ISSN: 2278 – 909X
International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE)
Volume 4, Issue 5, May 2015

# Performance Analysis of Image Co Segmentation for Reduced Error Rate and Time Cost

**Virupakshappa B Biradar**
*PG Research Scholar*
*VLSI Design and Embedded Systems*

**Jayaramaiah G V**
*Professor, Dept. ECE*
*Dr. AIT, Bengaluru.*

*Department of Electronics and Communication,*
*Dr.Ambedkar Institute of Technology Bengaluru-56*

***Abstract*:** The analysis of fast and efficient co-segmentation algorithm is challenging due to the variety and complexities of the images and objects. In this paper we developed efficient co-segmentation algorithm by using countering concept and color reward strategy. Foreground similarity is defined by color reward strategy and background consistency is known with the help of countering concept. The performance is estimated in terms of error rate and time cost and analysis is done on many commonly used image data bases.The experimental results of proposed work demonstrate that the work can efficiently do segmentation of common objects in multiple images with lower error rates than existing co-segmentation algorithms. The tool used for simulation is on version Matlab 2013a.

***Index terms*** - Co segmentation, time cost, reward strategy, error rate.

## I. INTRODUCTION

The objective of all image processing operations is to get a better recognition of objects of interest i.e., identifying suitable features that can be distinguished objects from back ground this process is called as image segmentation and the result is binary image. Image segmentation is very popular image processing operation and finds many applications such as machine vision, video surveillance, medical imaging, recognition tasks etc. Segmentation is middle layer image processing operation comes under image analysis as shown in below figure.

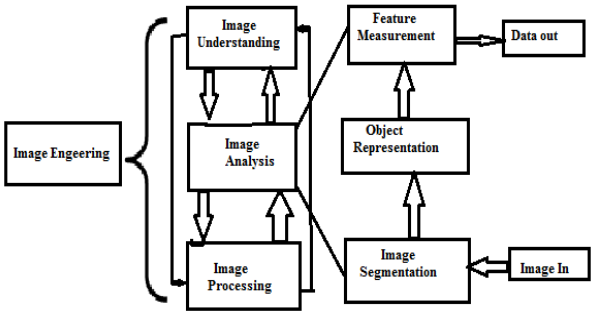


Fig.1 Image segmentation in Image processing block diagram

Segmentation algorithms basically classified based discontinuity and similarity measures. Discontinuity means sudden change in image intensity value and similarity means portioning images into same pixel value regions. The methods of single image based segmentation methods are not advantageous as compared with image co-segmentation. Image co-segmentation is used to segment multiple images and it is now a day's researcher's interested topic. The common object image segmentation from multiple images is convenient in terms of user interaction and can achieve precise segmentation results as compared with single image based segmentation method.

We now briefly summarize the topics of the remainder of this paper. In section II, we discuss about the previous work done co segmentation algorithms. Section III incorporates proposed algorithm. Simulation results are provided in Section IV to prove the proposed model. Section V includes conclusion of this paper. Finally, Section VI tells the future work to be carried out based on this paper.

## II. PREVIUOS WORK

Several Co-segmentation methods have been proposed in the past few years such as MRF based co-segmentation method [1], discriminative clustering based co-segmentation. The objective of MRF based co segmentation is how to measure foreground similarity but with this optimization of energy function is a big problem. In the MRF based co-segmentation method, the similarity measurements are Boykov-Jolly model, reward model, L1 norm, L2 norm. Along with MRF based co-segmentation method, discriminative clustering [2] and spectral clustering methods were combined to segment objects. In MRF based co segmentation method we found that the performance evaluation is done only with initial pixels not seed pixels, here author used only reward strategy. This method results unsuccessful segmentation for database images Kim, Ilama. Image co-segmentation via active countor method [3] will not support for region features such as shape, texture and with this multiple image based segmentation is not possible.

In discriminative clustering method the image co-

segmentation results in increased error rates, and it is time consuming task. With shape based mutual co-segmentation method [4] shape similarity is affected by shape variations of pose, scale, rotation. This method [4] leads to unsuccessful segmentation for image databases like duck, cddoga.

## III. PROPOSED WORK

In this section, the detailed analysis of proposed model is discussed. The co-segmentation process mainly depends on energy function and then it is optimized for better results. The flowchart shown here will describe the proposed model.

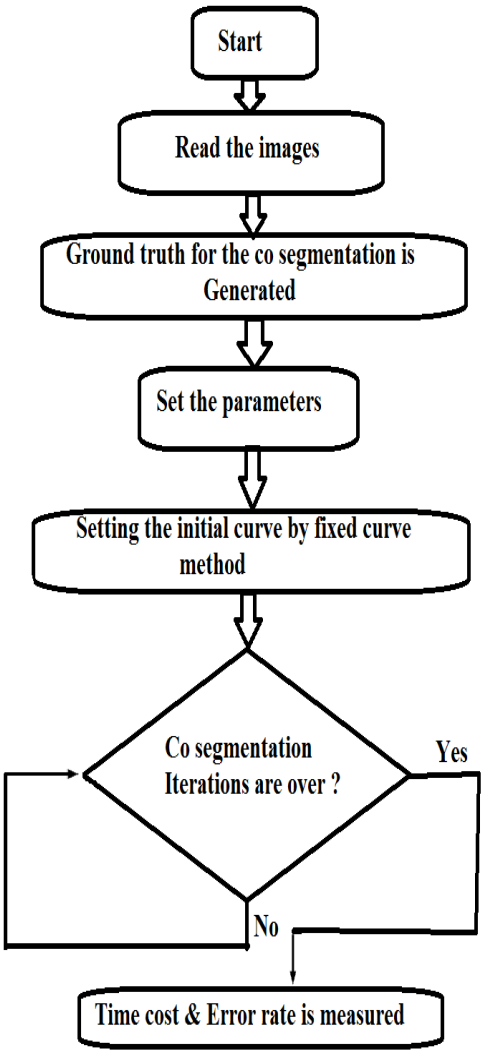


Fig.2 Flow diagram of proposed model

After reading input image pairs the ground truth masks are generated. The parameters are set to get better results and setting the initial curve is done by fixed curve method because this method is simple in terms of time complexity. The proposed model mainly depends on four aspects such as energy function, region representation, foreground similarity measurement and analysis of energy function. Each time co segmentation function is called to fit the object boundary and the number of iteration depends on the complexity of images. Here the author resized image pairs before doing co segmentation so that the performance of the algorithm is better. Finally the error rate and time cost is evaluated for all the image pairs.

### Energy Function

In region based method the regions are defined as energy functions. The energy function is calculated using curve integrals. The energy function for the curve is defined as

$$E_k(C_k) = \mu.Length(C_k) + v.\mathrm{Area}(w_k^i) - \lambda_k^i \int_{w_k^i} f[I_k(x,y), g(w_{1-k}^i,)]dxdy - \lambda_k^o \int_{w_k^i} f[I_k(x,y), g(w_{1-k}^o,)]dxdy$$

Where $I_k(x,y)$kth image of image pair is $C_k$ denotes the curve in the image. The first and second terms represents length, area of region curve which is calculated using entropy based operations.

### Region Representation

For region representation color histogram is defined as i.e., g (w) = h. Basically histogram is occurrence of number of gray levels in an image and a histogram is generated by considering the probability of each colour's occurrence in the region. So that this histogram operation will visually classify the objects in an image.

### Foreground similarity measurement

Similarity measurement is very important task with respect to segmenting objects from complex image pairs. Here if the object has large pixel value then we will say that foreground similarity is better and the difference between the pixel values give boundary for the object. Foreground similarity is done as follows

$$F(p, g(w)) = \sum_{|p'-p|\leq p} h(p')$$

Where $|p' - p|$ denotes the distance between two pixel color values p' and p.

### Analysis of Energy Function

In order to analyse the proposed energy function we assume that only the common objects in two images have the same color. The curve energy is minimum when the curve accurately separates common objects from images. Otherwise, the curve energy increases. The optimization of energy function is done to reduce the error rate whereas a little increases in time complexity.

## IV. SIMULATION RESULTS

The simulation is done using image database i.e., Microsoft Cambridge image databases and 256 object categories. During the simulation process we first define the initial curve using fixed or dynamic method. The level set is used to define curve as rectangle i.e., considering boundary pixels of image pair. The fixed initial curve method is simple but bit error rate is compromising with dynamic based curve setting method.

Fig.3 (a) Image pairs (b) Ground truth masks

We selected Image pairs from image database i.e., Stone, Pvocmota, Amira, Kim, Iiama image pairs as shown in fig.3 (a). In order to perform co segmentation we generated ground truth masks for the respective database images which are shown in fig.3 (b) respectively.

The simulation is carried with number of iterations as 300 and it can vary based on the complexity of image pairs like natural images. The parameters are set before simulation as alpha1=0.0001 for curvature, iter= [300], i.e. number of iteration, width= 1.2 for levet set band determination, alpha2=15 for color band, delt=5 for initial curve respectively. After that the parameters are saved for comparison. Before doing co segmentation each image is resized from 128x128 to 64x64 to get better performance in terms of error rate and time cost.

Fig.4 Segmented image pairs

We verified that the proposed algorithm will result more accurate segmentation when compared with conventional methods. After the co-segmentation process the error rate is calculated. The error rate of an image is the ratio of the number of in correct pixels to the total number of pixels in the original image. A low error rate indicates accurate co-segmentation. The segmented image pairs are shown as in fig.4. The objects are extracted as shown with red color curve.

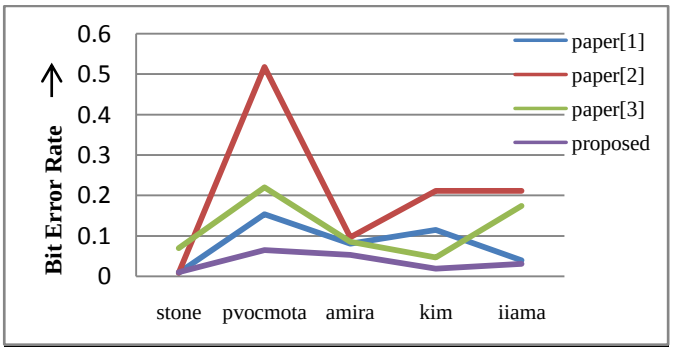


Fig.5 Bit error rates plotted for image data bases

The graph is drawn as bit error rate verses each image pair and we observed from the as the bit error rate is lower compared to previous methods as shown in above fig.5.

## V. CONCLUSION

In this paper, the proposed model is an efficient co segmentation algorithm to segment common objects from multiple images. Here the proposed model includes energy function by considering foreground similarity and the background consistency. To represent a region a color histogram is used for RGB color co-ordinate values. Countering concept is helpful for defining curve. The Mat lab simulation results demonstrate that the proposed model can efficiently segment the objects from the image pairs with reduced error rates than traditional co segmentation methods.

## VI. FUTURE WORK

In the future we will further reduce error rate and time cost to do co segmentation. And also we will other region features. Planned to implement this co segmentation algorithm on FPGA board.

## REFERENCES

[1]. Joulin, F. Bach, and J. Ponce, "Discriminative clustering for image co-segmentation," in *IEEE Conference on Computer Vision and Pattern Recognition*, 2010, pp. 1943–1950.

[2]. D. S. Hochbaum and V. Singh, "An efficient algorithm for co-segmentation," in *International Conference on Computer Vision*, 2009, pp. 269–276.

[3]. F. Meng, Guangghui Liu, "Image co segmentation via active counters", in IEEE conference on image processing, 2012, pp. 2773-2776.

[4]. T. Riklin-Raviv, N. Sochen, and N. Kiryati,"Shape based mutual segmentation, *International Journal of Computer Vision*,vol. 79, no. 3, pp. 231–245, 2008.

[5]. http://research.microsoft.com/enus/downloads/imag edata bases.

Mr. Virupakshappa B Biradar received the B E Degree in Electronics and Communication from VTU Belagavi in 2012.He is currently Second year M Tech student of VLSI Design and Embedded systems in Dr. AIT Bangalore.

He Presented Paper in National level conference. He delivered Guest lectures on different points related to image processing. His research area of interest is in image processing application and image segmentation. Now focussing on Implementation of image segmentation algorithms on FPGA Board.

Dr. Jayaramaiah G V is presently professor and Head of department in Electronics and Communication in Dr Ambedkar Institute of Technology Bengaluru. He completed his Ph. D from IIT Bombay.

He has teaching experience of 24 years. He has submitted many papers in international journals and conferences. His area of expertise is Power electronics, Energy harvesting, Renewable energy sources, Digital image processing and Embedded systems.