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Image Segmentation using Ant Colony Optimization and to Improved the Selection of Poor Segmentation

Pardeep Kaur[1] , Er. Neetu Gupta[2]

[1]Research Scholar (M.Tech), ECE
Global Institute of Management & Emerging Technologies, Amritsar
pardeepbhullar95@gmail.com
[2]Asst. Professor, ECE
Global Institute of Management & Emerging Technologies, Amritsar

Abstract: *Thresholding plays an important role in image segmentation. Thresholding is used to determine an optimal threshold for the image. The GA guarantees the local optimization but not guarantees the global optimization, the overall result depends on the selection of poor population may leads for poor segmentation. In this paper firstly, to overcome the limitation of the GA based on the multilevel thresholding, in near future so we used Ant Colony Optimization. To evaluate the performance of proposed technique by using different types of images. Secondly to obtain the results of mean square error (MSE) and peak signal to noise ratio (PSNR) by using different images for applying GA and ACO technique then these results are compared with those obtained by using genetic algorithm based context sensitive technique. From experimental result, ACO is better than GA.*

Keywords: *Thresholding, Image segmentation, Ant colony optimization, Genetic algorithm.*

1. INTRODUCTION

Image segmentation is a very important part in digital image processing. Image segmentation is used to divide image into different segment and separate regions. The outcome of image segmentation is a collection of segments that mutually enclose the whole image, or a group of contours extracted from the image. Image segmentation can be divided into different methods. For example: Compression based methods propose that the best segmentation is the one that minimizes the general probable segmentations and the coding length of the data. Histogram-based methods are extremely well-organized as evaluate to additional segmentation techniques since they normally want only single exceed in the course of the pixels. In this method, a histogram is figured from all of the pixels in the image, and the peaks and valleys in the histogram are used to establish the clusters in the image. Edge detection is a strong field on its own inside image processing. Region boundaries and edges are directly connected, because there is frequently a quick adjustment in strength at the area boundaries. Thresholding is also major part of image segmentation. It is used to convert grey scale image into binary image. The way of this process is to choose the threshold value once multiple-levels are chosen. An image is assumed to be divided into two parts: foreground and background. The interesting objects in the image are a foreground and the rest is a background. Hachemi Guerrout method [2] is demonstrates its robustness and resistance to noise by using HMRF-PSO method over threshold based techniques. Y. Liang, Leung [4] describe genetic algorithm with adaptive elitist- population strategies for multimodal function optimization. L.K. Huang, M.J.J. Wang [6], describe thresholding technique with adaptive window selection for uneven lighting image. Cheng, Jiang, Wang method [7] describe color image segmentation based on homogram thresholding and region merging. Maulik method [8] proposed genetic algorithm- based clustering technique. Chang method [10] introduce a fast multilevel thresholding method based on low pass and high pass filter. To improve the selection of poor population may leads for poor segmentation in multilevel thresholding, we pick an image and apply ACO segmentation then image can be divided into R, G and B channel. The next step apply adaptive threshold on red, green and blue channel . Then apply morphological operation and convolution operation . After these operation we have given three value i.e. 100 means threshold value, 255 means the image is white and 0 means the image is black then the final image can be show. Now apply ACO operation, ACO finds approximate solution to difficult optimization problem. After complete these operation ACO find a best solution. The rest of this paper is organized as follows. The proposed technique is presented in section "Proposed method". Section "Experimental results" provide the detailed description of experimental settings and obtained on the considered images. Finally, Section "Conclusion" draws the conclusion of this work.

2. PROPOSED METHOD

Multilevel thresholds selection process using genetic algorithm provide not sufficient results. To migrate these problem by using ant colony optimization. The basic steps of ACO, also followed in the thresholds selection, are now described in detail.

An ant colony is highly organized, in which one interacting with others through pheromone in perfect harmony. Optimization problems can be solved through simulating ant's behaviors. Since the first ant system algorithm was proposed, there is a lot of development in ACO. In ant colony system algorithm, local pheromone is used for ants to search optimum result. The principle of ant colony system algorithm is that a special chemical trail (pheromone) is left on the ground during their trips, which guides the other ants towards the target

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WINGS TO YOUR THOUGHTS.....

solution. More pheromone is left when more ants go through the trip, which improved the probability of other's ants choosing this trip. Furthermore, this chemical trail (pheromone) has a decreasing action over time because of evaporation of trail. In addition, the quantity left by ants depends on the number of ants using this trail. To find the shortest way between the colony and a source of food, ants adopt a particular collective organization technique. The Ant Colony Optimization algorithm (ACO) is a technique, can be applied to any optimization problems. It helps to find good and shortest path through pheromone trial updating. It is used to solve both static and dynamic optimization problem [10]. Ants are capable of finding the shortest route between a food source and their nest without the use of visual information and hence possess no global world model, adapting to changes in the environment. The probability that an ant chooses one path over another is governed by the amount of pheromone on the potential path of interest. With time, the amount of pheromone on a path evaporates. But the ants taking the shorter path will return to the nest first with food. The shorter pathway will have the most pheromone because the path has fresh pheromone and has not yet evaporated, and will be more attractive to those ants that return to the food source. This probability (although small) allows for exploration of other trails, which is beneficial because it allows discovery of shorter or alternate pathways, or new sources of food. Given that the pheromone trail evaporates over time, the trail will become less detectable on longer trails, since these trails take more time to traverse. The longer trails will hence be less attractive, which benefit to the colony as a whole.

2.1 Algorithm for ACO

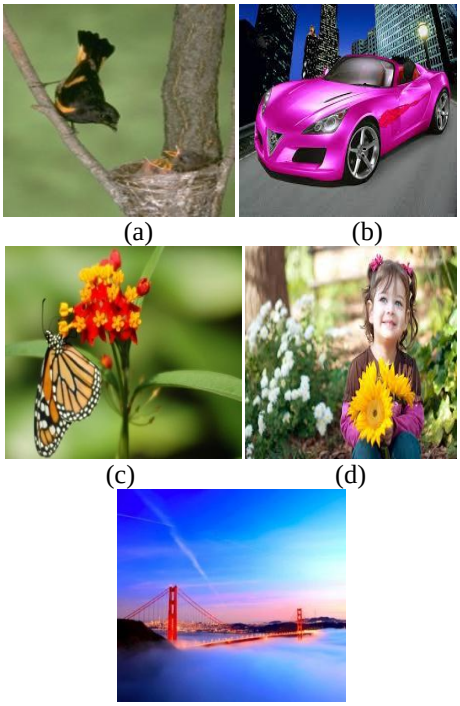
1. Ant traverse around the colony to find the food source
2. After finding the food source it returns to nest.
3. While travelling it deposit some amount of pheromone.
4. The followers of the first ant follow the pheromones which left by the first ant.
5. This transaction will make strengthen the deposition of the pheromone.
6. This strengthens the route of the ant in mean time the amount of pheromone will evaporate in each traversal.
7. If there are two routes to reach the same food source the ant find the shortest route between food and nest with the help of pheromone updating.

3. EXPERIMENTAL RESULTS

Experimental study provides an evidence of the effectiveness of the proposed technique. Below we analyzed the results.

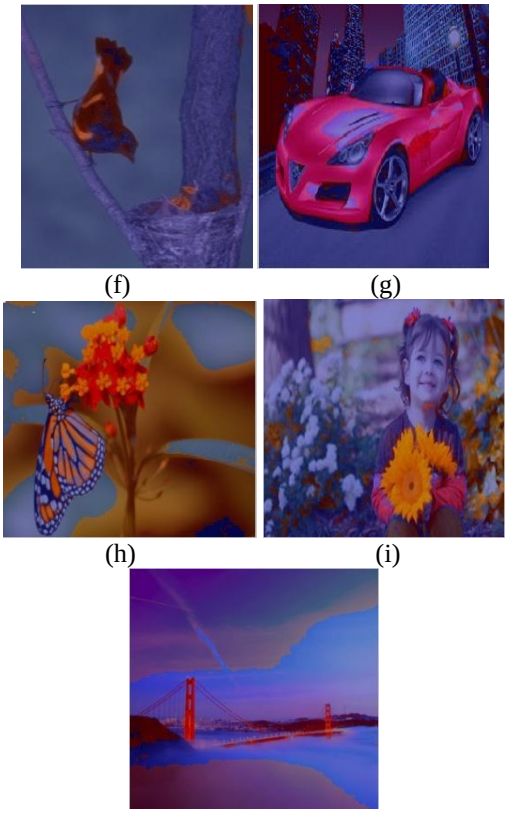
3.1 Analysis of results

In the present experiment five different images is used for the experimental validation. Fig. 1(a-e) shows the original images. And Fig. 2 shows the results by applying multilevel genetic algorithm and Fig. 3 shows the results by ant colony optimization technique. From these segmented images one can see that ACO technique result is better than genetic algorithm.



(a) (b) (c) (d) (e)

Figure1: Original images (a, b, c, d, e)



(f) (g) (h) (i) (j)

Figure 2: Result of segmented images using GA method (f, g, h, I, j)

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(k)


(l)


(m)


(n)

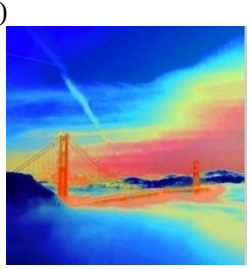
(o)

Figure 3: Result of segmented images using ACO method: (k, l, m, n, o)

3.2 Tables

Table 1: Mean Square Error

Input image	GA technique	ACO technique
1.	47.9585	52.7273
2.	48.7365	51.7936
3.	46.8625	51.8042
4.	47.8981	54.0590
5.	46.8170	51.8346

Table 2: Peak Signal to Noise Ratio

Input image	GA technique	ACO technique
1.	47.9585	52.7273
2.	48.7365	51.7936
3.	46.8625	51.8042
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5.	46.8170	51.8346

Table 1 represents the results obtained by using GA and ACO techniques. From the table show that mean square error is minimum in case of ACO. Table 2 represents the results obtained by using GA and ACO techniques. From the table show that peak signal to noise ratio is maximum in case of ACO. From Fig. 5, show the error rate which signifies in case of GA the error is maximum but when we apply ACO the error rate is minimum.

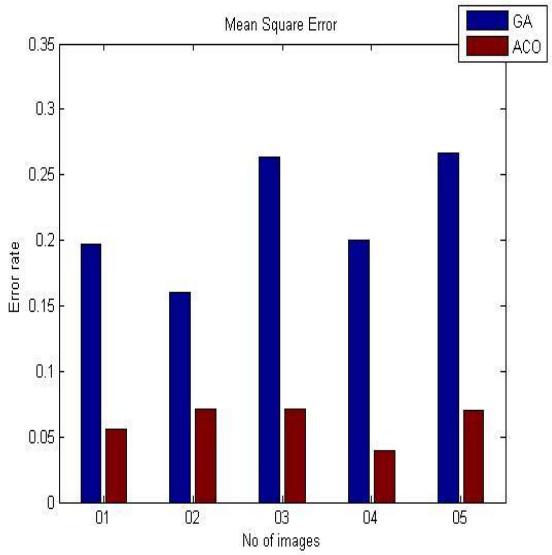

Figure 4: Mean Square Error Graph

Fig.5 depicts the peak signal to noise ratio. This graph clearly shows that PSNR of ACO is better than GA.

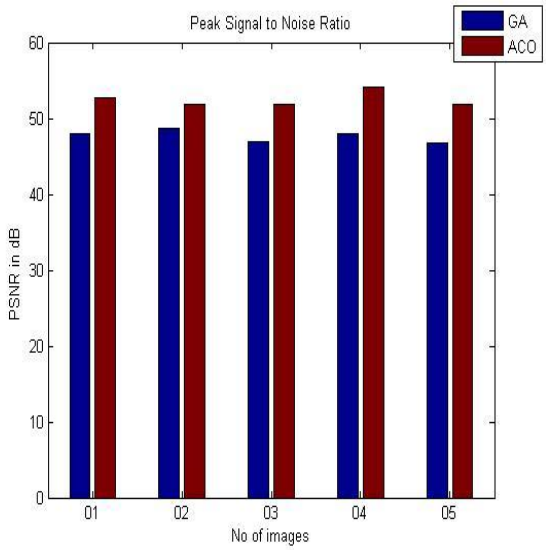

Figure 5: Peak Signal to Noise Ratio Graph

4. CONCLUSION

In this paper firstly we used different images to improve the selection of poor segmentation by using ant colony optimization and secondly to calculate the value of parameter MSE and PSNR. This parameter clearly shows that the error is less than GA and psnr is also better than GA. To empirically assess the effectiveness of the ACO method, we compared it with GA method. In this comparison, we observed that the ACO method provided better results as compared to the GA techniques.

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References

[1] S. Patra, "A novel context sensitive multilevel thresholding for Image segmentation", Applied Soft Computing 23 (2014) 122- 127.

[2] E1- Hachemi Guerrout, "HMRF and PSO: a Winning Combination in Image Segmentation", IERI Procedia 10 (2014) 19- 24.

[3] Beauchemin, M. "Image thresholding based on semi variance". Pattern Recognition Letters, 34(5) (2013) 456- 462.

[4] Y. Liang, K- S. Leung,'' Genetic algorithm with adaptive elitist- population strategies for multimodal function optimization", Appl. Soft Comput. 11 (2) (2011) 2017- 2034.

[5] S. Patra, S. Ghosh,'' Histrogram thresholding for unsupervised change detection of remote sensing images", Int. J. Remote Sens. 32 (21) (2011) 6071- 6089.

[6] L. K. Huang, M. J. J. Wang,'' Thresholding technique with adapative window selection for uneven lighting image", Pattern Recogn. Lett. 26 (2005) 801- 808.

[7] H.D. Cheng, X.H. Jiang, J. Wang,'' Color image segmentation based on homogram thresholding and region merging", Pattern Recogn. 35 (2002) 373-393.

[8] U. Maulik, S. Bandyopadhyay,'' Genetic algorithm-based clustering technique"e, Pattern Recogn. 33 (2000) 1455-1965

[9] S. k. Pal, D. Dutta Majumder, ''Fuzzy Mathematical Approach to Pattern Recognition", John Wiley, Halsted Press, New York, 1986.

[10] C. C. Chang. L. L. WANG, ''Afast multilevel thresholding method based on lowpass and highpass filter", Pattern Recogn. Lett. 18 (1997) 1469-1478.