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Unsupervised Image Segmentation Using Truncated Log Normal Distribution

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Abstract: ***Color image processing plays a vital role in the perception of the images by the humans. Among the color models YIQ model is considered in this article. The benefit beyond the consideration of this model is due to the fact that, more bandwidth is allocated to the luminance or Y-component, and which helps the human eye to catch sensible color information. In order to acquire any object of interest it is customary to segment the image into homogeneous regions such that the object of interest can be easily retrieved. In order to speed up the retrievals or to identify the object of interest this article presents a methodology using Truncated Log Normal Distribution. The developed model is presented using a bench mark data set and performance evaluation is carried out to evaluate the efficiency of the model.***

Key words: Image segmentation, color models, quality metrics, truncated log normal, RGB color model.

I. INTRODUCTION

Today in this digital scenario lot of information is shared and communicated using digital media, and to large texts matters are replaced with images, since usage of image saves much storage than representing thousands of lines of text, this forced the users to store and represents the data of their interest using the images. Image representation is an integral part of image processing and helps in better understanding about the images. Color image is a influential descriptor which simplifies object recognition and mining useful information from a scene. The color models which are in prominence along with RGB color space are YIQ and HSI. Among these models, YIQ color space is more helpful, since it couples luminance(Y) together with the color information (I, Q) and makes the processing simpler without affecting the color components. In order to display color I and Q play a vital role. Hence it is necessary to correlate the I and Q components of an image for better perception lot of research is driven in the area of color image processing [1] [2] [3] [4], among which most of the works can be broadly classified into parametric modeling using GMM and non parametric modeling using Edge Enhancement, SVM, HMM, Neural networks, Graph Cut and Watershed algorithms. Among the non parametric models each model suffers with the disadvantages as highlighted by Srinivas.Y et al (2012). Hence usage of parametric models will be more robust in the consideration of the segmentation process and in particular color image segmentation. N.R.Pal and S.K.Pal (1993) in their paper identified that parametric modeling is more robust compared to non parametric approaches and delivers better segmentation results. Hence in this article, we present a model for image segmentation using mixture models. Similar arguments about the effectiveness in the usage of parametric modeling approach based on GMM is also highlighted (Nagesh.v et al) (2012). Moreover most of the images in reality exhibit non-symmetric fashion and hence to have a closure study about the images asymmetric models are most sounding [5], hence in this paper we present a Log Normal Distribution. The advantage of considering Log normal distribution is that it is a asymmetric distribution and well suited for handling images which are generally asymmetric in shape. Also, while processing the images and retrieving the objects of objects of interest it is not necessary to consider the entire image which possess infinite ranges, due to the fact that every image always occurs between finite limits A to B, where A represents the maximum intensity pixel inside the image and B represents the minimum intensity range of the pixel inside the image [5], [6],[7]. The developed model using Truncated Log Normal Distribution is tested on Bench Mark data sets, BERKLEY. The results obtained are evaluated using metrics like PSNR, MS, AD and IF. The rest of the paper is organized as follows: Section-2 of the paper deals with Truncated Bivariate Log Normal Distribution. In section-3 of the paper we highlight the estimation of the initial parameters using K means algorithm. Section-4 of the paper highlights about the data sets considered and the experimentation. together with the evaluation results on bench mark data sets and the final section-5 concludes the paper.

II. TRUNCATED BIVARIATE LOG NORMAL DISTRIBUTION

Most of the realistic images in nature have a finite range of pixel intensity. In order to retrieve an object of interest it is meaningful to consider the finite space instead of considering the entire range of the image. Hence in this paper, to normalize the size of the image to a finite range truncation is applied. The probability density function of Log Normal Distribution is given by

$$\frac{1}{\sigma x\sqrt{2\pi}}\int_{-\infty}^{A}\int_{B}^{\infty} e^{-\left(\frac{(\log(x)-\mu)^2}{2\sigma^2}\right)}dx \quad \text{---------- (1)}$$

Where A denotes the lower range of image pixels and B denotes the maximum intensity of the pixel in the range.

III. ESTIMATION OF THE INITIAL PARAMETERS BY USING K MEANS ALGORITHM

In order to segment the image ,the initial estimates of the image are to be identified. For this purpose K means algorithm is utilized. The initial value of k is identified using the heuristics of A.C.Cohen (1991A). After estimating the initial values of μ and σ the initial centroids are to be estimated for running the K means algorithm.

3.1 The steps involved in k means algorithm are as follows

Step1: Estimate the initial value of K.

Step2: Identify the cluster centroid c_1, c_2….. c_n .Consider each pixel along a row and identify the distance between the pixel and the cluster centroid using Euclidian distance.

Step3: If the distance is less than the cluster centroid then the pixel exists the same row else swapping takes place.

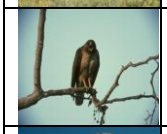
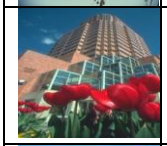
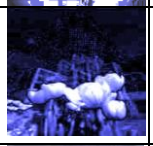
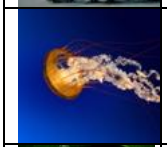
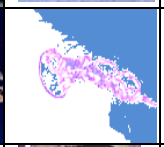
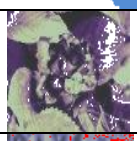
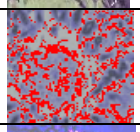
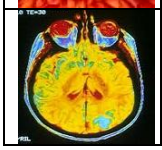
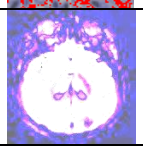
Step 4: The procedure is carried until no swappings are encountered.

After the implementation of K means algorithm the data will be divided into homogeneous groups.

IV. DATA SET AND EXPERIMENTATION

In order to exhibit the model a data base obtained from BERKLEY is considered. The experimentation is carried out on 6 images and the assessment is carried out using performance metrics like PSNR, MSE and IF. Every image is normalized to a preset size of 169 * 169. In order to retrieve the entity of interest, features play a imperative role. Hence in this paper, we have considered the features based on the correlation of I and Q. These associated features are given as input to the Truncated Bivariate Log Normal Distribution to obtain the probability density function against the image pixels. Each pixel is placed into its suitable clusters basing on the likely hood estimate and maximizing the component likely hood function. Re-construction of the image is carried out by assigning a color for each pixel in a region and using the address the address value of the pixel from the look up table. The results obtained are evaluated using performance evaluation metrics proposed by [12] and are represented in Table-1.

Table-1: Performance Evaluation

Input	Output	MSE	PSNR	IF
		0.34	42.7	0.89
		0.62	39.83	0.71
		0.79	35.79	0.50
		0.62	41.9	0.47
		0. 71	36.8	0.61
		0.39	47.7	0.49
		0.67	41.7	0.66
		0.47	41.8	0.79

V. CONCLUSION

In this paper a novel approach of image segmentation based on Bivariate Truncated Log Normal Distribution is presented. This model is very much for extraction of color images and constructive in NTSC, cameras. The research in this direction will benefit in getting a deeper insight into the various segmentation issues based on different color models. The evaluated results are presented in Table-1 and shows that the developed model contributes a significant importance towards the segmentation of images.

REFERENCES

[1] Bengt Muthen (1990) "Moments of the censored and truncated bivariatenormal distribution", British Journal of Mathematical and Statistical psychology, No.43, pp.131-143.

[2] Dipti Patra, Mridula J. and Kumar K. (2011),"Combining GLCM Features and Markov Random Field Model for Colour Textured Image Segmentation", Int. Conf. on Devices and Communications (ICDeCom),pp.1-5.

[3] N. R. Pal, S. K. Pal,"A Review on Image Segmentation Techniques", Pattern Recognition, Vol. 26, No. 9, pp. 1277- 1294, 1993

[4] Farag A.A., El-Baz A. and Gimelfarb G.(2004),"Precise Image Segmentation by Iterative EM-Based Approximation of Empirical Grey Level Distributions with Linear Combinations of Gaussians", Proceedings of the 2004 IEEE Computer Society Conference on Computer Vision and Pattern Recognition Workshops (CVPRW'04).

[5] Ferri F. and Vidal E. (1992), "Colour image segmentation and labelling through multi-edit condensing ",pattern Recognition Letters, Vol.13,No.8,pp.561-568.

[6] Rahman Farnoosh, Gholamhossein Yari, Behnam Zarpak (2008), " Image Segmentation using Gaussian Mixture Models", IUST International Journal of Engineering Science, Vol. 19, No.1-2, 2008, pp.29-32.

[7] Srinivas. Y and Srinivas. K (2007), "Unsupervised image segmentation using finite doubly truncated gaussian mixture model and Hierarchical clustering", Journal of Current Science,Vol.93,No.4, pp.507-514.

[8] Srinivas Y., Srinivasa Rao K. and Prasad Reddy P.V.G.D. (2010), "Unsupervised Image segmentation Based on Finite Generalized Gaussian Mixture Model With Hierarchical Clustering, International journal for Computational vision and Biomechanics, Vol.3, No.1, pp.73-80.

[9] Sujaritha M. and Annadurai S. (2010), Color image segmentation using Adaptive Spatial Gaussian Mixture Model", International journal of signal processing 6:1, pp. 28-32.

[10] K.S.Fu and J.K Mui, A survey on image segmentation", Pattern Recognition,Vol.13, pp3-16, 1981.

[11] Gau, W. L., Buehrer, D. J., Vague sets, IEEE Transactions on Systems, Man and Cybernetics, 1993, Vol.23, No.2, pp.610-14

[12] Eskicioglu A.M. and Fisher P.S. (1995) "Image Quality Measures and their Performance", IEEE Transactions on comm.., Vol.43, No.12, pp.2959-2965.

[13] Nagesh.V, Srinivas Y, An Enhanced Medical Images Segmentation Using Skey Gaussian Mixture Model and Hierarchical Clustering Algorithm" The International Journal of Multimedia & Its Applications (IJMA), Vol 4(2), 89-99,2012.

