavelet multi-scale decomposition is adapted to process image. *3)* In each scale, wavelet coefficients belonging to noises are removed and the wavelet coefficients are remained and enhanced. *4)* The enhanced image after denoising is gained using wavelet inverse transform. The common used operators are the Differential, Log, Canny operators and Binary morphology, etc. The simulation effect of wavelet denoising through Matlab is shown in Fig. 2.

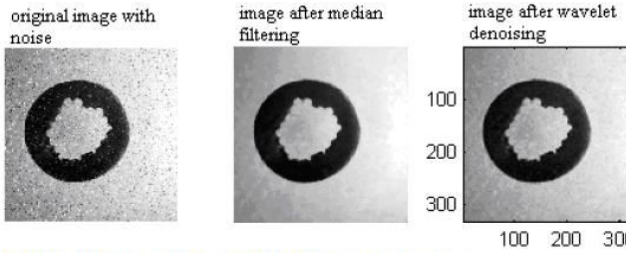

Fig.2.Comparison of denoising methods

Comparing with the traditional matched filter, the high-frequency components of image may not be destroyed using wavelet transform to denoise. In addition, there are Many advantages such as the strong adaptive ability, calculating quickly, completely reconstructed, etc. So the signal to noise ratio of image can be improved effectively making use of wavelet transform.

3. EDGE DETECTION

The edge detection of digital image is quite important foundation in the field of image analysis including image division, identification of objective region and pick-up of region shape and so on. Edge detection is very important in the digital image processing, because the edge is boundary of the target and the background. And only when obtaining the edge we can differentiate the target and the background.

The basic idea of image detection is to outstand partial edge of the image making use of edge enhancement operator firstly. Then we define the „edge intensity" of pixels and extract the set of edge points through setting threshold. But the borderline detected may produce interruption as a result of existing noise and image dark. Thus edge detection contains the following two parts: *1)* Using edge operators the edge points set are extracted. *2)* Some edge points in the edge points set are removed and a number of edge points are filled in the edge points set. Then the obtained edge points are connected to be a line.

4. BORDERLINE CLOSED

Although image is denoised before detecting edge, yet noises are still introduced when detecting edge. When noise exists, the borderline, which is obtained using derivative algorithm to detect image, usually produces the phenomenon of break. Under this situation, we need to connect the edge pixels. Thus, we will introduce a kind of method closing the borderline with the magnitude and direction of pixels gradient. The basis of connecting edge pixels is that they have definite similarity. Two aspects" one using gradient algorithm to process image. One is the magnitude of gradient; the other is direction of gradient. According to edge pixels gradient"s similarity on these two aspects, the edge pixels can be connected. Specific speaking, if Pixel(s,t) is in neighbor region of the pixel (x,y) and their gradient magnitudes and gradient directions must satisfy two conditions (16) and (17) respectively, then the pixels in (s,t) and the pixels in (x,y) can be connected. The closed boundary will be obtained if all pixels are judged and connected.

5. CONCLUSION

These edge detection operators can have better edge effect under the circumstances of obvious edge and low noise. But the actual collected image has lots of noises. So many noises may be considered as edge to be detected. In order to solve the problem, wavelet transformation is used to denoising the paper. Yet its effect will be better if those simulation images processed above are again processed through edge thinning and tracking. Although there are various edge detection methods in the domain of image edge detection, certain disadvantages always exist. For example, restraining noise and keeping detail can"t achieve optimal effect simultaneously. Hence we will acquire satisfactory

result if choosing suitable edge detection operator according to specific situation in practice.

REFERENCES

[1] Lei Lizhen, Discussion of digital image edge detection method, Mapping aviso, 2006, 3:40-42.
[2] Lai Zhiguo, etc, "Image processing and analysis based on MATLAB" , Beijing: Defense Industry Publication, 2007,4.
[3] Ma Yan, and Zhang Zhihui, Several edge detection operators comparation, Industry and mining automation, 2004, (1): 54-56.
[4] Gao Cheng, and Lai Zhiguoetc, Image analysis and application based on MATLAB, Beijing: Publishing House of National defence industry, 2007, 4: 133-175.
[5] Wang Zhengyao, Edge detection of digital image[Master paper], Xi"an: Xi"an Jiaotong University, 2003.
[6] Heung-Soo Kim and Jong-Hwan Kim. A two-step detection algorithm from the intersecting chords. Pattern Recognition Letters. 2001, 22:787-798.
[7] Canny J F. A computatioal approach tO edge detection[J]. IEEE Trans on PAMI, 1985, 8(6): 679-698.