SEGMENTATION OF IMAGES USING KAPURS STRATEGY AND COMPARISON USING K MEANS AND THRESHOLD ALGORITHM TO ENHANCE THE ENTROPY

Mounika T[1], Indira K. P.[2*]

Article History: Received: 12.12.2022 **Revised:** 29.01.2023 **Accepted:** 15.03.2023

Abstract

Aim: In this study, image segmentation is one of the fundamental aspects involved in image processing, which generally consists of discriminating objects of interest from its background. The RGB test image images use Kapur strategy for enhancement of entropy and to increase peak signal to noise ratio.The expansion of RGB test image is red,green and blue respectively.

Materials and Methods: Two sets of 10 images were enhanced using kapur strategy and the PSNR were calculated. The PSNR data were further analyzed using k-means and threshold algorithm. The significant value of the observed data was analyzed using SPSS.

Results: The PSNR values of the images were obtained from the Kapur strategy. The PSNR values are further processed in Threshold and K means algorithm. The mean values of the K means and Threshold algorithm are compared for the significant difference. The statistical results showed that means of threshold are greater than k-means. This shows that Threshold was found to be efficient in enhancement of RGB images. The comparison of k-means and threshold algorithm of significant value of ($p<0.05$, $p=0.04$).

Conclusion: In this study, it was observed that the mean PSNR of RGB images processed using threshold clustering (9.6330) was greater than the mean k-means clustering algorithm(8.4460).

Keywords: RGB test images, Kapur's function, Multi Thresholding, Image quality measure, innovative simplified kapur strategy, MATLAB software.

[1]Research Scholar, Department of Biomedical Engineering, Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, Tamil Nadu, India, Pincode:602105

[2*]Department of Biomedical Engineering, Saveetha School of Engineering, Saveetha University, Chennai, Tamil Nadu, India, Pincode:602105

1. Introduction

Image multi-thresholding is the principal image processing technique extensively used to extract significant information from a digital image structure. (Couceiro, Micael and Pedra Gamisi 2015). During this procedure, a chosen threshold is assigned based on a chosen image investigation procedure, which helps in separating the test data frame as different clusters. (Gao, Shailesh Tiwari and Munesh 2020) In image processing literature, a plethora of image multi-thresholding procedures are proposed and executed on various classes of image frames by the experts (Moreno, Víctor and Alberto Picazo 2009). Detailed investigation on the available processing methods are established in the image processing literature. (Oliva, Diego and Salvador Hinojosa 2020). In recent years, the multi-thresholding of color images is implemented on a class of image frames (Rajinikanth and Venkatesan 2020). Image thresholding based on the parametric approach is complex and time consuming of final outcomes.

This procedure is also affected due to the image quality and initial conditions. (Satapathy, Suresh Chandra, Vikrant Bhateja Mohanty, and Siba Udgata. 2019). Hence , non-parametric approaches are widely adopted by most of the researchers to solve gray and color image segmentation problems (Razmjooy, Navid and Vania Vieira Estrela 2019). In this paper, image multi thresholding is proposed using a non -parametric approach, such as maximal entropy criterion. (Satapathy and Suresh Chandra 2018). During the image multi thresholding process, an essential threshold level (Th) is preset by the user with the help of an available signal processing scheme,which splits the image into various clusters. (Satapathy, Suresh Chandra, Srujan Raju, Jyotsna Kumar Mandal, and Vikrant Bhateja. 2015).

Our institution is keen on working on latest research trends and has extensive knowledge and research experience which resulted in quality publications (Rinesh et al. 2022; Sundararaman et al. 2022; Mohanavel et al. 2022; Ram et al. 2022; Dinesh Kumar et al. 2022; Vijayalakshmi et al. 2022; Sudhan et al. 2022; Kumar et al. 2022; Sathish et al. 2022; Mahesh et al. 2022; Yaashikaa et al. 2022). In this work, popular benchmark images, such as Peppers and Jet are chosen to test the T-level thresholding (Sherratt, Simon and Amit Joshi.2019). The maximization of Kapur's entropy value is adopted as the cost function to obtain the optimal thresholds (Wang and Ram Mohana Reddy 2019). Performance of heuristic procedures are evaluated with the following quality measures: maximized cost function mean, structural similarity index, peak signal to noise ratio (PSNR). (Ye, Zhengmao and Yongmao Ye 2018).

2. Materials and Methods

This research was done in the simulation laboratory at the Saveetha school of Engineering. The images were grouped into two sets with each group containing 10 images. The groups were divided based on K means algorithm and Threshold algorithm method. The sample size was calculated using the parameter values from previous rounds clinical.com. The pretest power value is 80% and the Threshold mean value is set as 0.05 and confidence interval is 95% and innovative simplified Kapur strategy.

Sample preparation using algorithm

A sample preparation for two processes was completed for 2 groups, which consists of 20 images. The gray scale images are resized to 200 x 255 datasets and pixels. The K means and Threshold clustering algorithm were used to segment and classify features. MS Excel was used to detect the estimated sample values for additional data methods. Instead of the predicted label of the testing image, the algorithm was trained with features from all the images, and during the test, a total label of obtained features was expected rather than the predicted pixel of the testing image. It was considered a successful Threshold in which the image of the majority of features matches the predicted image.

Testing setup and testing procedure

All the test setup was done in the MATLAB programming 2018 version with all the add-ons required for total preparation and testing purposes. Within the preprocessing arrangement, scaling was done to resize the pictures to 200 x 255 pixels. The segmentation of RGB images using Kapur strategy included extraction output includes more information in 300 dimensions, permitting better retrieval execution.

Statistical analysis

The PSNR (%) comparison of Thresholding algorithm and k-means algorithm was done in IBM-SPSS. Since the variables are independent of each other, an independent sample t-test was to compare the PSNR sensitivity percentage.

3. Results

In this study, the RGB images were segmented using Kapur strategy for enhancement of entropy. The images were grouped into two, based on their segmentation of RGB test images in Threshold and K-means algorithms. Each group contains 10 images. Representation of group statistical (t-test) results is given in figure 1. From figure 1 it was observed that the mean PSNR of group 1 is higher than the mean PSNR of group 2. The standard mean error of group 1 is higher than the standard error of group 2. Also from the independent sample t-test, the significant difference was absorbed between the group. The performance of the k means is better than the threshold clustering algorithm. The PSNR values are identified for each image and given in the table 1 and 2. The segmentation of RGB images showing the pepper images using kapur segmentation strategy to segment the red, green and blue is represented in figure 2.The segmentation of RGB images showing the jet mages using kapur segmentation strategy to segment the red, green and blue is represented in figure 3.The PSNR data of each group was analyzed using two algorithms namely Threshold and K means algorithm. The data obtained was statistically analyzed and represented in table 3. Table 3 shows the mean, standard deviation and standard error of the Kapur strategy. The mean PSNR of the Threshold (9.6330) algorithm was found to be higher than the K-means algorithm. The significance of data from strategy were analyzed using independent t-test using SPSS statistical software. The results of the analysis shows that the segmentation of RGB images for enhancement of entropy in RGB color images was found to be effective and the data are shown in table 4. The statistical analysis shows a significant difference ($p=0.04$, $p<0.05$) of the tested methods using the RGB image of Kapur strategy for enhancement of entropy.

4. Discussion

In this study, an attempt has been made to segment the RGB test images for enhancement of entropy using Threshold and K means algorithm. Even though satisfactory performance has been achieved in the segmentation with all methods, there are still factors, such as the lighting conditions during the segmentation. Hence, innovative simplified Kapur strategy has been utilized to segment the dataset of RGB images. The experimental analysis demonstrates that the proposed work successfully segments the RGB images using Kapur strategy for enhancement of entropy. Further, this work can be extended to accurately segment RGB images using different types of enhancement of entropy and the innovative simplified Kapur strategy can be used along with MATLAB programming. Feature scope of RGB images feature extraction method divides the total color space into the fixed number of sets called bins. The RGB imagery is created by combining channels and operations into red, green and blue color. These are sometimes referred to as color guns.

5. Conclusion

In this paper, the PSNR value of the RGB images of Threshold clustering is 9.6330 and K means clustering algorithm is 8.4460. The processes done using MATLAB programming show better outcomes when compared to Kapur strategy, K Means algorithm with the PSNR 8.4460 and the SPSS of 9.6330. The processes done using Threshold show better performance that the K means and it can efficiently be used for the enhancement of entropy. In future studies, the resulting binary image could be used to assist in the extraction of individual RGB images, feature analysis and textural assessment of species characteristics. Hence it may be utilized in diagnosis centers.

Declarations

Conflict of interest
In this manuscript, there are no conflicts of interest.

Author contributions
Author TM is involved in R,G,B images and manuscript writing. Author KPI involved in image processing , data set and review of the manuscript.

Acknowledgement
We would like to express our special thanks to the management , Saveetha School of Engineering, Saveetha institute of Medical and Technical Sciences(formerly known as Saveetha University)for providing me with necessary infrastructure that was required in completing the project.

Funding
We thank the following organization for providing financial support that enabled us to complete the study.
1.Axia clinics Pvt.Ltd., Hyderabad.
2.Saveetha University.
3.Saveetha Institute of Medical and Technical Sciences.
4.Saveetha School of Engineering.

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TABLES AND FIGURES

Table 1. The below table represents the number of samples in group 1 with PSNR of Threshold respectively.

Sample (Group 1)	**PSNR (dB)**
1	92.3
2	92.5
3	93.1
4	93.4
5	93.6
6	93.8
7	94.3
8	94.6
9	95.4
10	95.7

Table 2. The below table represents the number of samples in group 2 with the PSNR of K means algorithm.

Sample (Group 2)	**PSNR (dB)**
1	81.3

2	81.5
3	81.7
4	81.9
5	82.2
6	82.4
7	82.6
8	82.8
9	82.9
10	83.5

Table 3. Comparison of mean and PSNR using K means Algorithm and Threshold Algorithm.

Parameter	**Group**	**N**	**Mean**	**Std.Deviation**	**Std.Error Mean**
PSNR	Threshold	10	9.6330	2.0763	0.6566
PSNR	K means	10	8.4460	0.8996	0.2844

Table 4. Independent sample T-Test in predicting the PSNR for Enhancement of entropy using K Means Algorithm and Threshold Algorithm. There appears to be a statistically significant difference ($p<0.05$)in both the methods.

Parameter	**Group**	**F**	**Sig.**	**T**	**df**	**Sig.(2-tailed)**	**Mean difference**	**Std.Difference**	**Lower**	**Upper**
PSNR	Equal variance assumed	6.93	0.04	1.658	18	0.000	1.1870	0.7155	1.0366	1.3373
PSNR	Equal variance not assumed			1.658	1.226	0.000	1.1870	0.7155	1.0314	1.3425

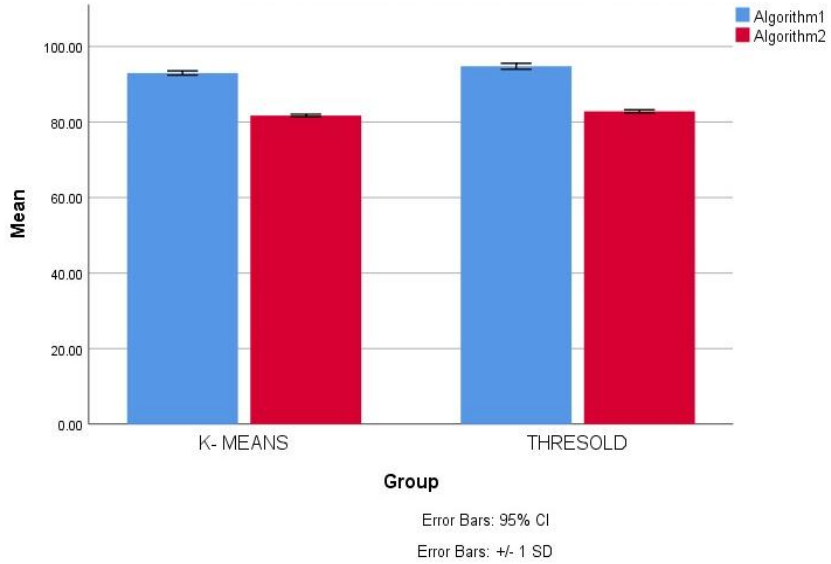

Fig. 1. Representation of group statistical (t-test) results. It was observed that the mean PSNR of group 1 is higher than the mean PSNR of group 2. The standard mean error of group 1 is higher than the standard error of group 2. From the independent sample t-test the significant difference was absorbed between the group. The performance of the k means is better than the threshold clustering algorithm. X- Axis: K means and Threshold algorithm and Kapur strategy. Y-Axis: Mean PSNR of detection= +_ 1 SD.

Fig. 2. The segmentation of RGB images showing the pepper images using kapur segmentation strategy to segment the red, green and blue.

Fig. 3. The segmentation of RGB images showing the jet mages using kapur segmentation strategy to segment the red, green and blue.