

Text Detection and Character Segmentation from Natural Scene Images Based Using Graph Cut Labeling

Shruthi .V¹, Sunitha. R²

1. PG student, Department of Electronics and communication, RajaRajeswari College of Engineering, Bangalore, India.
Email: shruthi.praveen@gmail.com
2. Assistant Professor, Department of Electronics and communication, RajaRajeswari College of Engineering, Bangalore, India.
Email: sunisathya18@gmail.com

Abstract: This paper presents an innovative scheme for character detection and segmentation from natural scene images professionally. In detection juncture canny edge and sobel edge is employed. To detect the edges of the text and so that it is achievable to extract only the text regions and non text regions are filtered out by using some geometric properties of text. For segmentation phase graph cut labeling technique is used for extracting characters from detective text regions rapidly.

Keywords: Scene text detection, text segmentation, Graph cut mode

I Introduction

With the extensive use of smart phone and speedy development of mobile internet it has become living style for people to confine information by using of cameras embedded in mobile terminals. Text embedded in images contains large quantities of useful semantic information which can be used to fully understand images. To extract the text from camera based natural scene images is very challenging problem due to variation in font size, style, complex background, shadows, reflection from background surface and uneven lighting circumstance.

Detection and extraction of text in images can be used in various applications. In this paper, first initiate text detection using canny edge and sobel edge detectors which are used to detect the potential edges in the images. By applying a few geometric properties of text we can remove non text regions and acquire only text regions. Secondly for extracting the characters apply the segmentation process on the text regions this can be finished by applying graph cut labeling method.

The rest of the paper is organized as follows: section I will have the introduction. Section II describes the text detection. Section III, IV briefly tells about the text localization and text segmentation. Section V defines the graph cut model and finally brief up with the conclusion.

II Text Detection

Aim of the text detection is to locate text region quickly and capably so we employ canny edge and sobel edge to identify the potential components and several geometrical features used to filter non text regions.

Canny edge : Canny edge is an edge detection operator that uses multi stage algorithm to detect a ample range of edges in images. Canny edge methods find the edges by preserving all limited maxima in the gradient images. This scheme uses double thresholding to detect well-built edges and weak edges at the edges between two thresholds noticeable as weak edges.

Sobel edge: This operator performs 2-D spatial gradient measurement on an image so emphasize region of spatial frequencies that corresponds to edges. It used two 3*3 kernels which are convolved with the original image to analyze the rough calculation of the derivatives , one for horizontal edges and one for vertical edges so that detect the edges equally in both the directions.

III Text Localization

The method of localization involves advance attractive the text regions by eliminating non text regions.

One of the property of text is that regularly all the characters appears close to each other in the image thus forming a cluster by dilation operation this probable text pixels can be clustered collectively eliminating pixels that are far from the candidate text regions. The resultant image after dilation may consists of non text regions or noise which need to be eliminated. An area based and height based filtering is accepted out for eliminating noise blobs present in the image.

IV Text Segmentation

Once the text regions are detected in natural scene images the next stage is to extract characters from the detected regions. The characters are extracted based on graph cut labeling technique. This technique differentiates between characters and non characters using which noise can be eliminated thus obtaining only characters.

V Graph Cut Labeling

Characters in the text messages can as well have wide range of forms like characters embedded in shaded textures or complex backgrounds so that the characters are alienated from the text in the detected regions accurately is very necessary. So the text is segmented in an efficient way. Later the normalized graph cut technique is applied. The basic manner used by the image segmentation is to view an image as weighted undirected graph.

$$G = (V, E) \tag{1}$$

Where V is number of nodes

E is number of edges

G is the directed graph

The nodes of the graph are the points in the potential space and an edge is form between every pair of the nodes (pixels). Weight on each edge $W = (i, j)$ is the function of the similarities between nodes i and j. A graph $G = (V, E)$ can be partitioned into two disjoint subsets A and B subjected to $A \cap B = \emptyset, A \cup B = V$ by basically removing edges connecting the two parts. The degree of dissimilarities between these pieces can be computed as entire weight f edges that have been detached. Hence it is called cut.

$$cut(A, B) = \sum_{u \in A, v \in B} W(u, v) \tag{2}$$

Optimal sub portioning of a graph is the one that minimizes this cut value. There are criterions to measure the final portioned results. The normalized cut value of a bipartition result can be defined as follows

$$Ncut(A, B) = \frac{cut(A, B)}{assoc(A, V)} + \frac{cut(A, B)}{assoc(B, V)} \tag{3}$$

Where $assoc(A, V) = \sum_{u \in A, v \in V} W(u, v) \tag{4}$

$$assoc(B, V) = \sum_{u \in B, v \in V} W(u, v) \tag{5}$$

Is the total connection from nodes in A or B to all nodes in the graph. The minimal Ncut value is just corresponding to the optimal sub partition of the graph in order to minimize the above equation. We can transform optimization problem into solving the Eigen value system.

$$D^{-1/2}(D-W) D^{-1/2}z = \lambda z \tag{6}$$

Where $D_{ii} = \sum_{j \in N} W(i, j)$ is the diagonal matrix.

W is the symmetric matrix with size of $N \times N$,

λ is the Eigen value and z is the corresponding Eigen vector. Shi and Malik (2000, pp.888-905). Have proved that second smallest Eigen vector of the Eigen system is the real value solution to the normalized cut problem. The element values in z can contain all the real number, so a threshold should be defined to two groups.

VI Implementation

In this paper graph cut labeling technique is proposed. The project was implemented using the software MATLAB R2010a. The image is resized, then the image undergoes normalization which improves the image quality. Then the canny edge and sobel edge detection which is followed by the noise elimination. Then this noise removed results are combined and the connected component related to the text are selected based on the shape statistics. These shapes defined before hand and are stored as a knowledge base. After text region regions are detected the character are extracted based on the proposed technique. This method differentiates between characters and non characters using which noise can be eliminated, thus obtaining only characters.

VII Results



(a) Original image



(b) Grey image

Figure 1: Preprocessed output



(a) Sobel edge detection (b) Canny edge detection

Figure 2: Edge detection



(a) Sobel noise removal (b) Canny noise removal

Figure 3: Noise removal



Figure 4: Added noise

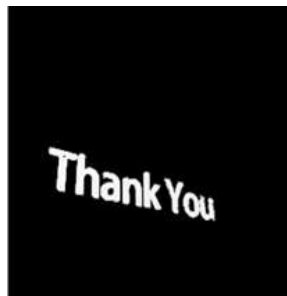


Figure 5: Dilated output

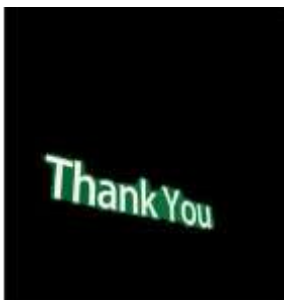


Figure 6: Segmented Image



Figure 7: Extracted characters

VIII Conclusion

In this paper the text segmentation scheme for natural image using graph cut labeling is proposed. Accurate retrieval of the texture information from the image that exists in the real environments is difficult to understand the images. The key part of the research is to receive the character from the text image area. This method resolves the issues the complexity of the background that the text built in, the convention thresholding method often cannot separate the characters from the natural background effectively. Hence the readability is increased by taking less time for extraction of the characters.

References

- [1] Xiapei Liu, Zhaoyany Lu, Jing Li, Wei Jiang "Detection & segmentation text from natural scene images based in graph model" Wseas transaction on signal processing, Volume 10, 2014.
- [2] Shi. S, and Malik. J, "Normalized cuts & image segmentation", IEEE transactions on pattern analysis & machine Intelligence, IEEE computer society, Vol. 22 [8], 2000, pp.888-905.
- [3] Epshtein, B., Ofek, E., Wexler, Y., Detecting text in natural scenes with stroke width transform. In: IEEE Computer Society Conference on Computer Vision and Pattern Recognition 2010, pp. 2963-2970.
- [4] CunzhaoShi, Chunheng Wang, Baihua Xiao etal, Scene text detection using graph model built upon maximally stable external regions, Pattern Recognition Letter, Vol. 34, 2013, pp.107-116.
- [5] Ping Zhou, Wenjun Ye, Yaojie Xia, Qi Wang " An improved canny algorithm for edge detection", Journal of computational Information systems, 2011, pp.1516-1523.
- [6] Qixiang Ye, Wengao, Qingming Hang, Automatic text segmentation from complex background, Proceedings of 2004 International Conference on Image Processing. Washington DC: IEEE Computer Society, 2004, pp.2905-2908.
- [7] Parvathy Raghunandan, John Livingston S, "A Review on various Graph Cut based image Segmentation schemes", International journal of advanced in engineering science and Technology, Volume 2, No.3.
- [8] Mr. Manoj K. Vairalkar, Prof. S.V. Nimbharkar, "Edge detection of images using Sobel operator", International Journal of Emerging Technology & advanced Engineering, Volume 2, 2012.
- [9] P. Felzenszwalb and D. Huttenlocher. Image segmentation using local variation. Proceedings of IEEE Conference on Computer Vision and Pattern Recognition, pages 98-104, 1998.
- [10] F. Sun, J. He, " A Normalized Cuts Based Image Segmentation Method," 2009 Second International Conference on Information and Computing Science
- [11] C. Pantofaru, M. Hebert, A comparison of image segmentation algorithms, Tech. Rep. CMU-RI-TR-05-40, CMU (2005). 2, 14
- [12] E. Sharon, M. Galun, D. Sharon, R. Basri, and A. Brandt, "Hierarchy and adaptivity in segmenting

visual scenes,” Nature, vol. 442, no. 7104, pp. 810–813, 2006.

- [13] F. Sun, J. He, “The Remote-Sensing Image Segmentation Using Textons In The Normalized Cuts Framework,” Proceedings of the 2009 IEEE International Conference on Mechatronics and Automation, August 9 - 12, Changchun, China.
- [14] F. Sun, J. He, ” A Normalized Cuts Based Image Segmentation Method,” 2009 Second International Conference on Information and Computing Science
- [15] Dr.N.Krishnan , C. Nelson Kennedy Babu , S.Ravi and Josphine Thavamani, “Segmentation Of Text From Compound Images”- Preceding of International Conference on Computational Intelligence and Multimedia Applications -[2007]
- [16] Sezer Karaoglu, Basura Fernando, Alain Trémeau “A Novel Algorithm for Text Detection and Localization in Natural Scene Images” -[2010]