Volume 2, Issue 2, February 2012 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Implementation of Multilevel Threshold Method for Digital Images Used In Medical Image Processing

Pritee Gupta[1]
Dept .of computer science & Engg., I.T.S Engg. College Gr. Noida (U.P), India,

Vandana Malik[2]
Dept .of computer science&Engg. Accurate Inst. of Mgmt. & Tech. Gr.Noida (U.P),India

Mallika Gandhi [3]
Dept .of Information Tech. I.T.S Engg. College Gr. Noida (U.P), India,

Abstract-- **The digital image processing has been applied in several areas, especially where it is necessary to use tools for feature extraction and to get patterns of the studied images. In an initial stage, the segmentation is used to separate the image in parts that represents a interest object, that may be used in a specific study. There are several methods that intends to perform such task, but it is difficult to find a method that can easily adapt to different type of images, that often are very complex or specific. To resolve this problem, this work aims to presents an adaptable segmentation method, that can be applied to different type of images, providing a better segmentation. The proposed method is based on a model of automatic multilevel thresholding and considers techniques of group histogram quantization, analysis of the histogram slope percentage and calculation of maximum entropy to define the threshold.**

***Keywords* — cardiac images, segmentation, histogram quantization, group quantization, thresholding, Multilevel thresholding**

I. INTRODUCTION

Segmentation refers to the process of partitioning a digital image into multiple regions (sets of pixels). The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. The result of image segmentation is a set of regions that collectively cover the entire image. Each of the pixels in a region is similar with respect to some characteristic or computed property, such as color, intensity, or texture. Adjacent regions are significantly different with respect to the same characteristics. Several general-purpose algorithms and techniques have been developed for image segmentation. Since there is no general solution to the image segmentation problem, these techniques often have to be combined with domain knowledge in order to effectively solve an image segmentation problem for a problem domain. The biological vision system is one of the most important means of exploration of the world to the humans, performing complex tasks with great ease such as analysis, interpretation, and recognition and pattern classification. For this reason many studies attempt to produce artificial vision systems with the same efficiency of the biological system. This task is still highly complex, mainly to implement one of the most obvious problems, the quantification and qualification of information's represented in many different fields, such as intensity of gray level, edges, contours and texture **[1].** These attributes are naturally sought by the human visual system when the measured signal is an image. One possibility to represent an artificial vision system efficient is to use appropriate methods of segmentation, considered as a first step for analyzing an image; it allows separating the objects in parts, according to some criterion of uniformity. For high quality segmentation systems, digital image processing is used in a primary stage of thresholding to separate the object of the rest of the image. In an initial stage, the segmentation is used to separate the image in parts that represents an interest object that may be used in a specific study. There are several methods that intend to perform such task, but are difficult to find a method that can easily adapt to different type of images, that often are very complex or specific. To resolve this problem, this work aims to presents an adaptable segmentation method, that can be applied to different type of images, providing a better segmentation. The proposed method considers techniques of group histogram quantization, analysis of the histogram slope percentage and calculation of maximum entropy to define the threshold. The technique was applied to segment the cell core and potential rejection of tissue in myocardial images of biopsies from cardiac transplant **[2].**

II. EXISTING TECHNOLOGY

Threshold Method

Histogram-based methods are very efficient when compared to other image segmentation methods because they typically require only one pass through the pixels. In this technique, a histogram is computed from all of the pixels in the image, and the peaks and valleys in the histogram are used to locate the clusters in the image.

Color or intensity can be used as the measure. A refinement of this technique is to recursively apply the histogram-seeking method to clusters in the image in order to divide them into smaller clusters **[3].** This is repeated with smaller and smaller clusters until no more clusters are formed. One disadvantage of the histogram-seeking method is that it may be difficult to identify significant peaks and valleys in the image. This may affect the quality and usefulness of the final solution. The thresholding consist in to identify in an image, a threshold of intensity in which the object distinguish better of the back of the image, and in most cases, the choice of threshold takes a subjective criterion of a human operator. Selects an optimal threshold *T* by minimizing the within group variance of the two classes of pixels separated by the thresholding operator *t*.

Algorithm

- Select an initial estimate of the threshold T.
- Partition the image into two groups, R1 and R2, using the threshold T.
- Calculate the mean gray values M1 and M2 of the partitions R1 and R2.
- Select a new threshold.

Drawback of Existing Method

Selection of Threshold is Difficult

However, in many cases is not achieved a threshold that provides a good segmentation of the entire image.

III. PROPOSED METHODOLOGY

This work proposed a methodology where the algorithm automatically gets the threshold, by the histogram analysis. The method finds the histogram valleys, which are the places where are concentrated the thresholds and therefore the subdivision of the image. However the method proves effective in cases where the image and the histogram are well defined, for cases where the image is not presented optimally, with noise, distortion and non standardized histograms, the method does not produce an effective threshold that identifies the objects in the image quality. In this context, the paper presents an group histogram quantization, analysis of the histogram slope percentage and calculation of maximum entropy to define the threshold **[4].** These improvements prevent the identification of not significant thresholds and allow more control of the technique during the step of feature extraction in artificial vision systems **[5].**

Histogram Calculation
Histogram Group Quantization (User can chose the group)
Detection of histogram slope Percentage
Entropy Calculation
Selection of Maximum Entropy
Multi-level threshold detection
Segmentation based on Multi-level threshold

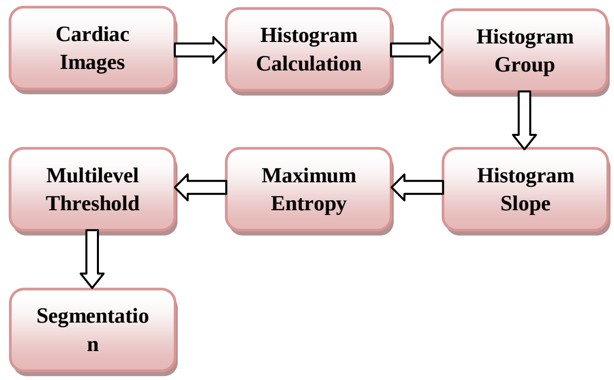

Fig.1 Block diagram of proposed method

IV. RESULTS

In the studied images we used different input parameters, the image format to be processed, the size of the histogram division group, the filter size, and the percentage of slope to be used for identify thresholds. To demonstrate the method and the results, input parameters: the image format =jpg, size of the histogram division group = 10, filter size = 5 and slope percentage = 35%. These parameters can be adjusted to the type of image that pretends analyze.

Input image

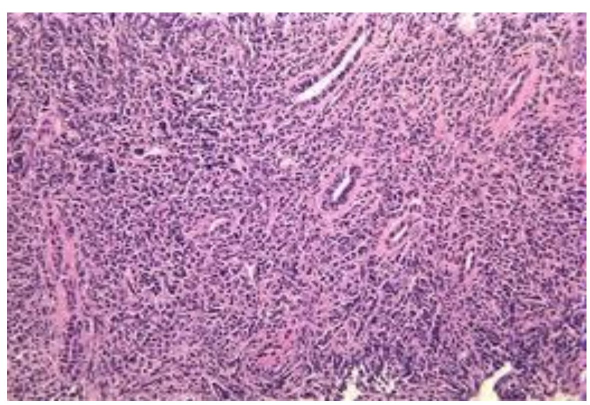

Fig.2 Example of myocardial images obtained with biopsies of a transplanted heart patient.

Output GUI

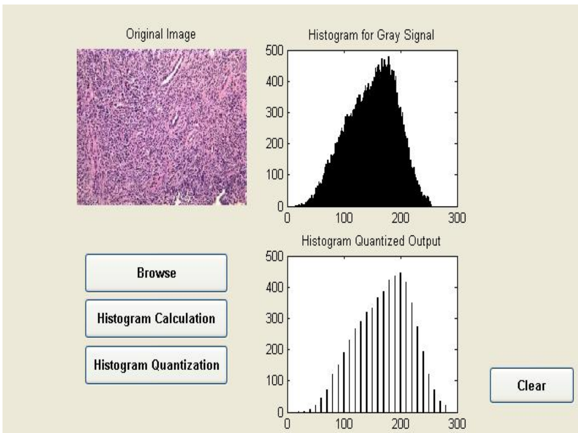

Fig.3 Histogram quantization of digital images applied in cardiac medical images

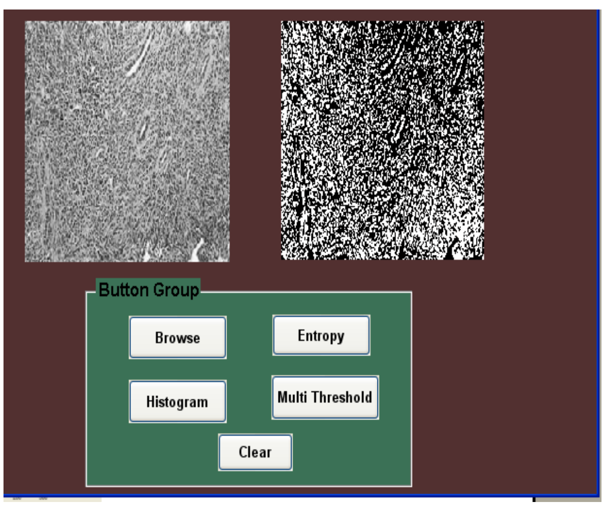

Fig.4 Segmentation of digital images applied in cardiac medical images. This shows cardiac muscle included as the cell core or tissue rejection.

V. CONCLUSIONS AND FUTURE WORK

The overall objective of such methods is referred to as computer-aided diagnosis. They are used for assisting doctors in evaluating medical imagery or in recognizing abnormal findings in a medical image. Proposed technique identify clearly cell core, fibrous tissue, muscle and tissue rejection, in myocardial images of biopsies from heart transplant patients, with advantages over one of the best known and widespread method in the literature. These characteristics are significant aspects of the developed technique, and allows the application to other image types, since the input parameters are adjustable to the studied case. This versatility and quality of results make the developed technique a considerable alternative to be applied during the stage of feature extraction in artificial vision systems. Imprecision in images due to noise poses a great challenge in image segmentation and thresholding. Hence the above concept may be extended to deal with noisy images by use of fuzzy tools etc.

REFERENCES

[1] A. K. Jain, R. Duin, "Statistical pattern recognition: A review". IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 22, no.1, pp. 4–37, 2000.

[2] A. N. Otsu, "A threshold selection method from gray-level histogram". IEEE Transactions on Systems, Man. And Cybernetics, pp. 62-66, 1978.

[3] T. A. Pun, "New method for gray-level picture thresholding using the entropy of the histogram". Signal Processing, vol.2, pp. 223-237, 1980.

[4] J. N. Kapur, P. K. Sahoo, K. C. Wong, "A new method for graylevel picture thresholding using the entropy of the histogram".Computer Vision, Graphics, and Image Processing, vol.29, pp. 273-285, 1985.

[5] A. H. Abutaleb, "Automatic thresholding of gray-level pictures using two-dimensional entropy". Computer Vision, Graphics and Image Processing, vol.47, pp. 22-32, 1989.