Modified Clustering Based Image Segmentation

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Abstract-**This paper has presented a modified clustering based image segmentation in which the segmentation will be carried out using the two well known clustering techniques that is mean shift and FELICM which is also called Fuzzy C-means With Edge and Local Information. The coloured image will passed through HSV plane and two segmentation algorithms will be applied over the hue, value and saturation component. The resultant images will be taken together to get the better segmentation . Performance have been evaluated on various parameters and the proposed technique have shown better results.**

***Index terms*: Clustering, HSV,Image Segmentation**

I. INTRODUCTION

Image Segmentation is an important process of image processing and understanding. Basically it is defined as the process of dividing the image into different parts of homogeneity. The aim of image segmentation is to simplify the representation of an image into something that is more meaningful and easier to understand.

It is basically used to find the location of objects, boundaries, lines etc. in the digital images. More precisely, image segmentation is the process of assigning a label to every pixel in the image such that pixels with the same label share certain visual characteristics or features.[6]

A color model is the specification of the coordinate system within which each color is represented by a single point. The RGB Color Model which an additive color model in which color appears in primary spectral components of red, green and blue. HSV model considered to be better model as it is more nearer to human interpretation. Hue describes the color attribute for a pure color, saturation represents the intensity of the specific hue and value represents the brightness of color. [2]

Clustering method is a process in which a data set or say pixels are replaced by cluster, pixels may belong together because of the same color, texture etc. There are two types of clustering that is hierarchical clustering and partional clustering.

II. FELICM SEGMENTATION

It stands for Fuzzy C-Means with Edge and Local Information, which introduce the weights of pixels within local neighbours windows to reduce the edge degradation. Image Clustering is considered to be very helpful method but usually it ignores the spatial relationship among the pixels due to which it becomes very sensitive to the noise. An adaptive FCM method was also proposed to suppress the noise and try to remove certain ambiguities. Further Dulyakarn and Rangsanseri add priori knowledge to FCM to work over remote images. Fundamentally FELICM method has somehow tried to overcome the isolated distribution of pixels inside segments of image [1] . The basic process of FELICM is that in this method firstly the original image is being converted into gray image and then the principal components analysis is occupied. Then in the next step edges are obtained by adjusting two threshold values that is a high threshold value and low threshold value in canny edge detection algorithm. After analyzing the edges , different weights are set to the neighbours within the local windows. Then the clustering is done with the FELICM method by using the spatial and spectral information.

III. MEAN SHIFT SEGMENTATION

It is an advanced technique for clustering based segmentation. It is a non parametric iterative technique which do not need prior knowledge of the number of clusters and it is a density of gradient estimation using a generalized kernel approach..It is implemented through kernel density estimation which is a non parametric way to estimate the density of a random variable. It is somehow accepted method for estimating probability. For each data point, mean shift defines a window around it and computes the mean of data point. Then it shifts the center of window to the mean and repeats the algorithm till it converges.[3] This method is suitable in over segmentation, multiple segmentation ,tracking ,clustering and filtering applications

IV. PROPOSED METHOD

After going through deep study many gaps have been found like images with mixed region have not been considered and effect of color have been neglected. So to overcome these kind of problems the following method has been proposed.

The following steps are involved in proposed methodology

Step 1: First of all take the input image.

Step 2: Convert the input image from rgb to hsv plane.

Step 3: In this step Mean Shift and FELICM Algorithm are applied separately and further FELICM involves the PCA analysis used along with otsu thresholding for canny edge detection. The output obtained from canny edge method will be used by FELICM for clustering.

Step 4: After getting the separate images from Mean Shift and FELICM Algorithm Variance based fusion is done over the two images that means the segments which has least variance among the two images will be taken together.

Step 5: All pixels are assigned to their nearest clusters and hence proposed segmentation method will be achieved.

Step 6: Color Labeling is done after obtaining the desired results.

V. RESULTS

Figure 1 shows the input image which will be used for the proposed algorithm over which rgb to hsv conversion is done and FELICM and Mean Shift Algorithm is applied separately.

Fig 1 Original Image

Figure 2 shows the image obtained from the existing technique that is FELICM

Figure 2 Image from existing technique

Figure 3 represents the image obtained from proposed method that is achieved after mixing the image obtained from mean shift and FELICM method and from figure it can easily be seen that segmentation is better in proposed method.

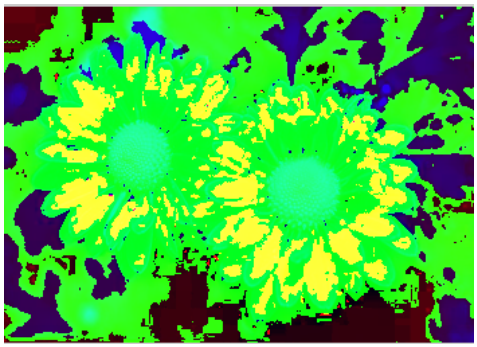

Figure 3 Image from proposed technique

VI. PERFORMANCE EVALUATION

The table I and figure 4 shows the results of proposed method on the basis of root mean square error. as RMSE need to be minimized, so our goal is to get low RMSE.

Table I :RMSE Values

Images	FELICM	Proposed
1	5.9213	3.8572
2	6.9328	3.0167
3	6.2526	1.2563
4	6.1807	3.8424
5	5.6330	2.7052
6	6.9215	5.5508
7	5.6476	3.3458
8	6.3551	1.1371
9	5.4005	3.7906
10	6.0324	3.3611

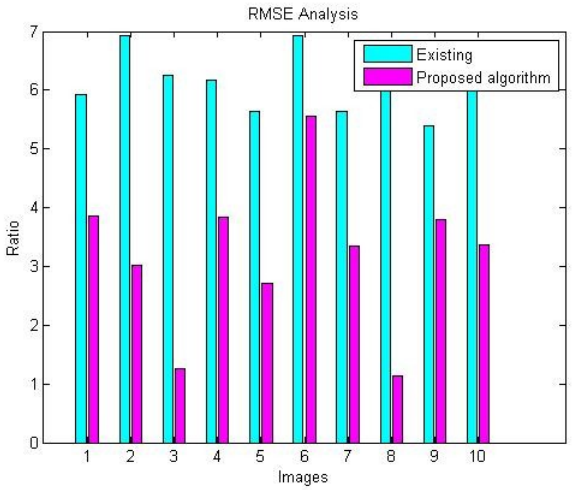

Figure 4 RMSE Analysis

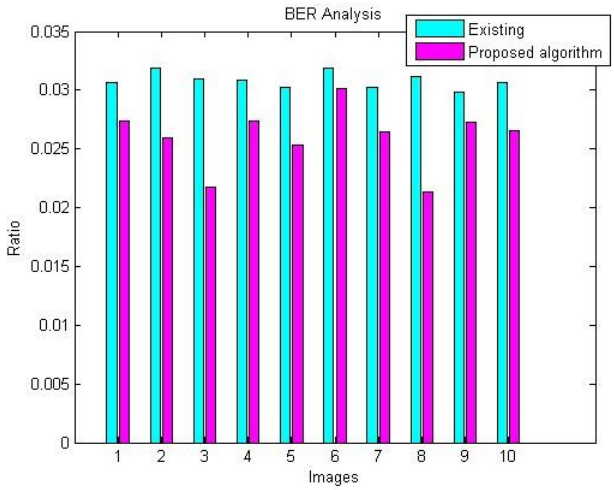

Figure 5 BER Analysis

The table II and Figure 5 shows the result for bit error rate (BER). Bit error rate is the number of error bits over the total number of bits transferred, as BER need to be minimized, so our goal is to reduce them BER as much as possible.

Table II: BER Values

Images	FELICM	Proposed
1	0.0306	0.0274
2	0.0319	0.0259
3	0.0310	0.0217
4	0.0309	0.0274
5	0.0302	0.0253
6	0.0319	0.0301
7	0.0302	0.0265
8	0.0312	0.0213
9	0.0298	0.0273
10	0.0307	0.0266

VII. CONCLUSION

Segmentation is the process of dividing the images into segments. There are various segmentation approaches available but clustering is considered to be the best approach . In this paper modified clustering approach has been used by using two methods. The performance evaluation has been done over RMSE and BER and in both the cases the existing technique is showing better results. Segments can be analyzed correctly in the proposed approach.

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