INTERNATIONAL JOURNAL OF PURE AND APPLIED RESEARCH IN ENGINEERING AND TECHNOLOGY

A PATH FOR HORIZING YOUR INNOVATIVE WORK

IMAGE SEGMENTATION TECHNIQUES

MISS. K. M. PIMPLE

Assistant professor, Department of Electronics & Telecommunication Engg. Dr. Rajendra Gode Institute of Technology & Research, Amravati.

Abstract: In the present day world computer vision has become an interdisciplinary field and its applications can be found in any area be it medical , remote sensing ,electronics and so on .Term segmentation is splitting the whole image into segments. Segmentation process helps to find region of interest in a particular image. This paper study and evaluate the different methods for segmentation techniques.

Keywords: Thresholding, Histogram, Clustering, Matching

Corresponding Author: MISS. K. M. PIMPLE

Access Online On:

www.ijpret.com

How to Cite This Article:

K. M. Pimple., IJPRET, 2016; Volume 4 (9): 193-200

PAPER-QR CODE

193

INTRODUCTION

A great variety of segmentation methods has been proposed.

• Threshold based segmentation.

• Edge based segmentation..

• Region based segmentation.

• Clustering techniques.

• Matching.

I. Threshold based segmentation

Thresholding is probably the most frequently used technique to segment an image. The thresholding operation is a grey value remapping operation g defined by:

$g(v) = 0$ if $v < t$

    $= 1$ if $v \geq t$,

where v represents a grey value, and t is the threshold value. Thresholding maps a grey-valued image to a binary image. After the thresholding operation, the image has been segmented into two segments, identified by the pixel values 0 and 1 respectively.
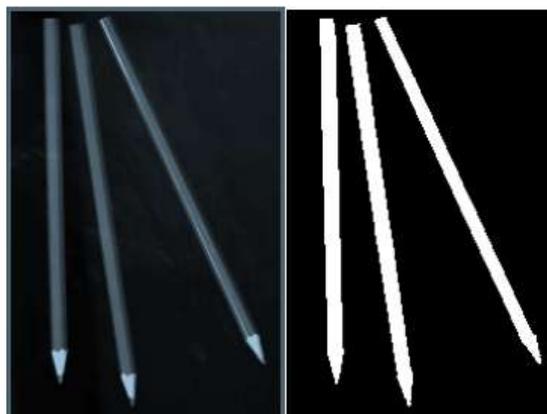

Figure 1 segmentation by thresholding.

Many methods exist to find a suitable threshold for segmentation

Histogram thresholding: The histogram is often a valuable tool in establishing a suitable threshold T

In figure 2 we show the image from the previous figure together with its histogram, and the thresholding results using four different threshold values obtained from the histogram
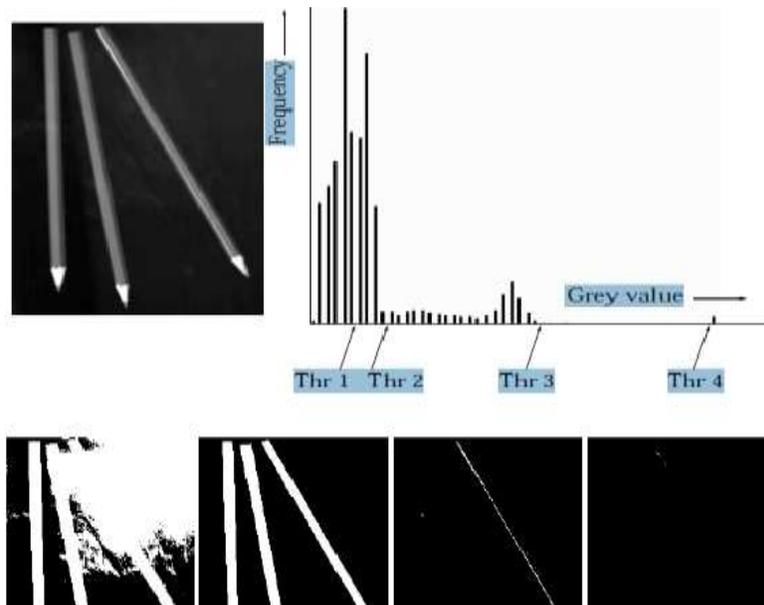

Fig 2 threshold selection from the histogram.

Multispectral thresholding

A color image will usually have three values (e.g., RGB values) attached to each pixel. In multispectral thresholding separate thresholding applied to each channel, and the results are combined using a boolean combination. A color image has three channels associated with it.

Fig.3 is a grey valued representation of a color image of a baboon, and the red, green and blue channel of the same color image:
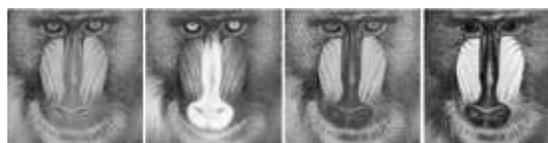

Fig.3

II. Edge based segmentation:

Edge detection detects outlines of an object and boundaries between objects and the background in the image

The gradient of an image f(x,y) at location (x,y) is the Vector

$$\nabla f = \begin{bmatrix} G_x \\ G_y \end{bmatrix} = \begin{bmatrix} \partial f / \partial x \\ \partial f / \partial y \end{bmatrix}$$

The gradient vector points in the direction of maximum rate of change of f at (x,y). In edge detection, an important quantity is the magnitude of this vector:

$$|\nabla f| = \sqrt{G_x^2 + G_y^2}$$

The gradient takes it's maximum rate of increase of f(x,y) per unit distance in the direction of ∇f .The gradient magnitude is commonly approximated by $|\nabla f| = |G_x| + |G_y|$

This is simpler to implement. The direction of the gradient vector is also important and is given by:

$$\alpha(x, y) = \tan^{-1}\left(\frac{G_y}{G_x}\right)$$

Edge Detection Techniques:

A.Sobel Operators- Sobel Operators represented by the mask:

-1	0	1
-2	0	2
-1	0	1

1	2	1
0	0	0
-1	-2	1

B. Roberts Cross Edge Detector- **Roberts** Operators represented by the mask:

1	0
0	-1

0	+1
-1	0

C. Prewitt Operator- **Prewitt** Operators represented by the mask:

-1	0	1
-1	0	1
-1	0	1

Gx

1	1	1
0	0	0
-1	-1	-1

Gy

D. Canny edge detector technique :

The algorithmic steps of Canny edge detector technique are

1. Convolve image f(r, c) with a Gaussian function to get smooth image f^ (r, c). f^ (r, c)=f(r,c)*G(r,c,6)

2. Apply first difference gradient operator to compute edge strength then edge magnitude and direction are obtain as before.

3. Apply non-maximal or critical suppression to the gradient magnitude.

4. Apply threshold to the non-maximal suppression image.

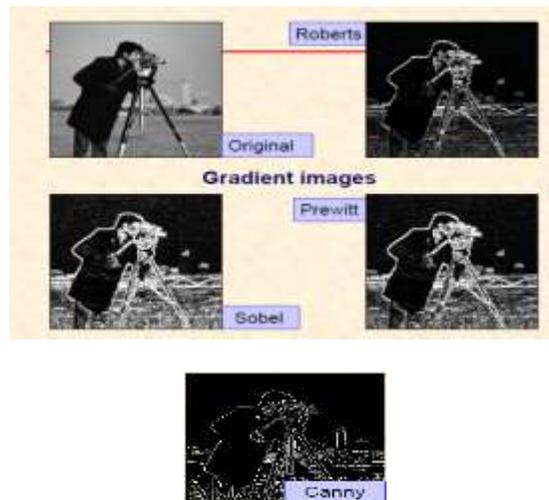This is simpler to implement. The direction of the gradient vector is also important and is given by:

Fig 4. Gradient images using different edge detection techniques

III. Region based segmentation: Region based segmentation is simple as compare to other methods and also noise resilient. It divides an image into different regions based on pre-defined criteria, i.e., color, intensity, or object. In this technique pixels that are related to an object are grouped for segmentation .The thresholding technique is bound with region based segmentation. The area that is detected for segmentation should be closed. Region based segmentation is also termed as "Similarity Based Segmentation". In each and every step at least one pixel is related to the region and is taken into consideration. After identifying the change in the color and texture, the edge flow is converted into a vector. From this the edges are detected for further segmentation

IV. Clustering:

Segmentation is also done through Clustering. A basic clustering algorithm i.e., K-means is used for segmentation in textured images. It clusters the related pixels to segment the image Segmentation is done through feature clustering and there it will be changed according to the color components. Segmentation is also purely depending on the characteristics of the image. Features are taken into account for segmentation. Difference in the intensity and color values are used for segmentation .Segmentation approach for region growing is K-Means Clustering.

Algorithm: K-Means Clustering-This algorithm minimizes the total distance of data points to the cluster center of the cluster they are assigned to. Note that it does not require the actual computation of distances.

1. Select the number of desired clusters k. Arbitrarily (or better: intelligently) place the k cluster centers at different initial locations in the image.

2. Assign each data point to the cluster whose center is closest.

3. Recompute the cluster centers; the cluster center should be at the average coordinates (center of gravity) of the data points that make up the cluster.

4. Go to step 2 until no more changes occur or a maximum number of iterations is reached.

V. Matching. If we want to locate an object in an image, we can find this object by matching the template to various image locations until we have found the object More useful is a

$$M_1(p,q) = \sum_{x=0}^{M-1} \sum_{y=0}^{N-1} (g(x,y) - f(x+p, y+q))^2$$

quantitative measure of fit such aswhere f is the image, g the M × N template, and the variables p and q determine the location of the template in the image, see figure
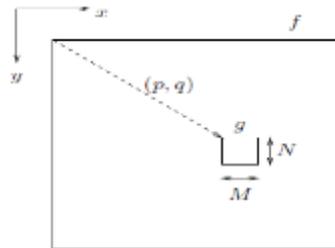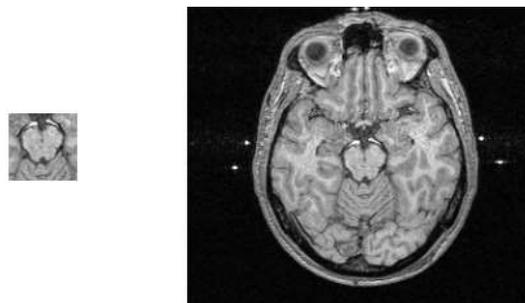

Fig 5 Definition of image matching

Figure 6 Image matching.

This is achieved by matching of the template to various locations in the right image.

CONCLUSION

Image segmentation has become a very important task in today's scenario .In this paper, various techniques of image segmentation has been discussed. Algorithm of edge segmentation & of clustering has been explained. According to application, method of segmentation technique varies.

REFERENCES:

1. G. Seerha, "Review on recent image segmentation techniques," International Journal on Computer Science and Engineering, 2009.

2. J. Acharya, S. Gadhiya, and K. Raviya, "Segmentation techniques for image analysis: A review," International Journal of Computer Science and Management Research, vol. 2, pp. 2278-733, 2013

3. S. S. Varshney, N. Rajpal, and R. Purwar, "Comparative study of image segmentation techniques and object matching using segmentation," in Proc. International Conference on Methods and Models in Computer Science, 2009, pp. 1-6.

4. N. Senthilkumaran, R. Rajesh, "Edge Detection Techniques for Image Segmentation and A Survey of Soft Computing Approaches", International Journal of Recent Trends in Engineering, Vol. 1, No. 2, PP.250-254, May 2009.

5. N. Senthilkumaran, R. Rajesh, "Edge Detection Techniques for Image Segmentation - A Survey", Proceedings of the International Conference on Managing Next Generation Software Applications (MNGSA-08), 2008,

6. R.C. Gonzalez, R.E. Woods, Digital Image Processing, Prentice-Hall, Englewood Cliffs, NJ, 2002.