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

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Abstract— These The digital image processing has been applied in several areas, especially where it is necessary to use tools forfeature 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 thatintends to perform such task, but it is difficult to find a method that can easily adapt to different typeof images, that often are very complex or specific. To resolve this problem, this workaims to presents anadaptable segmentation method, that can be applied to different typeof images, providing a better segmentation. The proposed method is based ona 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.

Index Terms— cardiac images, segmentation, histogram quantization, group quantization, thresholding, Multilevelthresholding

1 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 character istic or computed property, such as color, intensity, or texture. Adjacent regions are significantly different with respect to the samecharacteristics. 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 biologicalvision system is one of the most-important means of exploration of the world to thehumans,performing complextasks with great ease such as analysis,interpretation,andrecognitionand pattern classification. For this reasonmanystudies attempt to produce artificial vision systems with thesame efficiency of the biological system.

This task is stillhighly complex, mainly to implement oneof the most obviousproblems, the quantification andqualification ofinformation's represented in many differentfields, such asintensity of graylevel, edges, contours andtexture.

These attributes are naturally sought by the humanvisual system when the measured signal is an image. One possibility torepresent an artificial vision systemefficient is to useappropriate methods of segmentation,considered as a first step for

analyzing animage;it allowsseparating the objectsin parts, according to some criterion ofuniformity. For high quality segmentation systems,digital image processing isused in a primary stage ofthresholding to separatethe objectof the rest of the image.In an initial stage, the segmentationis used to separate the image in parts that represents aninterestobject thatmay be used in a specific study. There areseveral methods thatintendto perform such task, butaredifficult to find a method that can easily adapt to differenttype of images, that often are very complex or specific. To resolve this problem, this workaims to presents anadaptable 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. EXISTING TECHNOLOGY

THRESHOLD METHOD

Histogrambased methods are very efficient whencompared to other image segmentation methods becausethey typically require only one pass through the pixels. Inthis technique, ahistogramis computed from all of thepixels in the image, and the peaks and valleys in thehistogram are used to locate the clusters in the image. Colororintensitycan be used as the measure. Arefinement of this technique is torecursively apply thehistogramseeking method toclustersin the image in order to divide them into smaller clusters. This isrepeated with smaller and smallerclustersuntil no more Clustersareformed.One disadvantage of thehistogram 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 Thethresholding 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 ofthreshold takes a subjective criterion of a human operator. Selectsan optimal thresholdTby minimizing the within group variance of the two classes of pixels separated by thethresholding operator

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

3. PROPOSED METHODOLOGY

This workproposed a methodology where the algorithm automatically gets the threshold, by the histogram analysis. The method finds the histogram valleys, whichare 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 isnot presented optimally, with noise, distortion and non standardized histograms, the method does not produce an effective threshold that id entifies the objects in the image quality. In this context, the paper presents angrouphistogram quantization, analysis of thehistogram slopepercentage and calculation of maximum entropy to definethe threshold.These improvements prevent theidentification of not significant thresholds and allow more control of the technique during the step of feature extraction in artificial vision systems . Histogram Calculation Histogram Group Quantiza-

tion (User can chose Thegroup) Detection of histogram slope Percentage Entropy Calculation Selection of Maximum Entropy Multilevel threshold detection Segmentation based on Multi-level threshold As demonstrated in this document, the numbering for sections upper case Arabic numerals, then upper case Arabic numerals, separated by periods. Initial paragraphs after the section title are not indented. Only the initial, introductory paragraph has a drop cap.

4 RESULTS

Inthe 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 percentageof slope to be used for identify thresholds. Todemonstrate the method and the resultsinput parameters: the image format =jpg, size of the histogram division group = 10, filter size = 5 and s lope percentage = 35%. These parameters can be adjusted to the type of image that pretends analyze.

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

- Cardiac Images
- Histogram Calculation
- Histogram Group
- Quantization Histogram
- Slope Percentage
- Maximum Entropy
- Multilevel Threshold
- Segmentation

5. CONCLUSION AND FUTURE WORK

The overall objectiveof such methods is referred to as computed aided diagnosis. They are used for assistingdoctors in evaluating medical imagery or in recognizingabnormal findings in a medical image. Proposedtechnique identify clearly cell core, fibrous tissue, muscleand tissue rejection, in myocardial images of biopsiesfrom heart transplant patients, with advantages over oneof the best known and widespread method in the literature.Thesecharacteristics aresignificant aspects ofthe developed technique, and allowstheapplication toother image types, since the input parameters are adjustable to the studied case. This versatility and qualityof results make the developed technique a considerablealternative to be applied during the stage of featureextraction in artificial vision systems.Imprecisioninimages due to noise poses a great challenge in imagesegmentation and thresholding. Hence the above conceptmay be extended to deal with noisy images by use of fuzzy tools etc.

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