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Efficient Improved K means Clustering for Image Segmentation

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ABSTRACT: Image segmentation is the most commonly used method. It divides an image into number of different regions such that all pixels are similar to each other in one region. Different types of clustering are used for segmentation eg. K-means clustering, fuzzy C-mean clustering, subtractive clustering etc. In this paper, we proposed improved clustering technique to minimize the time complexity with the same PSNR. The proposed approach is implemented in MATLAB and validate with the recent image segmentation approach based on PSNR and time complexity as performance metric.

KEYWORDS: image segmentation, clustering, k-means, PSNR, time complexity.

I. INTRODUCTION

Image segmentation is one of the most commonly used method that divide an image into a number of discrete region in such a way that pixels are similar in one region and high contrast between regions. For this different type of clustering are used:- K-means, fuzzy c-means, subtractive clustering method [1]. The classification of image segmentation technique based on the performance of edge detection, threshold, region detection etc. clustering also provides a number of clusters and the locations of cluster centroid, this plays a very important role in image segmentation [5]. Hence image segmentation involves K-means clustering algorithm [13-15] to predict the number of clusters and the location of cluster centroid.

II. RELATED WORK

Many works has been done in the area of image segmentation by using different clustering methods. K-means is one of the simplest clustering algorithms. **Pallavi Purohit and Ritesh Joshi** et. all [2] introduced a new method for K-means clustering generating a cluster center by reducing the mean square error of final cluster without large increment in execution time. **Madhu Yedla, Srinivasa Rao Pathakota, T.M. Srinivasa** et. all [3] proposed enhancing K-means clustering algorithm with improved initial center. They introduced a new method for finding initial centroid and efficiently assign data points to suitable cluster with reduced time complexity. Their proposed algorithm has more accuracy with less computational time as compared to original K-means clustering algorithm**. K.A. Abdul Nazeer, M.P. Sebastian** et. all [4] proposed algorithm to improve accuracy and efficiency of K-means clustering algorithm. Their proposal algorithm combines a systematic method consisting two approaches. First one is finding the initial centroid and another is assigning data to clusters. They conclude that their proposed algorithm reduced the time complexity without sacrificing the accuracy of cluster. **Nameirakpam Dhanachadra, Khumanthem Manglam** et. all [1] proposed algorithm to improve K-means using subtractive clustering and median filter. They observe the RMSE and PSNR value of different images and comparison done between proposed and existing algorithm and found that proposed method have better performance result. **Keh-Shih Chuang, Hong-Long Tzeng, Chen** et. all [8] proposed a FCM algorithm that incorporate spatial information into the membership function to improve segmentation result. The new method was tested on MRI image and evaluate by using various cluster validity function. **Mei Yeen Choong, Wei Yeang Kow, Yit Kwong Chin** et. all [9] proposed segmentation on synthetic image and natural image to study the complexity of image. Two stages image segmentation implemented to help reducing unnecessary image segmentation in particular region instead of performing segmentation on whole image. **Daniel Gomez, Javier Yanez, Carely Gauda** et. all [10] introduced the concept of fuzzy image segmentation. They provide an algorithm to build fuzzy boundaries

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based on existing relation between fuzzy boundary set problem and hierarchical image segmentation problem. **V.Kalist, Genesan P, B.S. Satshish** et. all [11] proposed a possibilistic fuzzy c-mean based segmentation of satellite images. PFCM resolve noise sensitivity problem of FCM. **Feng Zhao, Jiulun Fan** et. all [12] proposed a spatial fuzzy clustering algorithm applied to synthetic and real images contaminated by Noise and compared with K-means, fuzzy c-mean. Result shows that proposed method behaves well in evolving number of clusters. Ms**. S.S Adagale, Ms. S.S. Pawar** et. all [7] proposed and algorithm that is the combination of PCNN and Template Matching Algorithm to segment and count overlapped red blood cell images. Proposed algorithm performed better on overlapped red blood cell images in comparison with existing system.

III. PROPOSED WORK

Segmentation:-

1. Read the images that are in RGB color format.
2. Convert the images from RGB to Lab format.
3. Reshape the image into a two dimensional matrix. As the original image data is in the form of three dimensional matrixes. So before performing segmentation convert it into a two dimensional matrix.
4. Apply clustering technique on the above 2-D matrix of image. Improved K-means clustering used that make three clusters of image data as we have three colors in image.
5. On the basis of these three clusters image is divided into 3 segments. Each segment shows 1 color highlighted in the image. 3 segments are shown in three different images.

Clustering:- Clustering technique is used to make cluster of image data or divide the image into different parts on the basis of similarity between pixels. We use improved K-means clustering in our proposed work to segment an image.

- **Phase 1: Center prediction:-**
  In clustering first thing done is to predict the center that is used to make the clusters. Center prediction plays very important role in improving segmentation technique. In the improved K-means clustering center prediction is different from original k-means.
  Following steps are performed for center prediction in improved K-means

I. The original image data is converted into a two dimensional matrix.
II. Sort image data matrix in ascending order
III. Divide the whole sorted image data into 3 parts.
IV. Find the mean of each part and that mean value became the centroid for respective cluster. This approach for center prediction is very time efficient as compared to original K-means clustering or subtractive clustering.

- **Phase 2: Prepare Cluster**
- Steps:
- 1. Compute the distance of each data-point *di* (1<=i<=n) to
- all the centroids *cj* (1<=j<=k) as *d(di, cj)*;
- 2. For each data-point *di*, find the closest centroid *cj* and
- assign *di* to cluster *j*.
- 3. Set ClusterId[i]=j; // j:Id of the closest cluster
- 4. Set Nearest_Dist[i]= *d(di, cj)*;
- 5. For each cluster *j* (1<=j<=k), recalculate the centroids;
- **6. Repeat**
- 7. For each data-point *di*,
- 7.1 Compute its distance from the centroid of the
- present nearest cluster;
- 7.2 If this distance is less than or equal to the present
- nearest distance, the data-point stays in the cluster;
- Else
- 7.2.1 For every centroid *cj* (1<=j<=k)
- Compute the distance *d(di, cj)*;
- Endfor;

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- 7.2.2 Assign the data-point *di* to the cluster with
- the nearest centroid *cj*
- 7.2.3 Set ClusterId[i]=j;
- 7.2.4 Set Nearest_Dist[i]= *d(di, cj)*;
- Endfor;
- 8. For each cluster *j* (1<=j<=k), recalculate the centroids;
- **Until** not center updation

IV. EXPERIMENT

We have validated our result on the machine with the configuration of installed memory (RAM 2GB), 3-Bit Operating System, having processor Intel(R) Core™ i3-2330 M CPU @ 2.20 GHz. Images are gathered by online surfing eg. Leena, Barbara, Parrot, house with the resolution of 256x256.

To validate our result we compare our proposed algorithm with the existing algorithm [1].

(a)

(b)

(c)

(d)

(e)

(a) – (e) original images in RGB format on which segmentation is to be performed.

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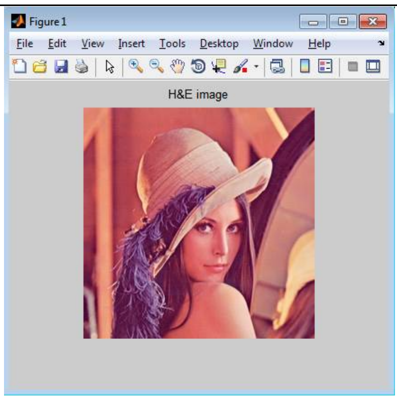
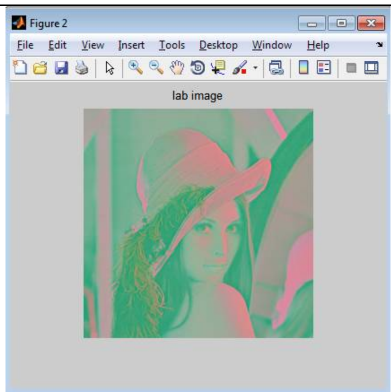
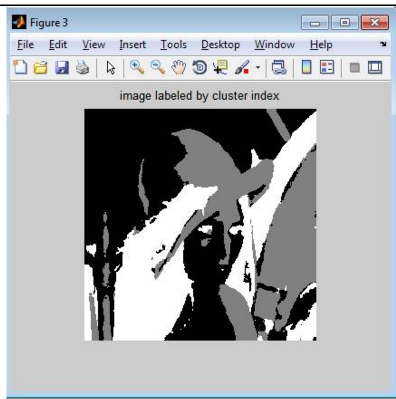


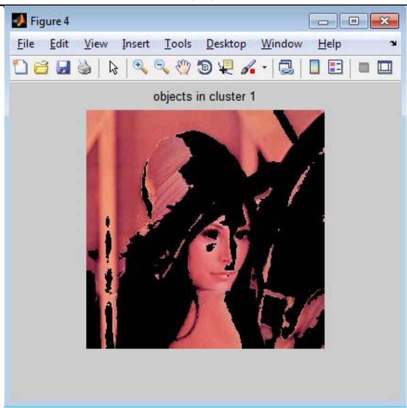
(a)



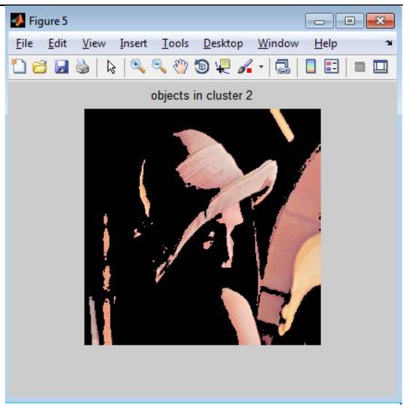
(b)



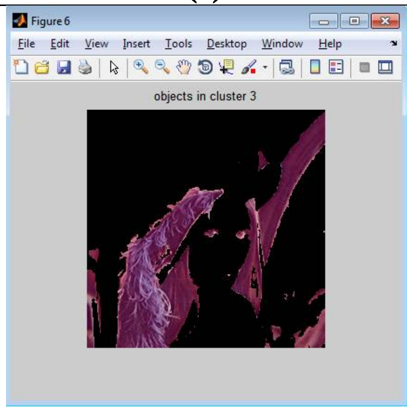
(c)



(d)



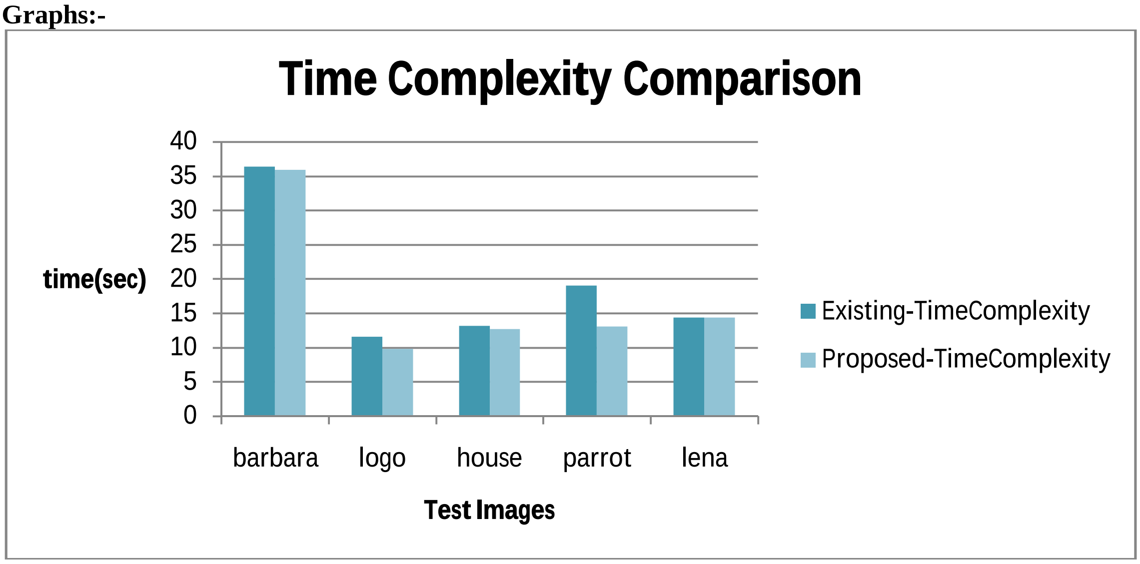
(e)



(f)

(a) original image in RGB color format; (b) image converted into lab color format; (c)
(d) segment of cluster 1; (e) segment of cluster 2; (f) segment of cluster 3

Graphs:-



a) this graph shows the reduced time complexity of different images between existing and proposed algorithm

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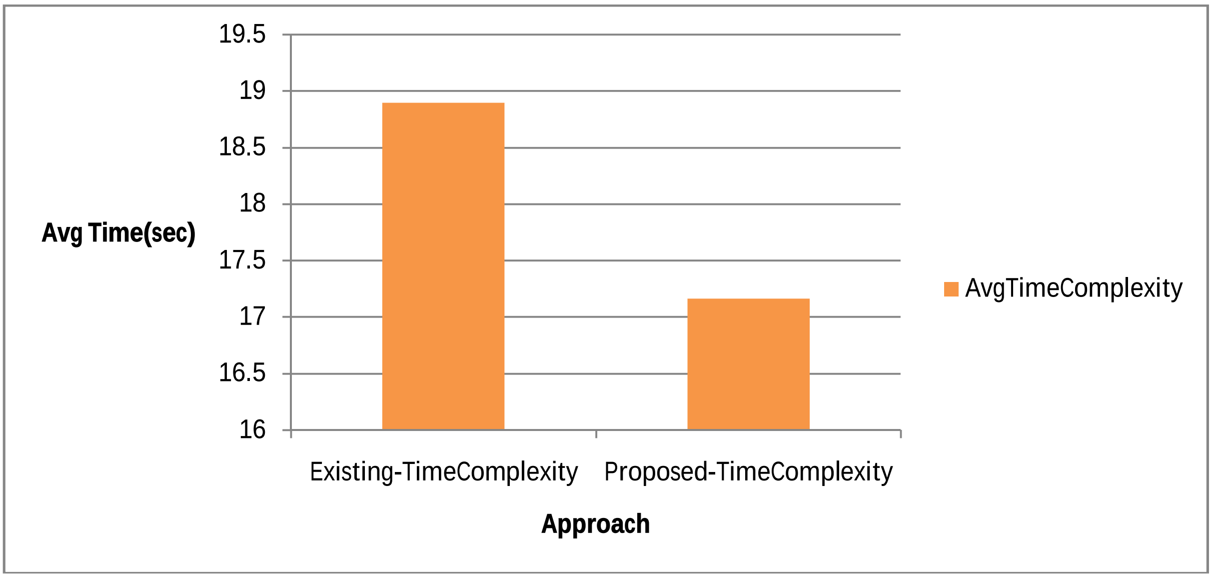

(b) average time complexity between existing and proposed algorithms

V. CONCLUSION

The proposed validated with the existing algorithm. We concluded that the proposed algorithm perform better than the existing algorithm with the average time difference of 1.73. Image segmentation an improve with the improved time complexity. In future concern other technology can also be implemented using the proposed algorithm PSNR rate and time complexity can be improved simultaneously. Some clustering can be used on other type of segmentation technology eg. Texture base segmentation or shape based segmentation.

REFERENCES

1. Nameirakpam dhanachandra, Khumanthem manglam," image segmentation using k-means clustering algorithm and subtractive clustering algorithm". 11th international multi-conference on information processing-2015(IMCIP-2015.
2. Pallavi Purohit and Ritesh Joshi, "A new effiecient approach towards k-means cluste4ring algorithm", In International Journal of Computer Applications, (0975-8887), vol. 65 no 11 march 2013.
3. Madhu Yedla, Srinivasa Rao Pathakota, Enhanced k-means clustering algorithm with improved initial center, In International Journal of Science and Information Technologies, vol. 1(2), pp. 121-125 (2010).
4. K.A. Abdul Nazeer, M.P. Sebestian, Improving the efficiency of the k-means Clustering algorithm, In Proceedings of the World Congress on engineering, London, WCE, vol. 1, July (2001).
5. Arti Taneja, Dr. Priya Ranjan, "A Performance Study On Image Segmentation Technique", IEEE 2015.
6. H. Narkhede, "Review of image segmentation techniques," *Int. J. Sci. Mod. Eng,* vol. 1, p. 28, 2013.
7. Ms. S.S. Adagale, Ms. S.S. Pawar, "image segmentation using PCNN and template matching for blood cell counting." 2013 IEEE international conference on computational intelligence and computing research.
8. Keh-Shih Chaung, Hong-Long Tzeng, Sharon(2006)," Fuzzy C-means clustering with spatial information for image segmentation."
9. Mei Yean Choong, Wei Yeang Kow, Yit Kwong Chin, " image segmentation via normalized cuts and clustering algorithm." 2012 IEEE international conference on control system.
10. Danial Gomez, Javier Yanez, Carely Gauda," Fuzzy image segmentation based upon hierarchical clustering". Knowledge based system(2015).
11. V.Kalist, Ganesan P, B.S.Sathish, " Possiblistic-Fuzzy C-Means Clustering Approach for the Segmentation of Satellite Images in HSL Color Space", 3rd International Conference on Recent Trends in Computing 2015 (ICRTC-2015).
12. Feng Zhaoa, Hanqiang Liub, Jiulun Fana," A multi objective spatial fuzzy clustering algorithm for image segmentation". ScienceDirect (2015).
13. L. Galluccio, O. Michel, P. Comon, and A. O. Hero, "Graph based k-means clustering," Signal Processing, vol. 92, pp. 1970-1984, 2012.
14. J. Selvakumar, A. Lakshmi, and T. Arivoli, "Brain tumor segmentation and its area calculation in brain MR images using Kmean clustering and Fuzzy C-mean algorithm," in International Conference on Advances in Engineering, Science and Management (ICAESM), 2012 2012, pp. 186-190.
15. I. A. Yusoff, N. A. M. Isa, and K. Hasikin, "Automated two dimensional K-means clustering algorithm for unsupervised image segmentation," Computers & Electrical Engineering, vol. 39, pp. 907-917, 2013.