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Image Segmentation Using Modified K- Means Algorithm and JSEG Method

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Abstract: **Image segmentation is one of the important tasks in modern era. Traditional image segmentation techniques make use of conventional methods of clustering which suffers from problems. First problem is over segmentation which degrades the quality of the image. Moreover, parameter estimation is a big problem in traditional segmentation techniques. A new technique called JSEG is proposed towards this goal. This approach does not tend to apply to a specific model. Further some; it is used to test the homogeneity of the color pattern in regions in images. In this paper, JSEG along with enhanced clustering method called Modified K means clustering is presented. It has been investigated that the method is quite computationally feasible. Matlab software is used for simulation along with image processing toolbox**
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Keywords**:** Jseg, modified K means, clustering, Region Growing, Windows, Quantization.

I. INTRODUCTION

Image segmentation is one of important task in computer vision. It is unproductive to process the whole image directly for some applications like image recognition and compression. Therefore several image segmentation methods are proposed to segment an image before recognition and compression. Several image segmentation methods exist but segmentation is still remaining as hard problem. A lot of image segmentation algorithm has been existed in literature. Chao Wang et.al [1] proposed a multi scale segmentation method of oil spills in Synthetic Aperture Radar (SAR) images based on JSEG and spectral clustering. K.Madhu et.al [2] had introduced Multi-class image semantics segmentation (MCISS) that had many applications such as image editing and content based image retrieval. Luciano C.Lulio et.al[3] had introduced image processing techniques in computer vision to a agricultural mobile robots used for trajectory navigation problems as well as localization matters. To carry out this task, computational methods based on JSEG algorithm were used to provide classification. S.N.Sulaiman[4] presented a new clustering algorithm called Adaptive Fuzzy K means (AFKM) clustering for image segmentation which might be applied on general images or specific images

(medical and microscopic images).Yong Gang Wang [5] presented a new color image segmentation method that combined directional operators and the JSEG algorithm. J.J Charles et.al [6] investigated an evaluation measure of image segmentation for classification of organic materials obtained from rocks and drill cuttings. Organic materials obtained from rocks and drill cuttings involved finding multiple objects in the image. J.CHEN et.al [7] proposed a new approach for image segmentation that was based on low level features for color and texture. It was aimed at segmentation of natural scenes, in which the color and texture of each segment did not typically exhibited uniform statistical characteristics. Good and wide range of overviews of clustering algorithms can be found in literature [8],[9],[10],[11],[12],[13]. Each approach has its own merits and demerits. For clustering, the whole image is considered and distance between pixels in image is considered and connected pixels are moved from centre to centre. Clustering leads to formation of clusters.

I.i. SEGMENTATION

Image Segmentation is the process of dividing an image into different regions such that each region is, but the union of any two adjacent regions is not, homogeneous [14].Segmentation subdivides an image into its constituents regions and objects. It is the process of observing the image and dividing the contents inside the image into various segments having common characteristics such as color, semantics meaning etc. Segmentation in images is done in order to simplify the demonstration of images into something that is significant and easier to examine and observe. Segmentation is the process of providing label to every pixel in an image such that the pixels with same label share certain visual characteristics. Basically segmentation is used to situate objects and boundaries in images. Segmentation in images can be proceeding in three ways:-

i) Manual segmentation:-The pixels connected to same intensity range can point out manually. But this type of segmentation is not suitable for large images because it takes lot of time to activate and operate.

ii) Automatic segmentation:-Due to high amount of complexities and variation present in images, fully automatic segmentation is difficult to implement. In this type of segmentation, the information about images must be available to computer and some kind of software.

iii) Semi-automatic segmentation: - Semi-automatic segmentation combines both the features as well as advantages of manual and automatic segmentation.

I. ii. CLUSTERING

A cluster is a group of objects of data that are similar to one another within the same cluster and are not similar to the objects in another cluster. The process of grouping a set of physical or abstract objects into classes of similar objects is called clustering [16].K means is a popular clustering algorithm and has its application in data mining, image segmentation, bioinformatics and many other fields[17].It is frequently used clustering algorithm but K means algorithm suffers from certain drawbacks. One of the major drawbacks of this algorithm is that it does not handle noise. To outcome these limitations, modified K means clustering method is proposed.

II. PROPOSED METHOD

This section reviews the proposed method of JSEG along with modified K means clustering method of segmentation.

II. i. JSEG

JSEG stands for j value segmentation. It is the very powerful method to test the homogeneity of the image with given color texture pattern and is quite efficient in computational terms. JSEG algorithm is used to segment color images with uniform regions to generate clusters in the class. It deals with the following assumptions for the acquired image:-

- Image containing homogeneous color texture regions.
- Color information is represented by quantized colors.
- Color among two neighboring regions is noticeable.

JSEG is a classical approach for classification. JSEG is based on the concept of region growing and is a bottom up approach. It is a robust method of segmenting natural images. The JSEG algorithm simplifies color and texture of images. Basically, JSEG algorithm segments the images of natural scenes properly. There is no need to adjust parameters manually for each image. The essence of JSEG method [15] is to separate the segmentation process into two independently separate stages- which are color quantization and spatial segmentation. Basically, JSEG algorithm consists of three stages- Color space quantization, hit rate regions and similar color region merging.

i) **Color space quantization**: - Color space quantization minimizes or reduces the number of distinct and primary colors used in an image in such a way that the new image formed should be visually as same as the original image. Various algorithms are used for color space quantization. Quantization is carried out with minimum coloring. Each color is associated with a class. Pixels in original image are replaced by classes to form the class map. Various colors are quantized in image into several representative classes that can differentiate regions in the image. Spatial distribution of colors is not considered in color space quantization.

ii) **Hit rate regions**: - Before performing hit rate regions, J-image must be formed. J-image is a class map for each windowed color region, where positive and negative values indicates edges and textures of the processing image. The pixels values used as a resemblance algorithm for the hit rate section. These values are called 'J-values'. J values are related with the sizes of the windows. These values are calculated from a window placed on the quantized image, where the J-value belongs and the size of the window can be varied.

iii) **Similar color region merging:** - This stage is used to check the homogeneity as well as uniformality of images. Images of similar color and same visual characteristics are merged together with the help of various algorithms. Histograms are used for region merging.

II. i. a. Advantages of JSEG

i).JSEG works on images of natural scenes which composed of complex objects, textures, shadows and brightness.

ii).JSEG algorithm has very good computational capability and is a robust algorithm.

iii).JSEG algorithm does not require any pre processing and post processing techniques, also there is no need to adjust parameters manually.

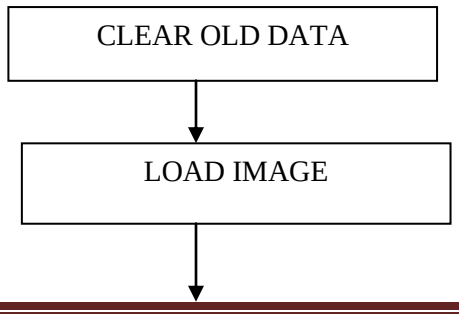
iv).JSEG can be applied to both structured and non structured objects. Non structured objects are those which do not have any specific shape like river, sky.

II. ii. Modified K means clustering

Modified K means clustering method is better in terms of efficiency and effectiveness. This algorithm works very well with large dataset images. It is based on iterative process. Cluster analysis is one of the major tools for exploring the underlying structure of a given data and is being applied in wide variety of engineering and scientific disciples such as medicine, psychology, biology, sociology, pattern recognition and image processing [18]. Ahead of the performance of modified K means clustering, the properties of the clusters have to be recognized. This modified version of clustering overcomes the problem of parameter evaluation. This clustering method prevents receiving into local optimal clarification in some measure and reduces the taking up of cluster error decisive factor. This algorithm has certain additional properties than conventional clustering methods like ability to deal with noise, insensitive to the order of input records, capability to pact with variety of image types, scalability in case of both time and space.

III. METHODOLOGY USED

The following table explains the methodology used in this paper to carry out segmentation.



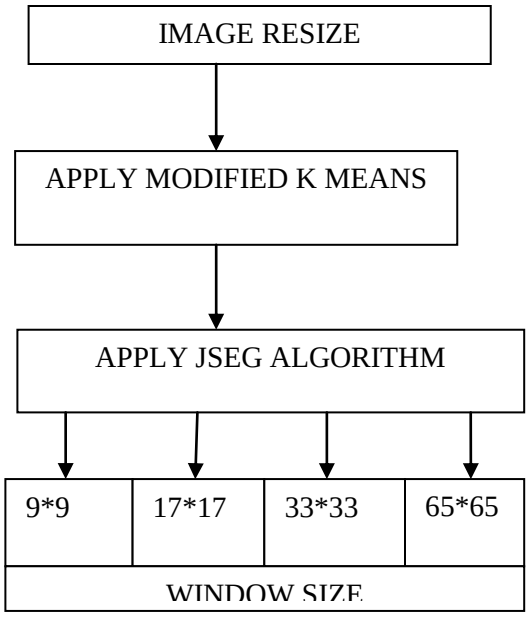


Figure 1: Methodology used

Step 1: Clear old data in order to have proper simulation. Previous data should be deleted for clear command box.

Step 2: In this step, loading of image is carried out. Image may be of any type like jpeg, png, bmp, tif, gif. Images may be colored, black and white or gray scale image. This step can load the image into the system of your own choice.

Step 3: This step is optional. Basically, when image is too large to be work with, image resize step is applied. But there is very less need of it.

Step 4: Here modified K means algorithm is being applied. It works on pixels in image. It includes pattern demonstration, definition of sample closeness, data abstraction if needed and evaluation of output. Pattern demonstration involves number of offered patterns Sample closeness is measured by distance function distinct by couple of patterns. Data abstraction is practice of extracting an easy and compressed representation.

Step 5: JSEG method consists of various windows. The windows used here are 9*9 windows, 17*17 windows, 33*33 windows and 65*65 windows. The size of the window is inversely proportional to the number of pixels in the image. The size of the window affects the performance of the segmentation results. J values are calculated on these windows centered over pixels. Window dimensions determine the size of image regions, for intensity and color boundaries in images. The larger window size detects the region boundaries and the smaller window size referred to change in intensity. By varying the window size**,** multistage J images can be calculated and process of segmentation on different images can be performed.

v. RESULTS

On the execution of m. file, follow window is displayed.

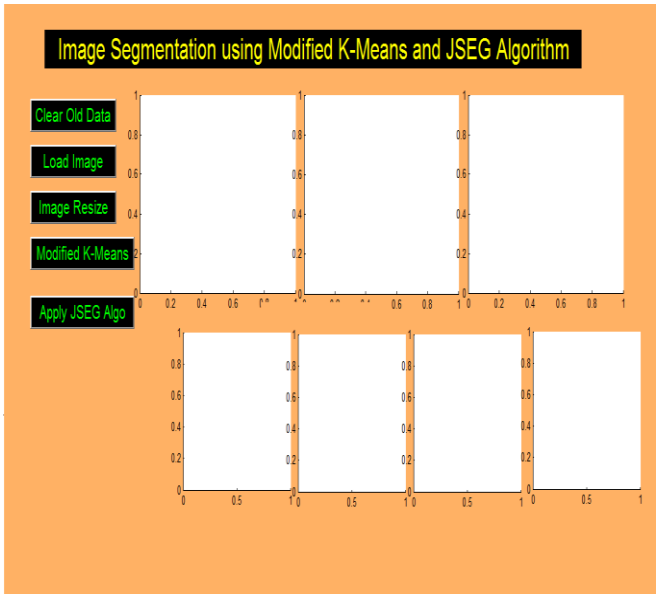


Figure 2: Image processing toolbox

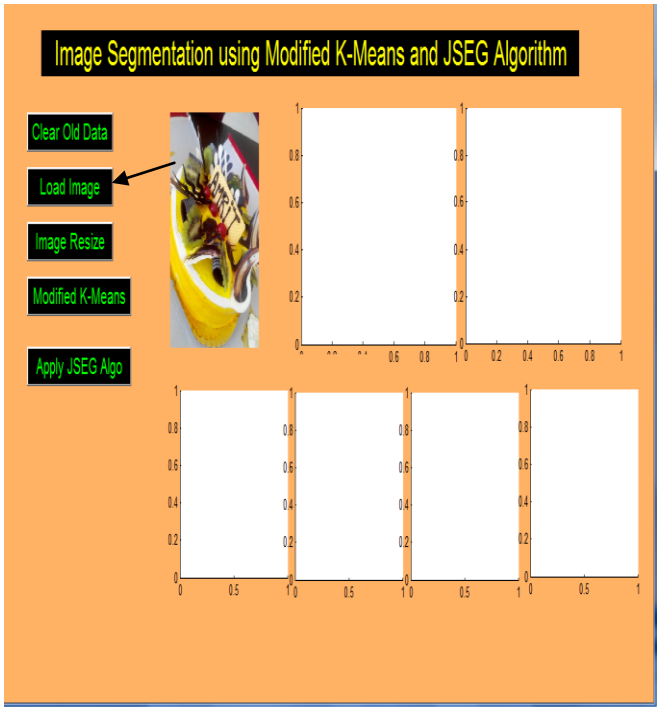


Figure 3: Loading of Image of any file format

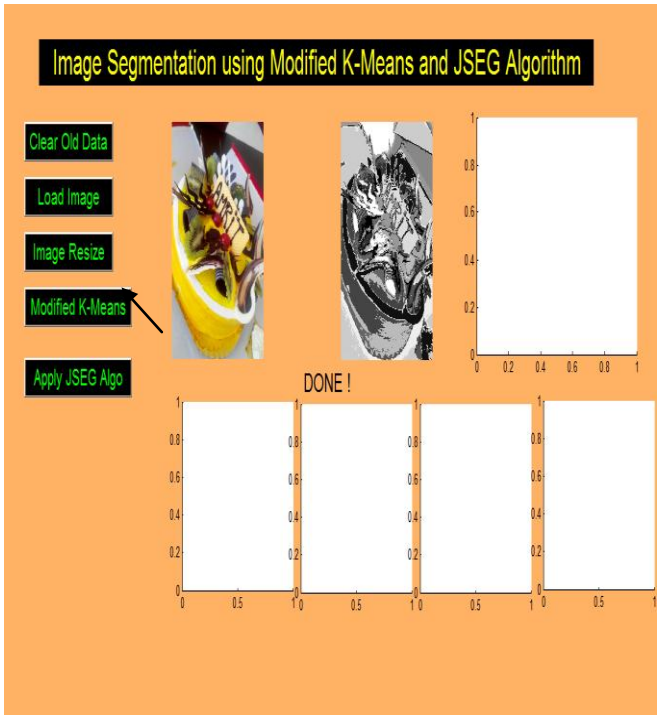


Figure 4: Image segmentation by Modified k means

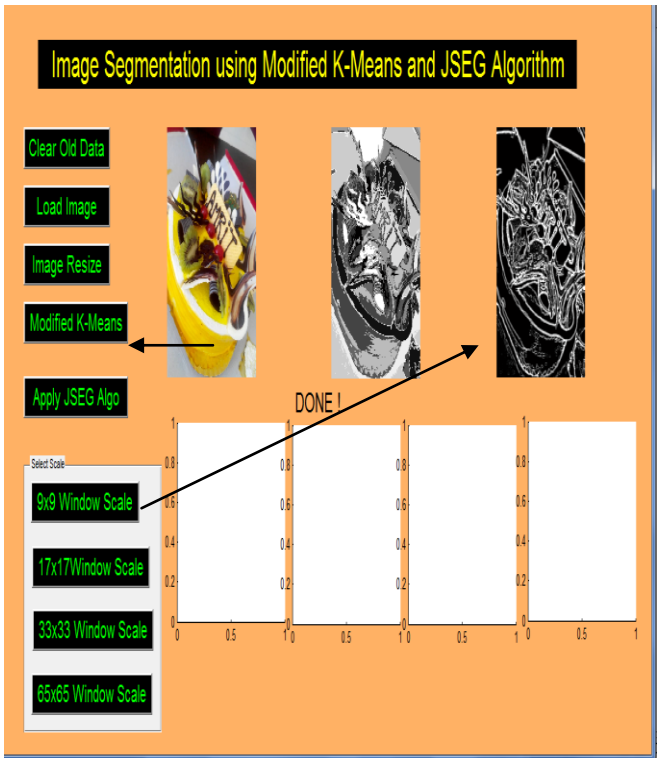


Figure 5: Image segmentation by JSEG (9*9 windows)

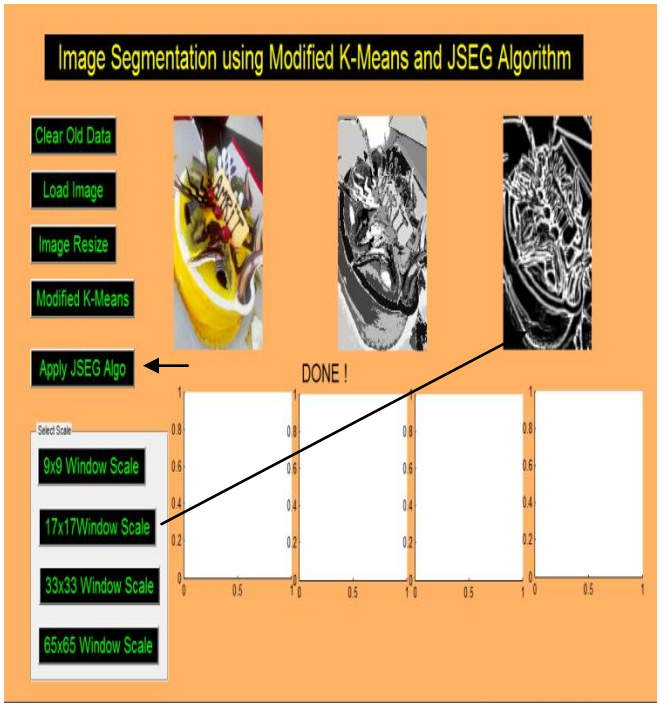


Figure 6: Image segmentation by JSEG (17*17 windows)

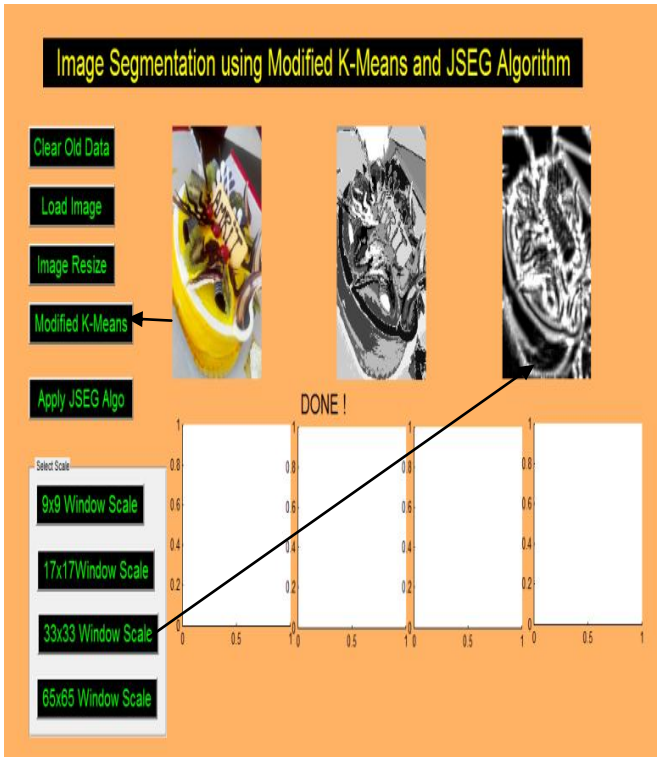


Figure 7: Image segmentation by JSEG (33*33 windows)

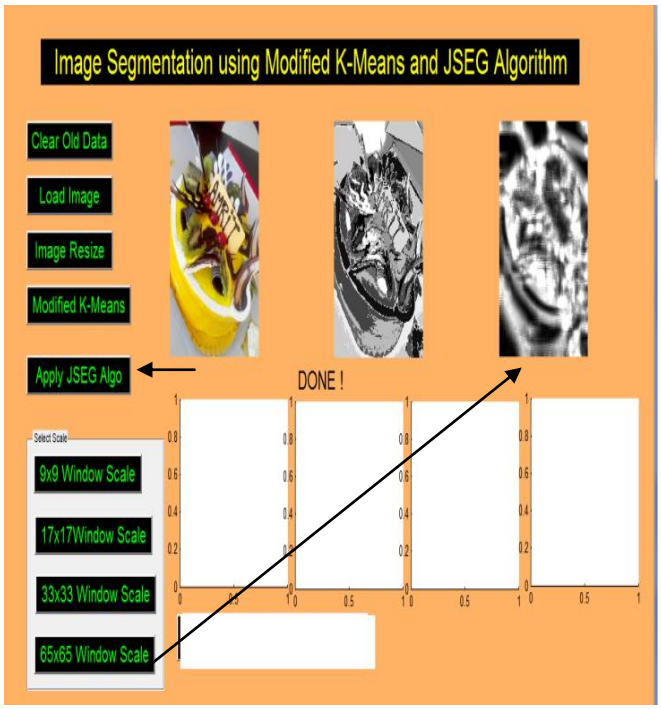


Figure 8: Image segmentation by JSEG (65*65 windows)

V. CONCLUSION AND FUTURE SCOPE

Image segmentation is a basic section in several computer vision applications and can be addressed as a clustering dilemma. An image segmentation can be defined as the procedure of complete partitioning of an input image into regions, each of which is considered to be identical with respect to some image property of interest. In this paper, segmenatation of images is done with mofidified k means clustering as well ae JSEG method. Here we make use of four windows. Results shows that less is the size of the window, better is the segmenatation and less are the chances of over segmenation. Modified k means also performs well segmenatation. Modified k means takes less computation time as compared to JSEG. The same work can be extended to more size of windows. The two proposed method of image segmentatiom provides solution to poor segmentation results of images with background and foreground objects having analogous color and composite textures.

REFERENCES

[1] Chao Wang, Li-Zhong Xu, Xin Wang and Feng-Chen Huang, "*A Multi-scale Segmentation Method of Oil Spills in SAR Images Based on JSEG and Spectral Clustering*", International Journal of Signal Processing, Image Processing and Pattern Recognition Vol.7, No.1 (2014), pp.425-432.

[2] K. Madhu and R.I. Minu, " *Image segmentation using improved JSEG",* IEEE Proceedings of the 2013 International Conference on Pattern Recognition, Informatics and Mobile Engineering, February 21-22,page 37-42.

[3] Luciano C.Lulio, Mario L. Tronco, Arthur J. V. Porto, "*Cognitive merged Statistical Pattern Recognition Method for Image Processing in Mobile Robot Navigation*", IEEE Proceedings of 2012 Brazilian Robotics Symposium and Latin American Robotics Symposium, pg 279-283.

[4] S. N. Sulaiman and N. A. M. Isa, "*Adaptive Fuzzy-K-means Clustering Algorithm for Image Segmentation*

" , IEEE Trans. on Consumer Electronics, vol. 56, no. 4, pp. 2661-2668, 2010.

[5] Yong Gang Wang, J. Yang, and Y.-C. Chang, *"Color-texture image segmentation by integrating directional operators into jseg method"*,Pattern Recogn. Lett., vol. 27, no. 16, pp. 1983–1990, 2006.

[6] J.J. Charles, L.I. Kuncheva, B. Wells, I.S. Lim, *" An evaluation measure of image segmentation based on object centers"*, in: Proc. of the International Conference on Image Analysis and Recognition, Portugal, September 18–20, 2006.

[7] Junqing Chen, Thrasyvoulos N. Pappas, Aleksandra Mojsilovic and Bernice E. Rogowitz, *"Adaptive Perceptual Color-Texture Image Segmentation"*,IEEE TRANSACTIONS ON IMAGE PROCESSING, VOL. 14, NO. 10, OCTOBER 2005.

[8] A.K. Jain and R.C. Dubes, "*Algorithms for Clustering*",Englewood Cliffs, N.J.: Prentice Hall, 1988.

[9] R.O. Duda and P.E. Hart, Pattern Classification and Scene Analysis. New York: Wiley, 1973.

[10] J. Bezdek, "*Pattern Recognition with Fuzzy Objective Function Algorithms"*,New York: Plenum, 1981.

[11] J. Hartigan, *Clustering Algorithms*. New York: Wiley, 1975.

[12] J. Tou and R. Gonzalez, *Pattern Recognition Principles*. Reading, Mass.: Addison-Wesley, 1974.

[13] E. Ruspini, *"A New Approach to Clustering"*,Information Control, vol. 15, no. 1, pp. 22-32, July 1969.

[14] Karin S. Komati, Evandro O. T. Salles, Mario Sarcinelli-Filho, *"Unsupervised Color Image Segmentation Based on Local Fractal Dimension",* IWSSIP 2010 - 17th International Conference on Systems, Signals and Image Processing. Page 243-246.

[15] Y. Deng and B. S. Manjunath, "*Unsupervised segmentation of color-texture regions in images and video",* IEEE Trans. Pattern Anal. Mach. Intell., vol 23, no 8, pp. 800–810, August 2001.

[16] Asif Khan, Israfi Tamim, Emdad Ahmed, *"Muhammad Abdul Awal, Multiple Parameter based clustering (MPC): Prospective Analysis for Effective Clustering in Wireless Sensor Networks (WSN) Using K means Algorithm",* doi:10.4236/wsn.2012.41003 Published Online January 2012.

[17] Shailendra Singh Raghuwanshi , PremNarayan Arya, "*Comparison of K-means and Modified K-mean algorithms for Large Data-set*", International Journal of Computing, Communications and Networking, Volume 1, No.3, November – December 2012.

[18] Mu-Chun Su and Chien-Hsing Chou, *"A Modified Version of the K-Means Algorithm with a Distance Based on Cluster Symmetry"*, IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE, VOL. 23, NO. 6, JUNE 2001