IMAGE SEGMENTATION USING WATERSHED AND GRADIENT VECTOR FOR MULTIPLE OBJECTS

1ESHA CHAUHAN, 2ANOOP SINGHAL

1M. Tech. Scholar, Department of Electronics & Communication, Jagannath University, Jaipur, Email: esha.0150@gmail.com
2Assistant Professor, Department of Electronics & Communication, Jagannath University, Jaipur, Email: anoop.singhal@jagannathuniversity.org

ABSTRACT

This paper describes a novel method for partitioning image into meaningful segments within a given time. The proposed method employs a step wise approach which uses gradient vector method for determining the boundary, a threshold which after getting the boundary neutralizes the values to make the image consistent enough so that the watershed segmentation technique can segmentize the image with proper and fine boundary definitions. Along with that, it uses various auxiliary schemes such as gray scale conversion, average threshold method, which segment the image in proper way but with some distortion around the boundary. The algorithm proposed in this paper considers all these methods in effective way and takes little time. It is organized in such a manner so that it operates on input image adaptively. Its robustness and efficiency makes it more convenient and suitable for all types of images.

Index Terms- Image Segmentation, vector gradient, watershed, threshold

1. INTRODUCTION

Image Segmentation is an important tool of Digital Image Processing, the main objective of this thesis is to obtain the segemented image within a given period of time and to make the system robust. The results will required to be compared with some other paper as well in terms of the time taken by the other image segmentation algorithms.

In computer vision, image segmentation is the process of partitioning a digital image into multiple segments (sets of pixels, also known as super 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. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain characteristics.

Threshold is one of the widely methods used for image segmentation. It is useful in discriminating foreground from the background. By selecting an adequate threshold value, the gray level image can be converted to binary image. The binary image should contain all of the essential information about the position and shape of the objects of interest (foreground). The advantage of obtaining first a binary image is that it reduces the complexity of the data and simplifies the process of recognition and classification. The most common way to convert a gray-level image to a binary image is to select a single threshold value (T). Then all the gray level values below this T will be classified as black (0), and those above T will be white (1). The segmentation problem becomes one of selecting the proper value for the threshold T. A frequent method used to select T is by analyzing the histograms of the type of images that want to be segmented. The ideal case is when the histogram presents only two dominant modes and a clear valley (bimodal). In this case the value of T is selected as the valley point between the two modes. In real applications histograms are more complex, with many peaks and not clear valleys, and it is not always easy to select the value of T.

2. PREVIOUS WORK

Tsai and Tseng (1997) developed unsupervised segmentation scheme in which RGB of SPOT satellite was transformed into HSI colour space to estimate the number of colour sets by scale space filter based histogram thresholding. Then, iterated conditional mode (ICM) algorithm was employed for MAP estimation of GMRF based pixel partition labelling. Method used spectral and spatial information using texture (hybrid of local and global texture information) features for pixel based segmentation. Tseng and Lai (1999) also used GMRF but approximation was done by using Genetic algorithm instead of ICM for MAP estimation.

Sarkar et al. (2000) developed a modified technique to reduce the complexity of MAP-MRF estimation. Instead of working directly on pixels, they used a two stage algorithm for oversegmented image. At first stage, region adjacency graph was plotted for those regions. Energy function of MRF model was defined based on intra-region homogeneity and inter-region dissimilarity. At second stage, region merging is performed based on these energy equations value compared with a threshold based on Fischer distribution. This is an unsupervised MRF model based region merging approach which utilised spectral, spatial and textural properties. Sarkar et al. (2002) extended the above mentioned MRF based unsupervised segmentation approach for multiband imagery and used it for land-use classification.

Beveridge et al. (1989) used thresholding object/background model for generating initial regions
and region merging algorithm with spectral, shape and connectivity as homogeneity measures.

Osvaldo, Alejandro, Ismael et al. (2014) presented, described and tested a new Matlab Graphic User Interface (GUI) for image segmentation of degraded images using two probabilistic techniques, Markov random fields (MRF) and nonparametric entropy estimation. This GUI was created in order to integrate a series of steps needed for the segmentation process into a single visual environment to allow an easier handling of input images and saving of results. It is also used a powerful utility of the Matlab software concerning to parallel processing, with the aim of reduce the computational time because of the high time consumption of this kind of algorithms. Results show a very satisfactory performance of this tool, allowing us to make this task easier and faster.

3. METHODOLOGY

As discussed earlier in this paper that there are many ways of segmenting and image but to do it with complete perfection is a difficult task.

In this paper, RGB Image has been taken as an input image, which is then converted into a grayscale image which has the gray scale values between 0 to 255.

Entropy is the amount of information content of an image, here in this paper we have preserved that just to examine the information content level of an image.

Gradient vector is a MATLAB tool which emphasizes over the variations of the light intensity or the grayscale values, as at the edge of the object the variations will be noticable as well as they will be large.

Threshold based segmentation provides a support to detect the object easily as there will be a huge difference between the background and the foreground so to separate the two a threshold can be set which will divide the both by representing them in a binary form. The obtained result can be further used to determine the object and can be useful for the pattern matching algorithms.

After the gray scale conversion the image goes under the gradient vector process to identify the boundary, gradient vector performs a boundary scan or it monitors the sudden change in colour or grayscale intensity of an object within an image.

After the boundary scan the model checks the threshold of the objects and made them consistent accordingly, consistent image undergoes the process of watershed segmentation.

At the end of the segmentation process time has been calculated to measure and examine the proposed method with some other methods.

4. RESULTS

Result obtained from the compile code are shown in this section.

(a) Input Image (b) Image Segmentation

<table>
<thead>
<tr>
<th>Table I TIMING COMPARISION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method</td>
</tr>
<tr>
<td>----------------------------</td>
</tr>
<tr>
<td>MRF Simple</td>
</tr>
<tr>
<td>MRF Parallel</td>
</tr>
<tr>
<td>Our Proposed Method</td>
</tr>
</tbody>
</table>

5. CONCLUSIONS

From the above compiled work and results we can conclude that the results obtained in the base paper of this thesis has been improved by a vast margin In simple segmentation the Markov Random Fields takes about 339 secs.[12] In Paralel segmentation the Markov Random Fields takes about 95 secs.[12] Our methods takes an avg time of 23.11 secs. Future Scope: On successful segmentation process this work can further be improved by applying few filters based on fuzzy logic and neural networks and along with Artificial Intelligence this can be used as an object recognition program which can be very helpful with many current applications.

REFERENCES


pp. 1–8.


