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Edge Detection on Medical Images Using Moore Neighbourhood Method

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Abstract - Edge detection is a basic step in image segmentation; it helps to extract the foreground pixels from background especially in medical images.The main purpose of the work is to develop the edge detection on medical images. This method can be used for medical diagnosis in the department of radiology. The existing systems have provided sufficient information to achieve the edge detection, even though the results have to be improved. This paper presents computer vision system with grey scale images for the edge detection. In this work a modified Moore neighbourhood edge detection algorithm is used on medical images. The main goal of this work is to detect the boundaries of medical images with Moore neighbourhood edge detection algorithm to help for medical diagnosis.

Key Words: Edge detection, Moore neighbourhood, medical diagnosis.

1. INTRODUCTION

This is an era of digital technology. It is essentially a period wherein all the forms of information are digitalized, irrespective of the field that it belongs to. It means information, in various fields, is extensively subjected to the digital techniques and this is specifically done for gaining a proper understanding of the concepts underlying the information under consideration. In this process of digitalization, various digital techniques are used successfully and profusely to acquire, process, manipulate, interpret and understand the data from the real world. One of the areas where these digital techniques are most commonly used is the field of processing visual information; say an image or a video. Here, the term image means the digital image of a real life event. The techniques of image processing deal with the theory and practice of processing and manipulating the digital images to get the desired results and to meet the requirements or the purpose for which the image has been processed.

The techniques of digital image processing have been largely designed to work in accordance with the working of the human visual system. Further an image is defined and described in terms of the characteristic features like colour, brightness, texture, etc. [1,2] The edges are very important as they play a vital role in capturing the structural properties of the objects in an image. They are the chief components of the image that help in interpreting information and describing an object in the image; thus edges play an essential role in decreasing the extent of information to be processed in this procedure. Hence, edge detection is the most fundamental and chief step involved in processing, analyzing, recognizing the patterns and computerized image processing techniques. It can be treated as a preprocessing step [3]. The width of an edge varies from a thin line to a broad strip, i.e. to say that the edge can have a width of one or more than one pixel [4]. Rahimzadegan and Sadeghi have been implemented an iterative fuzzy edge detection (IFED) method on blurred satellite images. Some degradation effects such as atmospheric effects, clouds and their shadows, atmospheric aerosols, and fog remarkably decline the quality satellite images [5].

Traditional Canny edge detection algorithm is sensitive to noise, therefore when filtering out this noise weak edge information gets lose easily. The improved canny algorithm introduces the concept of gravitational field intensity to obtain the gravitational field intensity operator while replacing image gradients [6]. Kalra, and Chhokar have been proposed a median filter to remove the salt and pepper noise from the image which consequently smoothen the image and edges can be detected easily [7]. Lawend et al. have been proposed an edge detection technique based on traditional Canny edge detector. Unlike many established edge detection techniques that focus on the gradient in grayscale image, the proposed technique includes two more features: the length and the directional change of the edges[8]. The inclusion of the two features helps to increase the robustness of the proposed technique towards noise[9]. Biswas and Ghoshal have been introduced a new algorithm for detection of edges of gray images via polynomial evaluation based Gabor filtering (PEBGF). Proposed algorithm is applied to fit histograms for defining the index of each pixel according to their intensity values [10]. This work focuses on the edge detection method for medical images.

2. METHODOLOGY

Almost all the traditional techniques in the field of edge detection, the operators behave like high pass filters in the frequency domain. But the filters of this kind do not suite the detection of edges in noisy images because the noise present masks the edge thereby making the edge go undetected. In more important applications like clinical images, the entire diagnosis are at risk due to the failure of the technique in the detection of an edge as it would lead to incorrect decisions regarding the treatment.

In order to understand the flow of the implemented work, it is necessary to be aware of some of the basics used in this work. Firstly, two different noise patterns as the Salt and Pepper noise with a size of 0.01 and the Gaussian noise of 0.1 sizes are applied to the gray scale image. Using this noised image as the input, edges are detected by applying the moore neighborhood, separately. The region1 and region 2 specified in the flow of the work correspond to the foreground and the background of the image. Initially an image is read and is converted into gray scale form.

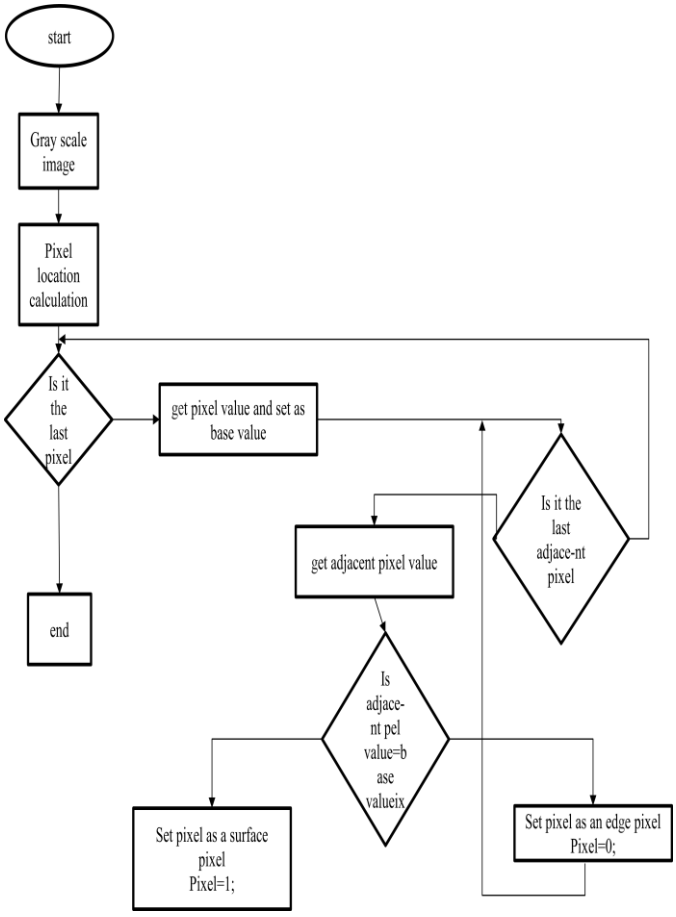

Fig 1: Proposed Flowchart

Fig. 1, represents the flow chart of the proposed methodology in which the image is read first and then the RGB format is converted to grayscale format, and then grey scale image is passed through a low pass filter i.e Gaussian filter to filter the noise in the input image. The resultant de-noised grayscale image is taken as an input image and the seed is initiated to perform segmentation. With the initialization of the seed, the energies inside and outside the image are found and the initial image force for each layer is found. Along with these components, the single image component and the average values for the inside and outside forces are obtained. The average inside and average outside force form the input, calculate the external force. This process is repeated for a number of iterations even up to a maximum of 1000 iterations as done in this work. Every single iteration of 0.5 size at every step is taken into consideration; this evolves the curve with the updated forces (i.e., inside force, outside force, and external force).

The term morphology is the branch of biology and could be defined as

a) The branch of biology that deals with the form and the structure of organisms without consideration of function.

b) The form and structure of an organism or one of its parts.

The morphological tools are constructed based on the set theory concepts where image components are the elements of the sets. In simpler terms, every image is assumed as a binary image made of pixels taking two values 0 for the black pixel and 1 the white pixel. So the morphological operators can then be termed as the binary morphological operators that are then extended to grey level images.

The small scale structural element of the size 3 x 3 is used. A threshold value is selected, the image is segmented to get a sub-image. Using this sub-image new threshold value is obtained. The image is segmented again with new threshold and is repeated for much iteration. Finally two regions are obtained, the background and the foreground. A large scale structure element is found by dilating the small structure element. Compute MSR and PSNR If PSNR is greater or equal to 3 or the number of iterations reached is 3 and 5 for the salt and pepper noise and the Gaussian Noise respectively, regions are detected. Otherwise dilate the large structure element using small structure element. Once the edges are detected for foreground and background, add all the edges using mean value. Finally all the values for the detected edges are summed up to get the final edge detection.

3. RESULTS

Fig 2: Input image

Fig 3: row wise segmented image

Fig 4: Column wise segmented image

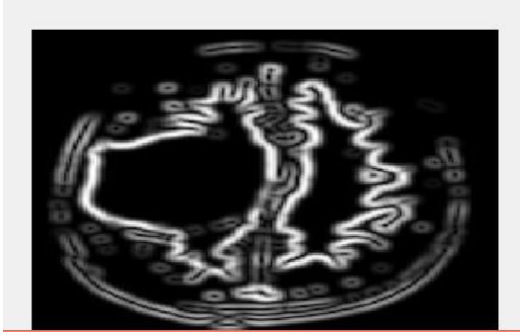

Fig 5: Gradient image

Fig 6: Edge image

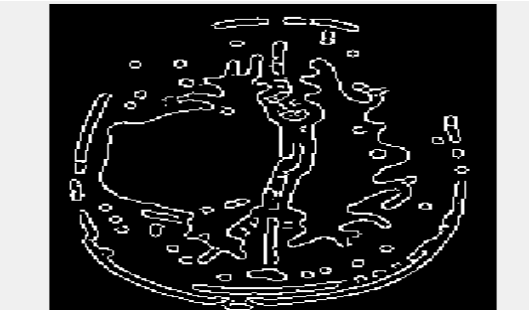

Fig 7: Final Edge detected image

The simulation results are shown in the figures from 2 to 7. Fig. 2 is the input brain image, initially this image is converted into grayscale image and then segmentation process is done on the grayscale image. Figures 3 and 4 represents row wise column wise segmented images respectively. The gradient image is shown in fig. 5, the edge of the image and the final edge detected images are given in figures 6 and 7 respectively.

4. CONCLUSION

To care for some critical situations in medical diagnosis, the edge detection needs to be carried out with a pre-processing step for noise removal using a suitable filter which is designed separately based on the noise model. Another alternative to this situation is the traditional signal processing approach with the application of mathematical morphological operators. In this work a modified Moore neighbourhood edge detection algorithm is used on medical images to detect the boundaries of medical images.

REFERENCES

[1] Y. Meng, Z. Zhang, H. Yin, T. Ma, Automatic detection of particle size distribution by image analysis based on local adaptive Canny edge detection and modified circular Hough transform, Micron (2017).

[2] W.C. Lin, J.W. Wang, Edge detection in medical images with quasi high-pass filter based on local statistics, Biomed. Signal. Process. Control 39 (2018) 294–302.

[3] Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, 2nd edition, Prentice Hall, 2002.

[4] IEEE, J. Kuruvilla, D. Sukumaran, A. Sankar, S.P. Joy, A review on image processing and image segmentation, Data Mining and Advanced Computing (SAPIENCE), International Conference on, (2016), pp. 198–203.

[5] M. Rahimzadegan, B. Sadeghi, Development of the iterative edge detection method applied on blurred satellite images: state of the art, J. Appl. Remote Sens. 10 (3) (2016) 035018.

[6] R. Gupta, Enhanced edge detection technique for satellite images, International Conference on Cloud Computing and Security, Springer International Publishing, 2016, pp. 273–283.

[7] A. Kalra, R.L. Chhokar, A hybrid approach using Sobel and Canny operator for digital image edge detection, International Conference on Micro Electronics and Telecommunication Engineering (ICMETE), (2016), pp. 305–310 IEEE.

[8] H.O. Lawend, A.M. Muad, A. Hussain, Robust edge detection based on Canny algorithm for noisy images, J. Theor. Appl. Inf. Technol. 95 (19) (2017).

[9] M. Wang, J.S. Jin, Y. Jing, X. Han, L. Gao, L. Xiao, The improved Canny edge detection algorithm based on an anisotropic and genetic algorithm, Chinese Conference on Image and Graphics Technologies, Springer, Singapore, 2016, pp. 115–124.

[10] Biswas Soumen, Ghoshal Dibyendu, A new approach of edge detection via polynomial evaluation based Gabor filter, Far East J. Electron. Commun. 3 (2016) 21–31.