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COMPARISON OF VARIOUS COLOR SPACES FOR IMAGE SEGMENTATION USING ROUGH-FUZZY CLUSTERING TECHNIQUES

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ABSTRACT

Fuzzy C Means and Rough set based Fuzzy C Means are used for different color spaces like CMYK, HSV, XYZ, RGB, YUV, Lab are considered to perform a comparative study on color image segmentation in this paper. For different color spaces, FCM and RFCM compared and efficient segmentation for color images is produced for proposed RFCM algorithm when compared with various clustering for the computational time like DB index, Rand index, Silhouette index and Jaccard index, improved performance and segmentation was shown in the proposed algorithm during the experimentations.

Keywords: Rough Set, Fuzzy C Means, Image Segmentation, Color Spaces, Clustering Technique.

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1. INTRODUCTION

Image segmentation plays a vital role in pattern recognition. Preprocessing steps in various computer vision such as low-level computer vision and high-level computer vision, in the analysis of images image segmentation, plays a prominent role. The more concerning part in recent years with regard spatial data is uncertainty in spatial data.

Reasons for uncertainty is special data is such as measurement inaccuracy, sampling discrepancy, outdated data sources, etc. [1][2].Network latencies, wireless transmission errors, measurement inaccuracies, a deviation caused by the rapid change of the measurement property over time, Inherent in nature, Limited understanding of reality and limited perception leads to Uncertainty. Uncertainty data increase plays a significant role in uncertainty in information.

Image mining explains the relationship between image data, tacit knowledge about image extraction, images that are not stored in explicit patterns [5][6][7]. Image Segmentation is the challenging role of identification of images and medical diagnosis process. The radiologist is using efficient segmentation methods as a useful way of medical diagnosis [3, 4]. Image segmentation is a process of partitioning an image into various regions. Various types of image segmentations such as region-based segmentation, edge-based segmentation, thresh hold based segmentation can be applied.

Clustering based image segmentation methods are used to partition images according to their global feature distribution. In this paper, Fuzzy C-means algorithm using rough set theory is proposed for image segmentation. Based on the intensity and spatial features, the pixels are clustered, final segmentation results were produced by combining the clusters. Organization of the paper is as follows. Section 2 deals with color models and conversions. Section 3 deals with fuzzy c mean algorithm associated with rough set theory. Experimental results were presented in Section 4 and conclusions are presented in section 5.

2. COLOR MODELS

The purpose of a coloration representation is in accordance with facilitating the specification over colors of half standard normally conventional way. In essence, a color model is a specification on a 3D coordinate rule and a subspace within as provision where each color is represented via an odd point. Each enterprise as utilizes color employs the most suitable color model. For example, the RGB color model is aged between laptop graphics, YUV or YCbCr are back among video systems, Photo YCC is aged within Photo CD production then hence on.

Transferring color statistics from some enterprise in accordance with some other requires changing from one engage over values in accordance with another. Intel IPP gives a wide range of capabilities in imitation of metamorphosing distinctive color spaces in conformity with RGB or dust versa. In the RGB model, every color appears namely a combination regarding red, green, and then blue. This model is called additive, and the colorings are referred to as important colors. The major colorings execute stand introduced after birth the fewer hues on mild (see Figure "Primary or Secondary Colors because RGB then CMYK Models") - magenta, cyan, or yellow. The combination regarding red, green, and blue at full intensities makes white.

3. ROUGH SET THEORY

Pawlak introduced the Rough Set (RS) Theory in 1982 [2] and [3] for dealing the uncertainty and vagueness parameters. Similar to Fuzzy Set approach, imprecision and uncertain scenarios are handled and expressed using boundary regions and not by the partial membership as implemented in Fuzzy Set techniques. Further, RS is defined as an approximation of the conventional set of pairs with upper and lower approximations in the original dataset. The objective of RS is to learn the approximation of concepts so that the patterns are discovered in the data. The basic components of RS are Information Systems, Indiscernibility, Reducts and Core, Set Approximation, Rough Membership and Attribute Dependencies. The following shows the algorithm for RS-based FCM method.

3.1 Rough Set Based Fuzzy C -Means Algorithm

The sub-processes in the RFCM are as follows:

Step 1: Randomly select a cluster number 'c', such that, two ≤ c ≤√n, where, n represents the points in the image.

Step 2: Select random 'c' pixels as cluster centers.

Step 3: From the randomly selected cluster centers, the optimal clusters are selected by using the RS method.

Step 4: The Step variable is initialized to zero.

Step 5: Frequently its value is updated using the following membership matrix function: $U = \{u_{k,x}\}$ using the equation 1.

$$C_i = \frac{\sum_{j=1}^{n} U_{ij}^{m} X_j}{\sum_{j=1}^{n} U_{ij}^{m}} \tag{1}$$

Step 6: Cluster centers are updated.

$$U_{ij} = \frac{1}{\sum_{l=1}^{k}, x_j \epsilon \, \mathrm{Rwi}(\frac{d_{ij}^2}{d_{ij}^2}) \frac{1}{m-1}}$$

Step 7: Xie-Beni index is determined.

Step 8: Until the condition is satisfied, i.e., $\| XB^{t+1} - XB^{t} \| < pn$, (where 'pn' is a small positive number), the steps from 5 to 8 are repeated.

Step 9: The optimal Xie-Beni index and cluster's center are determined.

4. EXPERIMENTAL RESULTS

In this segment, experimental outcomes on actual images are described in detail. In those experiments, the number of various types of item factors in each picture from manual evaluation was taken into consideration because the quantity of clusters to be referenced. The Xie-Beni index price has been applied all through to evaluate the first-rate of the classification for all algorithms. All experiments have been carried out on the system with 1.8GHz Pentium IV processor using Mat lab

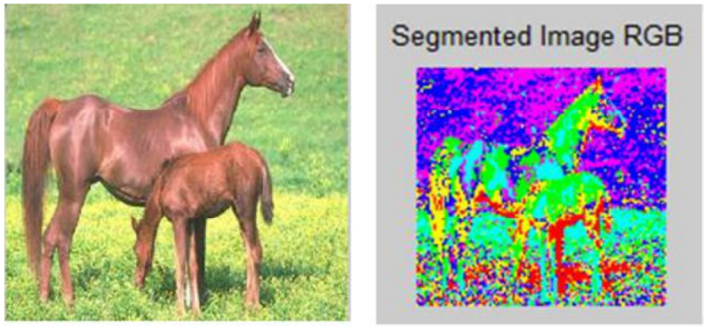
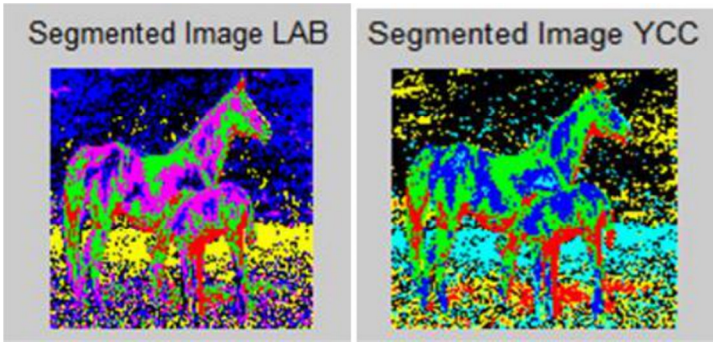
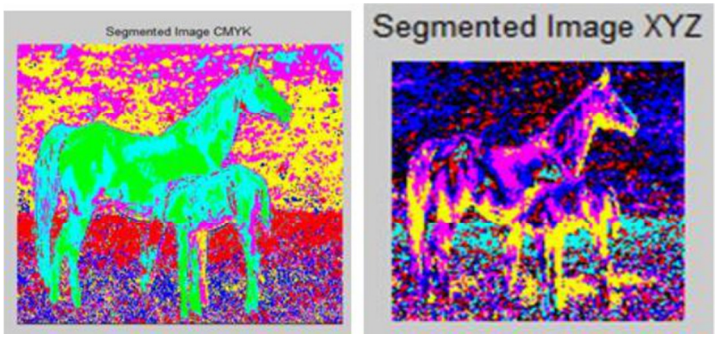


Figure 1 (a) Original Image Corel – 744 (b) Segmented in RGB



(e) Segmented in Lab (f) Segmented in YCC



(g) Segmented in XYZ (h) Segmented in CMYK

Table 1 Segmentation Time for different Color Models of the Image: Corel – 744

Color Model	Time in Sec
RGB	47.849976
HSV	30.783493
YUV	35.007284
LAB	49.635199
XYZ	65.500038
YCC	64.521090
CMYK	31.921300

Table 2 Various Validity Indices for Iris Data set using Rough Fuzzy C Means Clustering with Euclidean distance

No of Clusters	DB index	Jaccard Index	Silhouette Index	Rand index
2	1.1827	0.72886	0.61289	0.92886
3	1.1335	0.69586	0.55282	0.87973
4	0.85632	0.62817	0.42217	0.85423
5	0.76193	0.55673	0.4899	0.83884
6	0.75073	0.62719	0.3895	0.85351
7	0.52537	0.55544	0.46448	0.8511
8	0.40347	0.46883	0.33198	0.80555
9	0.35298	0.35674	0.34265	0.78523
10	0.27834	0.32514	0.20386	0.76653

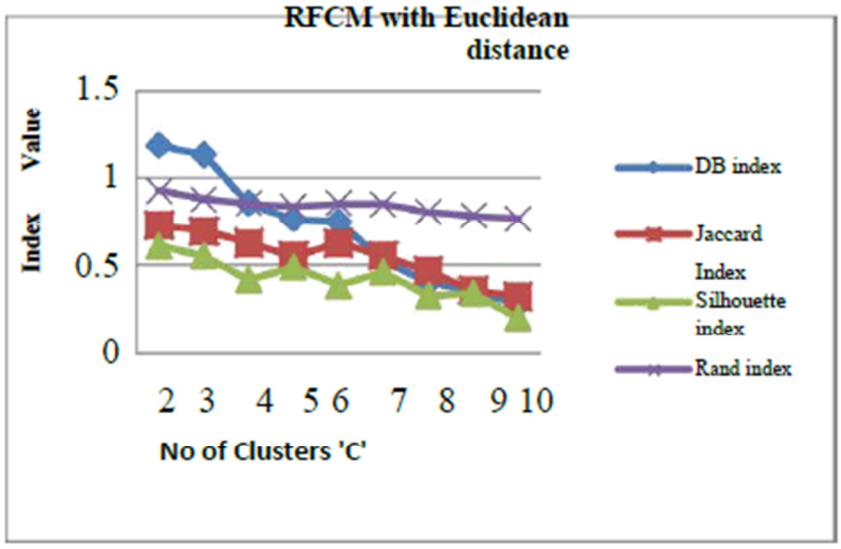


Figure 2 Validity indices value based on the Clusters

5. CONCLUSION

The developed approach contributes a hybrid methodology, which integrates judiciously rough sets and fuzzy c-means algorithm. This formulation is geared towards maximizing the utility of both rough sets and fuzzy sets concerning knowledge discovery tasks. The proposed method is applied to several real data sets from UCI Machine Learning Repository and Images from Corel, BSDS data set. Some of the cluster validity indices such as DB index, Rand index, silhouette index, and Jaccard index for evaluating the quality of the proposed algorithm are considered. The effectiveness of the proposed algorithm is demonstrated, along with a comparison with another related algorithm like RFCM and proved better performer by considering various indices given. Experimental effects show that the proposed technique performs well and improve the segmentation consequences in the vague regions of the image. The proposed algorithm proves that HSV and CMYK color images will give better segmentation results when compared with other color models.

REFERENCES

[1] Wei Zhang, Yu-Zhou Zhang, Cheng Li, A new hybrid algorithm for image segmentation based on rough sets and enhanced fuzzy c-means clustering, IEEE, International Conference on Automation and Logistics, August 2009.

[2] E.V.Reddy, Dr. E.S.Reddy , Image Segmentation using Rough set based Fuzzy K Means clustering algorithm, Global Journals Inc., GJCST Volume 13 Issue-6 Version 1.0 ISSN: Online: 0975-4172 Print: 0975-4350

[3] E.V.Reddy, G.V.Suresh, Dr. E.S.Reddy rough set analysis for uncertain data classification, IEEE Explore, 2010

[4] E.V.Reddy, G.V.Suresh "uncertain data classification using rough set theory", advances in intelligent and soft computing series: 4240 of Springer.

[5] Hassanien, A. E., A. Abraham, J. F. Peters, G. Schaefer, and C. Henry. 2009. Rough sets and near sets in medical imaging: A review. IEEE Transactions on Information Technology in Biomedicine 13(6):955–968. Digital object identifier: 10.1109/TITB.2009.2017017.

[6] S. Asharaf and M.N. Murty. An adaptive rough fuzzy single pass algorithm for clustering large data sets, Pattern Recognition, vol. 36, no. 12, pp. 3015–3018, 2004

[7] W.H. Au and K.C.C. Chan. An Effective Algorithm for Discovering Fuzzy Rules in Relational Databases. Proceedings of the 7th IEEE International Conference on Fuzzy Systems, pp. 1314–1319, 2008

[8] S Mohapatra, D Patra, Unsupervised Leukocyte Image Segmentation Using Rough Fuzzy Clustering, ISRN Artificial Intelligence, 2012

[9] Krishnapuram, R., Keller, J. M.: A Possibilistic Approach to Clustering, IEEE Transactions on Fuzzy Systems, 1(2), 2008, 98–110.

[10] Bhatt, R B, and M Gopal. 2004. fuzzy-rough interactive dichotomizes. In Proceedings of the IEEE international conference on fuzzy systems, 1337–1342.