[Frontiers in Bioscience-Landmark, 8, 36-45, DOI:10.52590/4943]

MODIFIED CPBIS METHODS USED FOR FUZZY BASED ISODATA CLUSTERING ALGORITHM USING WITH REAL TIME IMAGE DATABASE

Dr.K.Ramesh[1] [0000-0002-13135882],
Associate Professor, PG & Research Department of Computer Science & Applications, Vivekanandha College of Arts & Science, Namakkal, krmca86@gmail.com

Dr.N.Thangarasu[4] [0000-0001-6638-1262]
Assistant Professor, Department of Computer Science, Karpagam Academy of Higher Education, Coimbatore 642 021.
drthangarau.n@kahedu.edu.in

[1]**Dr.M.Ramaraj** [2] [0000-0002-0265-2139],
Assistant Professor, Department of Computer Science, Karpagam Academy of Higher Education, Coimbatore 642 021.
ramaraj.phdcs@gmail.com

Dr.G.Manivasagam[5] [0000-0001-6638-1262]
Assistant Professor, Department of Computer Science, Karpagam Academy of Higher Education, Coimbatore 642 021.
mani.mca.g@gmail.com

Dr.D.Sabareeswaran[3] [0000-0002-5204-6858]
Assistant Professor, Department of Computer Applications, Karpagam Academy of Higher Education, Coimbatore 642 021.
sabaredhendapani@gmail.com

Dr.R. Revathi.[6] [0000-0003-4157-285x],
Assistant Professor, Department of Computer Science, Karpagam Academy of Higher Education, Coimbatore 642 021.

ABSTRACT

Data mining is a process of mining hidden information to the previously unknown data and hypothetically useful knowledge from a large amount of actual data to be stored in a database. Image mining is a part of data mining with used as a predictive measures to infer the age of the tiger. An interpretation of images can provide human users with useful knowledge. The extraction of reserved data to be associated with the image knowledge, or different patterns that are not process indirectly embedded within the image were associated with the image mining process. The research work is mainly focused on, to infer the age of the Tiger using data mining techniques. The tiger has adapted into a reserved animal. Tiger conservation has become a difficult challenge. To infer the age of the tiger, this research work incorporates those domains of image processing and data mining. The FISODATA clustering method requires more predefined parameters than the k-mean method used to calculate the approximate number of clusters, the maximum number of iterations, the minimum number of points in the cluster, and the minimum distance between the centers of the cluster. Cluster centers are the means of the actual clusters points. This research paper focuses on RGB color spaces, which are applied to real-time tiger images. The key task of the research work is to determine the age of the tiger using color pixel-based image segmentation using data

Submitted: 29 July 2021 Revised: 22 August 2021 Accepted: 15 September 2021 Published: 26 September 2021

mining techniques. The real-time tiger image database is employed to optimize the image filtering and enhancement methods that are used to eliminate the noise and boost the quality of pixels or images but also to be measuring processing time, retrieval time, accuracy, and error rate by generating higher performance.

Keywords: - Data mining methods, clustering, classification, color spaces, image enhancement method and Result Analysis.

I.INTRODUCTION

Mining is the process of extracting unknown information from previously unknown data and hypothetically significant knowledge from a large amount of actual data to be stored in a database. Many data mining techniques are available, such as clustering, classification, association, regression and evaluation [9]. To get access from this scenario, too many strategies are demonstrated, such as Pattern recognition, time series, OLAP, visualization, and other techniques are all significant. It's an interdisciplinary project that focuses on computer vision, image processing, image acquisition, image recovery, data mining, machine learning, database, and artificial intelligence. Advances in image acquisition and storage technologies have led to a tremendous growth in [20] in very broad and informative image databases.Analysis of images will reveal useful information to the human usersNameirakpam [21][22] [23]. Image mining deals with the ancestry of inferable acquaintance to the image data relationships that are different trims not explicitly embedded in the image database stored in the images [11]. ISODATA is defined as Iterative Self-Organizing Data Analysis Technique. ISODATA is an unsupervised arrangement technique. There has been no way to determine how many clusters there are. Fuzzy control is based on fuzzy logic, which is a logical system that is far closer to scientific rationality with including the natural language in the meaning than conventional logical systems. The fuzzy logic controller (FLC) uses fuzzy logic to transform a linguistic control strategy based on expert knowledge into a fuzzy logic controller (FLC). ISODATA Algorithm enables the measurement of bunches to be balanced naturally amid the emphasis. The ISODATA clustering algorithm was proposed by Kaufman Rousseeuw in 1990. The research paper is based on the ISODATA clustering algorithm is transform the Fuzzy Based ISODATA clustering algorithm that is supports the tiger image database. The main objective of this method is to infer the age of the tiger.

II. REVIEW OF LITERATURE

The entirely unconventional works to be carried out that the realm of the image process, as image segmentation has revealed victimization some different approaches and lots of those works square measure focused on the assorted technologies of image segmentation. The existing clustering algorithm becomes one of the most fundamental clustering algorithms, with many different implementations that are differentiated in the method used to be activated. ISODATA technique was announced by Ball &Hall, and others in the 1960s.[1],The algorithm towards assessing the well initial centroids are generated based on the optimization approach. The proposed clustering algorithm generates the highly accurate clusters while reducing computational time.An image segmentation approach based on pixel classification was proposed by[3] using for quality control implementation to the ISODATA clustering algorithm and the parameter estimation are to be used.4], presented with the clustering techniques in color image segmentation have managed to five clustering techniques as K-Means, ISODATA, Mean Shift, splitting and merging techniques for use in the color image segmentation are presented. [5], Automatic detection of route rumble strips, which are important for many applications, including lane level navigation and lane departure warning, has been introduced.[6], had proposed a new spectral-spatial classification scheme for hyper spectral Images. The Optimizing of the techniques is to incorporating the performance of image classification and grouping as well as the segmentation of map produced by region-based segmentation to the number of clusters into the different classifiers[8], had proposed an AF- ISODATA clustering algorithm for applying on color isolated sensing image segmentation. [10], described a color style transfer by constraint locally linear embedding. [12], had presented with a state based modified MEM (Modified Expectation Maximization) algorithm for region image segmentation. The proposed method will use and decrease the number of iterations for the segmented image to converge rapidly and center

at a low time.[13], A new approach based on an unsupervised image segmentation algorithm clustering technique will be introduced that determines the best clustering of an image data set with less user intervention.[15], It can be recognized that segmentation is individually dependent on either Pixel-based or texture-based optimization algorithms and does not contribute to the classification of remote sensing images with high spatial resolution since it includes textured and non-textured regions.[24]. [19], had analyzed that the presentation of unsupervised classification algorithms is called as ISODATA (Iterative Self-Organizing Data Analysis Technique Algorithm) and to test statistically by iterative approaches to automatically group pixels with identical spectral characteristics into unique clusters, K-means in remote sensing.[17], has presented with the fast and efficient method for color image segmentation[7].In addition, the computing time has been drastically reduced, allowing extremely large images to be processed in a reasonable time.[27].

III. METHODOLOGY

The FBISODATA clustering algorithm's unsupervised classification calculates the class, which means that it is presumed to be uniform in the data liberty. Then, using smallest amountreserve functions or techniques, the remaining pixels are clustered iteratively. Each iteration, in relation to the new properties, recalculates means and reclassifies pixels [26]. The FBISODATA clustering algorithms are divide into two iterative classes such as splitting and merging is done based on the input threshold parameter. Because, if a standard deviation or distance threshold is to be established with the all color pixels that are grouped into the nearest color classes. When some color pixels may be classified into other nearest cluster groups [4].However, if they do cannot an implementation of threshold value to be found [16][14]. The procedure was repeated until the number of pixels in each class falls below a certain threshold, or until the maximum number of iterations for the selected two pixels has been obtained. FBISODATA clustering uses two-parameter sets, the first parameter sets do not change during the clustering process [19]. Another parameter that which can be interactively adjusted until an acceptable clustering result is to be obtained. Found the unique attribute indicators matrix U* that illustrates each attribute of any object within investigation and reference samples $U_{ij}^{*}$is on behalf of the characteristic indicators j of object i. homogenize data of the unique characteristic and that indicators matrix is $U*$ and by assortment of process to be get U, and describable equation as followed by $Mj = max\,(U_{1j}^{*}, U_{2j}^{*}, \dots, U_{nj}^{*}), mj = min\,(U_{1j}^{*}, U_{2j}^{*}, \dots, U_{nj}^{*})$for column j of $U*$, estimate u_{ij}using formula

$$U_{ij}^{*} = \frac{U_{ij}^{*} - m_j}{M_j - m_j} \qquad (1)$$

Start an incremental process to be based on the unique core matrix of the cluster $V^{(0)}$of reference sample system compute fuzzy confidential matrix $r_{ij}^{(l)}$using formula as

$$r_{ij}^{(l)} = \left[\sum_{j=1}^{c}\left(\frac{\|U_k^l - V^{(L)}{}_l\|}{\|U_k^l - V^{(l)}{}_j\|}\right)\right]^{-2}, \qquad (2)$$

Therefore, c defines the number of cluster categories. Then amend bunch core matrix for $r^{(l)}$,

$$V_i^{(l+1)} = \frac{\sum_{k=1}^{n}(r_{ij}^{(l)})^2 u_k}{\sum_{k=1}^{n}(r_{ij}^{(l)})^2}. \text{ Here, } (3)$$

$V^{(l+1)} = (V_1{}^{(l+i)}, V_2{}^{(l+i)}, \dots V_c{}^{(l+i)})^T$, Repeat step 2). when evaluate the given matrix is $r^{(l)}{}_{and}$ $r^{(l+i)}$for a given precision $\varepsilon > 0$, if $\max\left\{r_{ik}^{(l)} - r_{ik}^{(l+i)}\right\} \leq \varepsilon$, iterative operation should be stopped and $r^{(l+1)}$ $V^{(l+1)}$ should be outputted. In parallel stipulation as followed by the equation as $i = i + 1$, and repeat step 3). Obtain a fuzzy set bunch using the better nearest cluster matrix segregation of the basic concept to the better cluster center matrix,$V^* = (V_1{}^*, V_2{}^*, \dots V_c{}^*)^T$, $\forall u_k \in U$. object U_k should be confidential to class i.

Once the tiger image database is loaded then create the unique distinguishing indicators matrix $U*$ that descript color feature value of all examined tiger image object and locus samples of tiger images is on behalf of the color characteristic pointers j of tiger object i. Normalize the original color value of the tigers to fall under the specified range which is denoted as matrix U* to get U. Then begin the process of iterative which frames the cluster center matrix $V^{(0)}$of the reference sample system of tiger images. Compute fuzzy classified matrix with a reference sample of tiger and new incoming image of the tiger. Modify the cluster center matrix for $r^{(l)}$, depending on the new arrival of the tiger

to re-cluster them by determining the optimal cluster center.

3.1. Splitting Algorithm

The algorithms for splitting and merging are segment the image into a particular region. The basic framework of representation is pyramidal. The algorithm generally starts from the initial assumption that a single region is the whole image, and then computes the criterion of homogeneity.

- Initialize the k centroid value
- Assign the splitting function of the membership process
- Search an entire color in the image line by line expect first to last line
- Find the pattern of each color and split into m*n
- Calculate the fuzzy classifier. Following the equation 2
- If a mismatch between assigned label value $r^{(i)}$ and $r^{(i+1)}$.
- Assign labels to unsigned pixels in the block
- Remove small regions if necessary.

3.2. Merging Algorithm

For hierarchical segmentation, reliable regions are merging and this technique is very effective. Based on the color-texture improves and artifacts of the image, the similarity measurement of regions and corresponding stopping criteria are proposed. The process of merging starts with the image's primitive color pixels before the termination criterion is reached and the segmentation is finished [18].

3.3. Neighbours of pixel

A pixel p has four horizontal and vertical neighbors coordinate as (x, y), and this synchronize are given by $(x+1, y), (x-1, y), (x, y+1), (x, y-1)$. $(x, y-1)$.This pixel set, referred to as N's 4-neighbors, and is N 4 Denoted (p). Each pixel is the distance of a unit from (x, y), and some of N's neighborsbe positioned. If (x, y) is on the boundary of the file, it is outside the digital image. N's four diagonal neighbors have coordinate $(x+1, y+1), (x+1, y-1), (x-1, y+1), (x-1, y-1)$ and are denoted by N D (p). The value m reins the amount of clustering with core clustering at m=l and more and morefuzzy clustering at largest amount of m, V is the set of c-cluster centers and $r_{ik}^{(l)}$ is the fuzzy separation of the image [25].

3.4. Finding the nearest color

This part of the study can explains the method of preventing an image's and number of colors by identifying the closest match to an image's available color. This object, just for simplicity, implies it will operate with a pre-defined image spectrum assigned to several colors such as, RGB colors and other combination of rgb colors.

```
Procedure Truncate (value)
    If value < 0 Then value = 0
      If value > 255 Then value = 255
      Return value
      End if
End if
```

Pseudo code

```
For y = 0 to ImageHeight - 1
  For x = 0 to ImageWidth - 1
    ActualColor = GetPixelColor(x, y)
    NearestColor = FindNearestColour
(actualColor)
    PutPixelColor(x, y, nearestColour)
  Next
Next.
```

By analyzing the relationship between the separate RGB values of the actual color and each of the colors available from the palette, the Euclidean distance is one of the best methods for finding the distance. A simple way to ensure that negative and positive values are adapted together to create the distance is to square the differences. The nearest color might be the one that has the maximum distance from the actual color.

IV. RESULTS AND DISCUSSION

The tiger image database is included with the proposed model, and it facilitates the execution of the Matlab tool. This database contains over the 500+ above camera trap images from different formats and sizes. There will be only one class, which encompasses the several age collections of tiger has been illustrations. The proposed method's retrieval accuracy would be assessed in a specific class using a different age group category. The proposed clustering methods ways to perform the square measures are used on the color performs for an extract to get values to the vector in RGB is concentrated on a virtual machine, and the formula for

a similarity metric is used to measure the greatest distance. The accuracy, recall, and F-measure is used to determine performance while retrieving images from the image database by generation.

4.1. Computational Complexity

The computational intricacy of poles apart was cluster technique, when assessed to determine their virtualeffectiveness, in the terms of timeerudition analysis. Clustering with the Fuzzy Based ISODATA clustering algorithm requires better steps than other clustering techniques i.e.O (.).The ability of hierarchy in clustering methods was interpreted as computational convolution equation as given.

$$o((N - \sum_{t=0}^{m-1} N_r)^2) \qquad (4)$$

Hence, N denotes the wholeamount of color pixel, m stand for the extent of cluster, and r is number of iteration on t. The enhancement with the computational complexity of optimized modified MC algorithm is able to a vitalconsequenceof extracting the clusters from the dataset, by separating themselves from the new-fangled tiger image, and thereby obtaining to reduced computational time for each successive region.

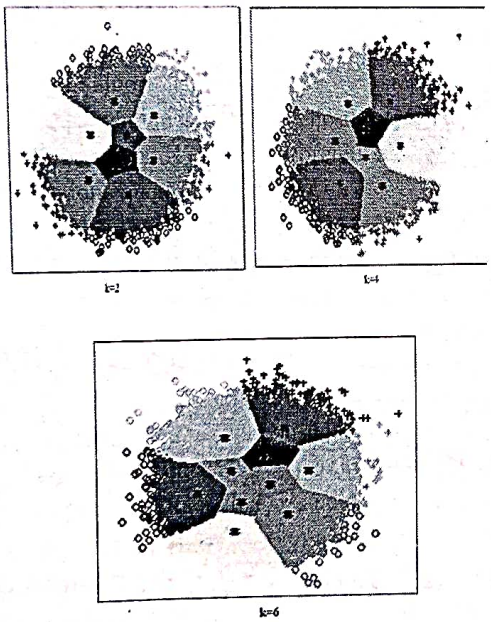


Figure 1.1: illustrate the Plot diagramon FBIC in $k = 2, k = 4, and\ k = 6$ cluster for tiger image database.

The grid plot of each database is based on the procedure values and thesamplevalues denoted from$k = 2, k = 4, and\ k = 6$ clusters that are using the enhanced clustering algorithm to be executed. In the tiger image database is shown in Figure 1.1. The formation of $k = 2, 4, and\ 6$ clusters is shown on dissimilar colors in figure 1.1 when every cluster is plotted in individualcolor patterns.

4.2. Accuracy calculation and predict the age of the tiger

That is the main distinctionamidat both the actual value and the stand for value of the fundamental mechanism that generates the data is the accuracy of the proposed method. The number of appropriatelyto segment the currentpixels is represented by the cells in either diagonal of the error matrices of (T_{ij}). The unit of measurement for overall segmentation precision can be generated from those kind of pixel value by measuring, and how many pixels in the tiger image database and the ground were classified as the same age $(\sum T_{ij})$, by separating this values on total number of pixels $(N = \sum R_i = \sum C_j)$. The following equation is given below.[2].

$$a = \frac{\sum T_{ij}}{N} \qquad (5)$$

Where: $\sum T_{ij}$becomes the whole amount of incidence was appropriatelyrecognized, and N denotes the whole amount of pixels in the error matrix. Fabricator performance has become a term referring to reliability that is widely used to measures and evaluate the percentage of correct predictions for a unit of pixels.

$$A = \frac{T_{ij}}{R_i} \qquad (6)$$

Where T_{ij}denote the numeral of aptly classified pixels in row j, $R_i$denotes the overall pixels in row j. The candidatetruthfulnessof the intrigue foundation accuracy that is calculated by analyzing a class's reference data and calculating the percentage of corrected predictions for this sample.

$$A = \frac{T_{ij}}{C_j} \qquad (7)$$

Where T_{ij}denotes the number of appropriatelyconfidential pixels in column i, $R_i$has denotes the total number of pixels in column j.

$$Age = \sum T_{ijk} \qquad (8)$$

$$Where\ 1: i = j = k,$$

$$(0: i \neq j \neq k,$$

$$i, j, k > 0.)$$

As a result, the thresholding values for color pixel-dependent pixel classification with pixel clustering and based on inferring the age of the tiger were used to predict the Tiger's Age. These estimates are evaluated by using tiger image databases, training datasets and compared to real-time camera trap image databases of a tiger in the wildlife forest.

$$d = \frac{N \sum_{i=1,j=1,k=1}^{m} T_{ijk} - \sum_{i=1,j=1,k=1}^{m} R_i . C_j}{N^2 - \sum_{i=1,j=1,k=1}^{m} R_i . C_j} \qquad (9)$$

Therefore, d is denoted on basic Euclidean distance, N is evaluated for the total number of pixels in an image, m is a number of RGB classes. Here, $\sum T_{ijk}$ is the total number of properlyclassify pixels in a tiger image. Moreover, when selecting the particular age of the tiger image, the threshold value of each color pixel was set to a specific tiger. R_i , C_j is represents with the number of pixels in the row and column.

Table 1.1: Applied FBIC with various similarity measures in one year tiger image.

Age	Similarity Measures	Precision	Recall	f-measure	No of clusters
1 year	City Block	0.91	0.96	0.935	3
	Chebychev	0.95	0.91	0.93	3
	Euclidean	0.96	0.95	0.955	3
	Minkowski	0.92	0.94	0.93	3

According to the table 1.1, data can be categorized into Age wise. The amount of clusters is uniformly set at three clusters. The highest precision is 96%, and the less precision is 91% in the first year. The recall is 96% for the highest and 91% for the less. The highest f-measure registered is 95.5%, while the lowest is 93%.Then all the measures are compared with the each individual comparisonprocedures in the table is faintly excited. Euclidean distance measures do have the utmost precision level is 96% and recall 96%, and the maximum f-measure is 95.5%, whereas city block distance measures have the lowest.

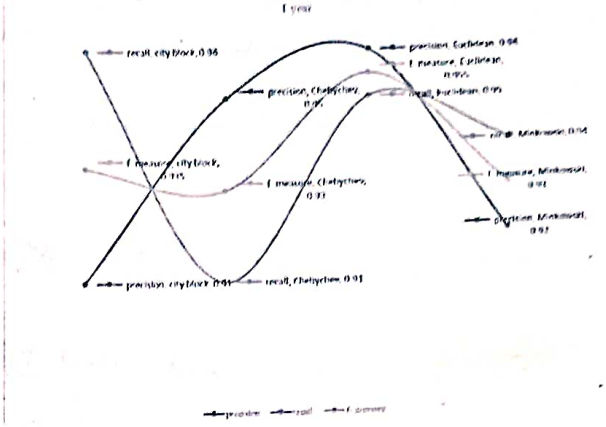


Figure 1.2: Demonstrate the various similarity metrics are used on FBIC with a sample one-year tiger image.

Here, the table 1.1 demonstrates that to predict the age of a tiger image, while evaluating similarity-based clustering accuracy and determining the similarity functions such as a city block, Chebychev distance, Minkowski distance, and Euclidean distance using clustering metrics including precision, recall, and f-measure. The figure portrays the experimental effects that are shown in figure 1.2.

Table 1.2: Applied FBIC with different similarity measures using two year tiger image.

Age	Similarity Measures	Precision	Recall	f-measure	No of clusters
2 year	City Block	0.94	0.95	0.945	3
	Chebychev	0.95	0.94	0.945	3
	Euclidean	0.96	0.97	0.965	3
	Minkowski	0.95	0.96	0.955	3

According to the table 1.2, data can be categorized into age wise. The amount of clusters is equally set at three clusters. The highest precision is 96%, and the lowly precision is 94% in the 2nd year. The recall is 97% for the highest and 94% for the lowest. The highest f-measure registered is 96.5%, while the lowest is 93%. Then all the procedures wereevaluatedin the each individual comparison procedures in the table is faintly excited. Euclidean distance measures do have the highest precision 96% and recall 97%, and the highest f-measure is 96.5%, whereas city block distance measures have the lowest.

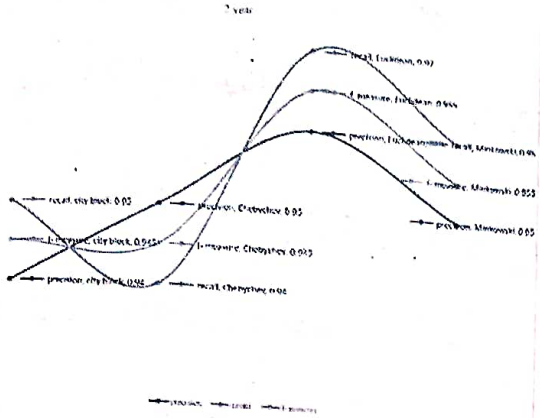


Figure 1.3: Illustrate on the verious kinds metrics applied on FBIC is tested with two year tiger image.

The above table 1.2, Illustrates that able to properly predict the age of a tiger image by identifying the full participation of which including the city block, Chebychev distance, Minkowski distance, and Euclidean distance also to be analyzing the similarity-based clustering accuracy by using clustering metrics such as precision, recall, and f-measure. Figure 1.3 illustrates the experimental effects.

Table 1.3:FBI clustering algorithm used with different clustering similarity approaches applied on 15th age of the tiger image

Age	Similarity Measures	Precision	Recall	f-measure	No of clusters
15 year	City Block	0.91	0.96	0.935	3
	Chebychev	0.96	0.95	0.955	3
	Euclidean	0.95	0.97	0.96	3
	Minkowski	0.94	0.90	0.92	3

According to the table 1.3, data can be categorized into age group wise. The number of clusters uniformly set at three clusters. The highest precision is 96%, and the lowest precision is 91% in the 15th year. The recall is 97% for the highest and 90 for the lowest. The highest f-measure registered is 96%, while the lowest is 92%. While lowest value is 93%. Then all the actions are measure uptothe each individual similarity procedures in the table is faintlyexcited. Chebyche distance measures do have the highest precision 96% and Euclidean distance of recall value is 97%, and the highest f-measure is 96.5%, whereas Minkowski distance measures have the lowest.

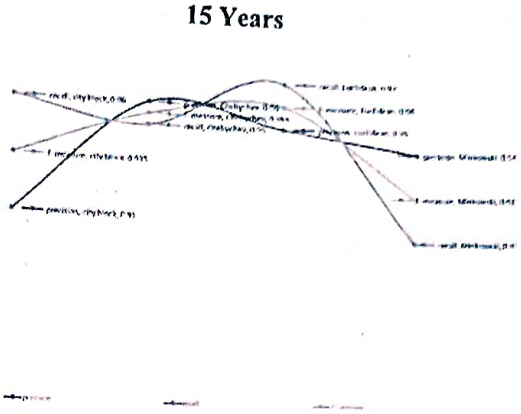


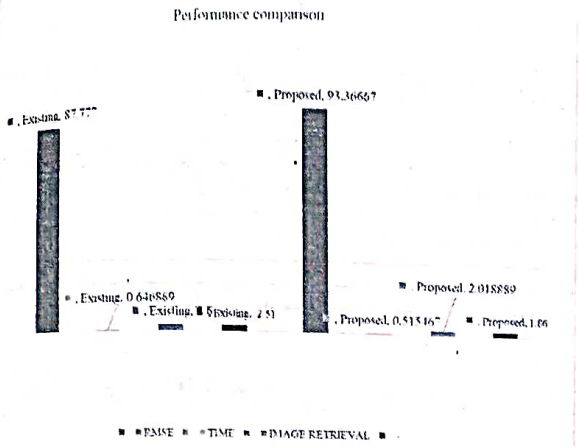
Figure 1.4: illustrate on FBI clustering algorithm used with different clustering similarity methods applied on 15th age of the tiger image

The above table 1.3, Demonstrates that by measuring similarity-based clustering accuracy and using clustering metrics like precision, recall, and f-measure, as well as identifying similarity functions like a city block, Chebychev distance, Minkowski distance, and Euclidean distance, it is possible to correctly predict the age of a tiger image. Figure 1.4 illustrates the experimental effects.

Table 1.4:Comparison of proposed clustering metrics

ACCURACY		RMSE		TIME		IMAGE RETRIEVAL	
Existing	87.777	Existing	0.646889	Existing	2.6	Existing	2.51
Proposed	93.36667	Proposed	0.515467	Proposed	2.018889	Proposed	1.86

Table 1.4 improves the consistency of each established and proposed clustering algorithm matrixes, such as the RMSE value, time estimation, and image



retrieval time. The clustering results are shown in plot format whenever the proposed algorithms that are used and generate the better result are much more accurate and effective. The proposed methods findings have the highest accuracy rating on FBIC.

Figure 1.5: Comparison of overall performance measures.

Figure 1.5, demonstrates that the consequences of the performance assessments of the Accuracy, RMSE, Time, and Image Retrieval on the tiger image database, as well as comparisons to proposed and existing methods on Accuracy, RMSE, Time, and Image Retrieval. The proposed techniques are described in Table 1.4.

V. CONCLUSION

The primaryaspiration of the progression is to inferring the age of the tiger is based on the image databases. This research work is generally focal point on the anticipatedmethod that have composed the more than 500+ real-time tiger images are calm in the wildlife forest;The various types of images of adult tigers were truly tested.Colors are being used to separate the image.Clustering is accomplished with the different age group tiger images of various ages because of various colors and skin tones and stripes. It is also divided into several parts focused on the tiger's age and color. Each image is characterized based on its age and color differences.Mostly, in the age prediction of tigers based on the color of the image of tigers, fuzzy clustering models mentioned in the following sections are included.True image tests demonstrated that the proposed method is effective to the stipulations of exactness and execution time when those are compared to recent effective in elevated appearance to the new statistical approach was processed. The product of the clustering is very efficient and effective and is conversed in the consequences sector.

REFERENCES

[1]. Md. Sohrab Mahmud, Md. MostafizerRahman, and Md.Nasim Akhtar "Improvement of K-means Clustering algorithm with better initial centroids based on weighted average" 2012 7th International Conference on Electrical and Computer Engineering 20-22, Dhaka, Bangladesh, IEEE, December 2012.

[2]. Dr. M. Ramaraj., N. Karthikeyan., "Identifying the Age of the Tiger Using Mountain Clustering Algorithm in Data Mining". Journal of XidianUniversity.ISSN: 1001-2400. Volume 14 No. 6 2020.

[3]. M. Merzougui, M. Nasri, and B. Bouali, "Image Segmentation using Isodata Clustering with Parameters Estimated by Evolutionary Approach: Application to Quality Control ", International Journal of Computer Applications, Volume 66 No.19, Pp. 25-30, ISSN: 0975 – 8887 March 2013.

[4]. HenrykPalus, and MarcinBogdonksi, "Clustering techniques in colour image segmentation", AI-METH, Artificial Intelligence Methods November2003,

[5]. Hang JIN, and Yanming FENG, "Towards an Automatic Road Lane Marks Extraction Based on Isodata Segmentation and Shadow Detection from Large-Scale Aerial Images", FIG Congress 2010, Facing the Challenges – Building the Capacity, Sydney, Australia, April 2010.

[6]. YuliyaTarabalka, JónAtliBenediktsson, and Jocelyn Chanussot, "Spectral–Spatial Classification of Hyperspectral Imagery Based on Partitional Clustering Techniques", IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING, Volume 47, NO. 8, Pp. 2973-2987, ISSN: 196-2892, August 2009.

[7]. Dr.M.Ramaraj., and Dr.S.Niraimathi., "Design and Implementations of Color Pixel Based Image Segmentation Using Enhanced Data Clustering Algorithms to Applying on Tiger Image Dataset",

International Journal of Pure and Applied Mathematics, Volume 119 No. 18, Pp. 2719-2739, ISSN: 1314-3395, 2018.

[8]. KANG Yonghui, DAI Jiguang, and WANG Guangzhe, "Adaptive fuzzy ISODATA algorithm for color remote sensing image segmentation". Computer Engineering and Applications, Volume 52, Issue 17, Pp. 198-202, ISSN: 1002-8331, 2016.

[9]. Dr. M. Ramaraj., Dr. S. Niraimathi., "Comparative Analysis of Proposed Methods for Analysing Color Pixel based Image Segmentation Using Tiger Image Dataset", International Journal of Research, Volume 7, Issue IX, and ISSN: 2236-6124, Pp. 245- 252, September 2018.

[10]. Kun Zeng , Ruimao Zhang, XiaodanLan, Yan Pan, and Liang Lin, "Color style transfer by constraint locally linear embedding", 18th IEEE International Conference on Image Processing, Pp. 1145-1148, 2011.

[11]. Dr. M. Ramaraj., Dr. S. Niraimathi., "Enhanced Image Segmentation To Infer The Age of The Tiger Using Fuzzy Modified K-Means Clustering Algorithm (FMKMCA)", Research Journal of Pharmaceutical, Biological and Chemical Sciences, Volume 10, Issue 2, Pp. 198-214, ISSN: 0975-8585, March – April 2019.

[12].LahouaouiLalaoui, TayebMohamadi, and AbdelhakDjaalab, "New method for image segmentation", Procedia- Social and Behavioural Science, No. 195, Pp. 1971-1980, 2015.

[13]. AmiyaHalder and SoumajitPramanik, "An Unsupervised Dynamic Image Segmentation using Fuzzy Hopfield Neural Network based Genetic Algorithm", IJCSI International Journal of Computer Science, Volume 9, Issue 2, Pp. 525-532, ISSN (Online): 1694-0814, March 2012.

[14]. Dr. M. Ramaraj., Dr. S. Niraimathi., "Color Pixel Based Image Classification and Clustering Using Fuzzy Methods", International Journal for Research in Engineering Application & Management (IJREAM) Vol-04, Issue-04, Pp. 225- 229, ISSN : 2454-9150 ,July 2018.

[15]. DebasishChakrabortya , SourabhSinghb and DibyenduDuttaa, "Segmentation and classification of high spatial resolution images based on Hölder exponents and variance", Geo-spatial Information Science, Volume 20, No 1, Pp. 39–45, y. Published by Taylor & Francis Group, 2017.

[16]. A. W. ABBAS, N. Minallh, N. Ahmad, S.A.R. Abid, And M.A.A. Khan, "K-Means and ISODATA Clustering Algorithms for Landcover Classification Using Remote Sensing", Sindh Univ. Res. Jour. (Sci. Ser.) Volume48 Issue 2, Pp. 315-318, 2016.

[17]. Hoel Le Capitaine, and Carl Frélicot, "A fast fuzzy c-means algorithm for color image segmentation", Aix-les-Bains, France, EUSFLAT-LFA, Published by Atlantis Press, Pp. 1074-1081, July 2011.

[18]. Dr. M. Ramaraj., Dr. S. Niraimathi., "Color Pixel Based Image Segmentation Using Enhanced Data", International Journal of Advance and Innovative Research, Volume 5, Issue 3 (VII), ISSN: 2394-7780, Pp. 83-88, July - September, 2018.

[19]. A. W. ABBAS, N. Minallh, N. Ahmad, S.A.R. Abid, And M.A.A. Khan, "K-Means and ISODATA Clustering Algorithms for Landcover Classification Using Remote Sensing", Sindh Univ. Res. Jour. (Sci. Ser.) Volume48 Issue 2, Pp. 315-318, 2016.

[20]. NameirakpamDhanachandra, KhumanthemManglem, and YambemJinaChanu. "Image segmentation using K-Means clustering algorithm and subtractive clustering algorithm" Procedia computer science, (IMCIP-2015), Pp. 764-771, 2015.

[21].NameirakpamDhanachandra, and YambemJinaChanu. "Image segmentation method using K-means clustering algorithm for color image" Advanced Research in Electrical and Electronic Engineering, Volume 2, Issue 11, Pp. 68-72, ISSN: 2349-5804, July-September 2015.

[22].NameirakpamDhanachandra and YambemJinaChanu, " A survey on Image Segmentation Methods using Clustering Techniques", EJERS, European Journal of Engineering Research and Science Volume 2, No. 1, Pp. 15-20, January 2017.

[23]. NameirakpamDhanachandra and YambemJinaChanu, "A New Approach of Image Segmentation Method Using K-Means and Kernel Based Subtractive Clustering Methods", International Journal of Applied Engineering

Research, Volume 12, Number 20, Pp. 10458-10464, ISSN 0973-4562, 2017.

[24]. Oludayo O. Olugbara, Emmanuel Adetiba, and Stanley A. Oyewole, "Pixel Intensity Clustering Algorithm for Multilevel Image Segmentation", Hindawi Publication in Mathematical Problems in Engineering, Pp. 01-19, 2015

[25]. Omer Sakarya, "Applying fuzzy clustering method to color image segmentation", Proceedings of the Federated Conference on Computer Science and Information Systems, ACSIS, Volume 5, Pp. 1049–1054, IEEE, 2015.

[26]. Preeti Rani, and Raghuvinder Bhardwaj, "An Approach of Colour Based Image Segmentation Technique for Differentiate Objects using MATLAB Simulation", International Journal of Advanced Research in Computer and Communication Engineering,Volume 5, Issue 7, Pp.553-556, ISSN: 2278-1021, July2016.

[27]. Preeti, and KompalAhuja, "Colour Image Segmentation Using K-Means, Fuzzy C-Means and Density Based Clustering", International Journal for Research in Applied Science and Engineering Technology, Volume 2, Issue VI, ISSN: 2321-9653, Pp. 31-35, June 2014.