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Enhanced Image Segmentation To Infer The Age Of The Tiger Using Fuzzy Modified K-Means Clustering Algorithm (FMKMCA).

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ABSTRACT

Tiger has become the reserve animal. Conservation of tiger has been the challenging task. This work would add a small account to the herculean task of conserving the species. This work proposes an algorithm from which the age of the tiger can be inferred. This work combines the domain of image processing with data mining to infer the age of tiger. Image processing techniques like image enhancement and segmentation plays a vital role in mining the image of the tiger. The image processing is complemented with data mining to find the age of tiger, where data mining plays the role of analyzing the statistical report of confirming the age of the tiger. Several scientific researchers have carried out their research on the tiger reserve conservation. This research work proposes a method to find the age of the tiger, using color as a parameter. Color pixel based image classification and clustering techniques has been used to identify the age of the tiger. Color histogram is easy to compute and proves to be effective in characterizing both the global and the local distribution of colors in an image. This process to be processing demands in several steps, 1. Partition of color space into cells. 2. Association of each cells to a histogram bin. 3. Counting of the number of RGB color pixels of each cell and 4. Storing this count in the corresponding histogram bin. Color image segmentation is based on the color feature of image pixels which assumes that homogeneous color in the image corresponds to separate cluster and is used for inferring. At present several researchers are into the word of image segmentation and they utilize the clustering technique. A segmentation of color image is tested with different classical color spaces, RGB, CMY, YUV, L*A*B and HSV. RGB selects the better color space for a given image. This research work mainly focuses on RGB color spaces, which is implemented to the real time tiger images. There are several clustering techniques has been applied to find the age of the tiger using a tiger image dataset. There are four new clustering techniques to be proposed for the tiger image dataset. Proposed algorithms likes Modify K-Means clustering, Fuzzy Based ISODATA clustering, Fuzzy Based DBSCAN clustering and Fuzzy Based Mountain clustering methods are discussed.

Keywords: Image Segmentation, Image Mining, Color Image Processing, Color Spaces, Clustering Methods, Fuzzy Based Clustering Techniques, Accuracy Calculation, Tiger Image Dataset.

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INTRODUCTION

Data mining is an interdisciplinary field which works on a larger set of raw data that may be used to evoke the useful data, viewed as a result of the natural evolution of the information age. The term data mining is often used to refer to the entire knowledge discovery process that discovers interesting patterns and knowledge from a large amount of data. Image mining is the process of searching and discovering valuable information and knowledge in large volume of data. Image segmentation is the process of classifying the image into completely different segment. Image mining is more than just an extension of data mining,

The cardinal role of image mining is to discover the means of an effective processing of low-level pixel representation, contained in a raw image, or image sequence, to arrive at high level spatial objects and relationships. Color image segmentation is based on the color feature of image pixels which assumes that homogeneous color in the image corresponds to separate cluster and is used for inferring. Each cluster defines a class of pixels that share similar color properties and the segmentation results depends on the color space. There is not only single color space that is an outcome result for all kind of images. At present several researchers are into the word of image segmentation and they utilize the clustering technique. A segmentation of color image is tested with different classical color spaces, RGB, CMY, YUV, L*A*B and HSV. RGB selects the better color space for a given image.

Image segmentation is one of the important methods to classify the pixels of an image correctly in a decision oriented application. It divides an image into a number of discrete regions such that the pixels have high similarity in each region and high contrast between regions, proving to be a valuable tool in health care, image processing, traffic image and pattern recognition etc. There are different methods for image segmentation like threshold based, edge based, cluster based and neural network based, of which one of the most efficient method is the clustering method. Then again there are different types of clustering like K-means clustering, Fuzzy C-means clustering, Mountain clustering and subtractive clustering methods. One of the often used clustering algorithm is the k-means clustering. It is quite simple and computationally faster when compared to the hierarchical clustering. It can also work with the large number of variables. It is a valuable tool in various fields including health care, image processing, traffic image and pattern recognition etc. There are different methods for image segmentation like threshold based, edge based, cluster based and neural network based, of which one of the most efficient method is the clustering method. Then again there are different types of clustering like K-means clustering, Fuzzy C-means clustering, Mountain clustering and subtractive clustering methods.

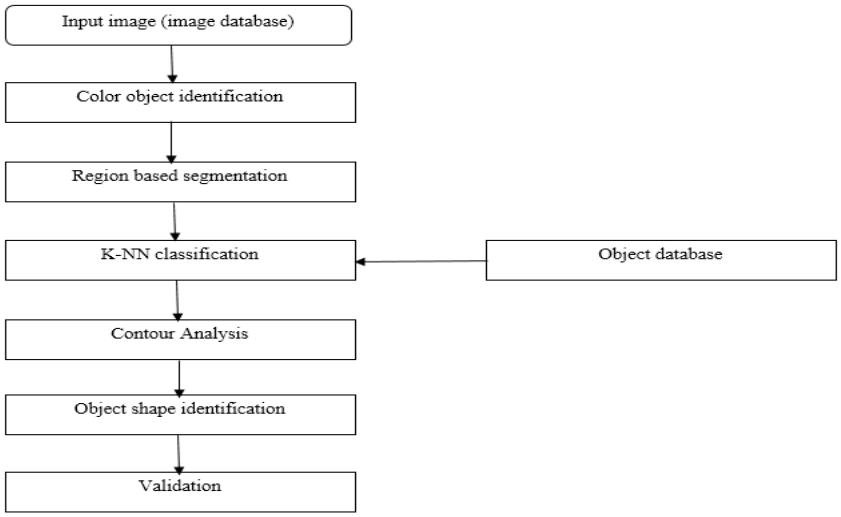

Figure 1: Color classification using 1N Rule

Figure 1 is represents the retrieval of an image from the tiger image database, which helps on the query image processing (CBIR), the color classification using K-NN and K-Means will be applied for color image. The role of contour analysis is to draw the object in the same color pixels in the image to various object

shapes, which will be generated. Color images are mainly represents the color information of each pixel composing them. Image processing can be said to increase the perception properties of an image, may it be noise removal, enhancement and segmentation, all these features are well attained by the image processing techniques.

BASIC INFORMATION ABOUT TIGER

The tiger happens to be the largest member of the felid (cat) family. They sport long, thick reddish coats with white bellies and white and black tails. Their heads, bodies, tails and limbs have narrow black, brown or gray stripes. There were once nine subspecies of tigers: Bengal, Siberian, Indochinese, South Chinese, Sumatran, Malayan, Caspian, Javan and Bali. Of these, the last three are extinct, one is extinct in the wild, and the rest are endangered.

Tigers occupy a variety of habitats from tropical forests, evergreen forests, woodlands and mangrove swamps to grasslands, savannah and rocky country. They are mostly nocturnal (more active at night) and are ambush predators that rely on the camouflage their stripes provide. Tigers use their body weight to knock prey to the ground and kills with a bite to the neck. They are also very good swimmers and have been known to kill prey while swimming.

Tigers essentially live solitary lives, except during mating season and when females bear young. They are usually fiercely territorial and have and mark their large home ranges.

TYPES OF TIGERS IN FOREST

There were once nine subspecies of tigers: Bengal, Siberian, Indochinese, South Chinese, Sumatran, Malayan, Caspian, Javan and Bali. The last three are extinct.

AGE OF THE TIGERS

By use for this study to age of the tigers into six groups as following,

1. Cubs<12 months
2. Juveniles 1-2 years
3. Sub-adult 2-3 years
4. Young-adult 3-5 years
5. & 6. Prime-adult 5-10 years, old-adult >10 years above. The reference page gives the detail information about the age of the tiger.

LITERATURE REVIEW

There have been many works done in the area of image segmentation by using innumerable methods and many are done based on different applications of image segmentation. K-means algorithm is one of the simplest clustering algorithm of which many methods are implemented differing in the process to initialize the center. Lot of research is done in this domain. Which gives better segmented results. Some of the recent methodologies proposed are as follows:

Clustering Algorithms for Color Image Segmentation

Y.V.Jhala et al. 2017 has described how the find the age of the tiger in his paper “the field guide aging tigers. He has categorized tigers into six groups of which the categorization is as follows a) cubs<12 months, b) juveniles 1to 2 years, c) sub-adult> 2 to 3 years, d) young adult> 3 to 5 years, e) prime adult >5 to 10 years, f) old >10years above. Field ageing of carnivores has been done using body characteristics and measurements on body size, teeth eruption, wear and colorations, nose pigmentation and the gum-line recession to age tigers in the field.

Nameirakpam Dhanachandra et al. 2015, has presented the segmentation of image classification using different clustering methods and one is most popular methods a K-Means clustering algorithms are used

in the segmentation process. When this method has been applied to the RGB color spaces, as done on color image segmentation using K-Means clustering algorithm. This process is to handle with pixel values of the images are transformed using the cumulative distribution function. The main reason of research work is to improve the time complexity.

K.A. Abdul Nazeer et al. 2014, describes an enhanced algorithm to improve the accuracy and efficiency of the K-Means clustering algorithm.

Namrata et al. 2013, describes contour analysis as a method to describe, store, compare and find the object presented in the form of exterior outlines and solve the main problem of a pattern recognition-transposition, turn and a rescaling of the image object.

Tajul Islam et al. 2017, has presented color image segmentation using automated k-means clustering with RGB and HSV color spaces. The combined segmentation of RGB and HSV color spaces give more accurate segmentation results compared to segmentation of single color space our main objectives while segmenting images of different kind like using the RGB color space IS**O**DATA method was developed by Ball, Hall and others in the 1960s.

M. Nasri et al. 2013, describes a segmentation method based on pixel classification by ISODATA algorithm and evolution strategies is proposed. ISODATA algorithm is an unsupervised data classification algorithm. The ISODATA method in which added division of a cluster, and processing of fusion of the K-means method. The individual density of a cluster is controllable by performing division and fusion to the cluster generated from the K-means method.

Oka Sudana et al. 2018, has presented the Image clustering of complex balinese character with DBSCAN algorithm, is unique in its almost identical form, and some writings are distinguished by a single line stroke. Cluster-based image segmentation uses multidimensional data to group image pixels into multiple clusters. Generally, those pixels are clustered based on pixel distance proximity. DBSCAN (Density-Based Spatial Clustering of Application with Noise) algorithm is suitable for clustering process. DBSCAN is an algorithm that builds high-density areas into clusters and finds clusters of any kind in a spatial database containing noise inside and variations in minimum point value (*minpts*) and epsilon (*eps*) values.

Nishchal K. Verma et al. 2009, proposed an Improved Mountain Clustering (IMC) based medical image segmentation. The proposed technique is a more powerful approach to X-Ray image based diagnosing diseases like lung cancer and tuberculosis. The performance of all these segmentation approaches is compared in terms of cluster entropy as a measure of information. The segments obtained from the methods have been verified visually.

METHODOLOGY

Clustering is the process of grouping objects in such a way that objects of one group are more identical to one another than to the objects of a different group. Based on the approach used for clustering objects, clustering algorithms are classified into two prototype and density based clustering. Prototype based clustering algorithms form clusters based on the similarity of objects with respect to randomly selected initial prototypes (most reference object in the cluster) whereas density based clustering algorithms form clusters by considering variation in object densities present in the tiger image dataset.

COLOR IMAGE PROCESSING

Color is powerful descriptor that often simplifies object identification and extraction from a scene. In an image analysis performed by human beings, the motivation for color is that human eye can discern thousands of color shades an intensities or compared to a both only two dozen shades of gray. Color image processing is divided into two major areas, full color processing and pseudo color processing.

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COLOR IMAGE SEGMENTATION

Color image segmentation that is based on the color feature of image pixels assumes that homogeneous colors in the image correspond to separate clusters and hence meaningful objects in the image. In other words, each cluster defines a class of pixels that share similar color properties. As the segmentation results depend on the used color space, there is no single color space that can provide acceptable results for all kinds of images. In this work, a segmentation of color images is tested with different classical color spaces, HSV, RGB , L*A*B , CMY, YUV and YCbCr to select the best color space for the considered kind of imagesThe color of each pixel in an image is characterized by three components R, G and B. There are several color spaces available that represent the color of the pixels. The color spaces such as Red Green Blue (RGB), Hue, Saturation, and Value (HSV), XYZ and luminance (Y), hue (I) and saturation (Q) (YIQ) are more suitable for image retrieval. These color spaces have their own properties, which can be efficiently taken into account in order to make the final combined color spaces more reliable than the individual color space.

TYPES OF COLOR SPACES

There are three color spaces. 1). Primary color. 2). Secondary color spaces. 3). Tertiary color spaces.

Primary color spaces

Red, Blue and Yellow are considered that the primary colors, because they are pure colors, which are beyond production by mixing other colors. Since, it can arrived at any color by mixing these three colors in different proportions and these rightly identified as primary colors.

Secondary color spaces

They mix two primary colors in equal parts, it get the secondary colors via, violet, green and orange.

Tertiary color spaces

By mixing primary color and secondary color in equal proportion and they get the tertiary colors.

IMAGE PIXELS

Pixel is the minutest component of an image. Each solitary pixel have an individual assessment. Digital images are used unknown data, which indicates the values of Red, Green and Blue at a specific position on a grid of pixels. A separate colors that can epitomized by a pixels depends on the extent of data to be stored for each pixel. Pixels are denoted by 8-bit gray value, range of the value of pixels between 0 and 255. The value of a pixel at any point correspond to the intensity of the light photons striking at that point. Each pixel store a value proportional to the light intensity at that particular location. Pixels at any point denotes the intensity of image at that location, and that is also known as gray scale value.

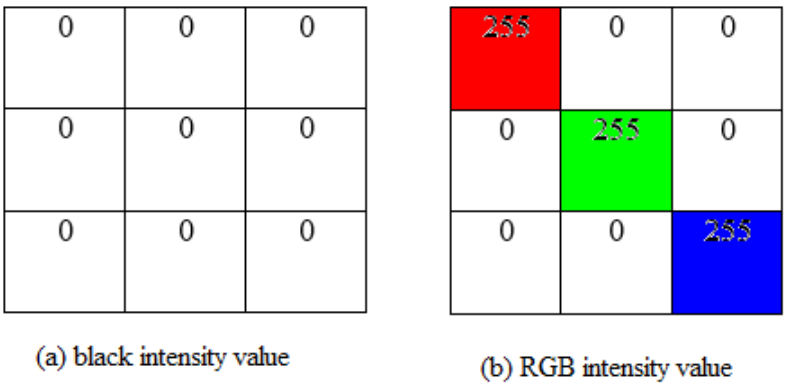

Figure 2: matrix represented by the black and RGB intensity value

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Each pixel can have only one value and each value denotes the intensity of light at that point of the image. The value 0 means absence of light. It means that 0 denotes dark, and it further means that whenever a pixel has a value of 0, it means at that point, black color would be formed. As shown the figure 2 (a). The pixel range value is starting with 0 to 255 and grouping with each pixel has been representing with array value. Example R= [255 0 0] this is a red value, G= [0 255 0] and B= [0 0 255]. To change the RGB value in each array will be generate the different color in a pixels. As shown the figure 2 (b).

The 'indexed color model' is generally used with the RGB model to reduce file sizes. This is a reduced version of the amount of colors in the graphic and only supports up to 256 colors. The number of bits used to represent each pixel in RGB space is called the pixel depth. It consider an RGB image in which each color of Red, Green, and Blue images is an 8-bit images. The full color image is used often is to denote a 24-bit RGB color image. The total number of colors in a 24-bit RGB color image is $(2^8)^3$=1, 67, 77, 216 as a possible colors in an RGB image.

MEGAPIXELS

Megapixels refer to the total number of pixels in the captured image, an easier metric is raster dimensions which represent the number of horizontal and vertical samples in the sampling grid. An image with a 4:3 aspect ratio with dimension 2048x1536 pixels, contain a total of 2048x1535=3,145,728 pixels; approximately 3 million, thus it is a 3 megapixel image.

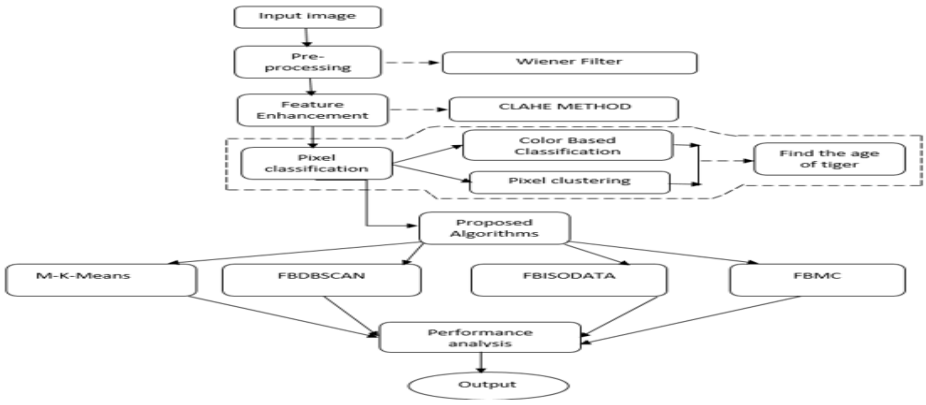

Figure 3: Overall process diagram for the proposed methods- a step by step process.

As shown in Figure 3, the image under consideration is a TIGER image database, which includes the querying facility namely the CBIR (Color Based Image Retrieval). After the image has been retrieved the pre-processing operation begins in which the filtering techniques are applied. The filtering technique used here is the wiener filter. When the pre-processing techniques are applied on color pixel or color image to remove the unwanted noise from the image or pixels. Wiener filters are often applied in the frequency domain. The wiener filter recovers the image by inverse filtering method. After filtering is applied feature selection operation begins by contrast enhancement using CLAHE (CONTRAST LIMITED ADAPTIVE HISTOGRAM EQUALIZATION METHOD) method. To enhance the image or pixel quality to use of enhancement techniques on CLAHE method. This method is used for improving the image or pixel quality of the real time TIGER image dataset. Clustering method, then plays the role of separating the pixels of the same color. For clustering k-means algorithm is used. After this process will be completed to infer the age of the tiger, it helps to pixel classification and clustering task is support to find the age of the tiger. The clustering methods like Enhanced K-Means clustering Algorithm, Fuzzy Based algorithms as DBSCAN/ ISODATA/Mountain Clustering methods for carrying our proposed work and clustering results to generate the better result of the method.

Fuzzy DBSCAN Clustering Algorithm

FDBSCAN stands for Density-based spatial clustering of applications with noise. Density-Based Spatial Clustering of Applications with Noise (DBSCAN) is most widely used density based algorithm. It is widely used in network security and data mining. Density reachability and density connectivity are used concept in

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DBSCAN. Density Reachability - A point "p" is said to be density reachable from a point " ε " if point "p" is within ε distance from point " ε " and " ε " has adequate number of points in its neighbors which are within distance ε. Density Connectivity - A point "p" and " ε " are said to be density connected if there exist a point "c" which has adequate number of points in its neighbors and both the points "p" and "ε" are within the ε distance. The advantage is, it does not require an apriori requirement of number of clusters and it is able to identify noise data while clustering.

```
Fuzzy DBSCAN Algorithm:
Given: p // points just marked as visited. //
Input: c,ε, // c is an classification and epsilon is an distance function//
        Initialize: neighborsPts, minPts, maxPts. // calculate the core density points.//
        Set: p to c membership of FDBSCAN (p) =μ_minPts(|neighborsPts|).
                For p' to ε neighborsPts do
                        If p' then // is not an unclassified//
                        Else mark p' is an unclassified.
                neighborsPts' = regionQuery(p', ε)
                        If(sizeof(neighborsPts')>minPts then
                neighborsPts= neighborsPts ∪ neighborsPts'
        Update
                p' to c with FDBSCAN (p') = μ_maxPts(|neighborsPts'|)
                End
                If p is not a membership of FDBSCAN then
                        p' to c // is an border points of c. //
                End
        End
End
```

Figure 4: Fuzzy DBSCAN Algorithm.

The minimum number of points for the proposed approach purely depends on the size of an image. Consider that the size of the image is p*c, then the minimum number of points are estimated as given:

$$minPts = \frac{p*c}{256} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where M, N are the size of the pixel image, 256 is the grey level value.

- Load the image dataset.
- Assign input parameters ε1, ε2 and f
- Initialize i = 0 and set the cluster assignment for all points as unassigned
- For each point p in the dataset:
  - Calculate cardinality of p by applying f to all points within distance epsilon p.
  - If cardinality (p) ≥ ε2
    - Assign p as a fuzzy core point
    - Start a new cluster C_i and assign p to C_i
    - Find all points within ε1 distance of p and add to seed set S
    - For each point q in the S
      - Assign q to Ci
      - If cardinality q≥ ε2
        - Assign q as fuzzy core point
        - Find all points within ε1 distance of q and add to seed set S.
    - Set i = i + 1
- Mark all the points which remain unassigned as noise.
- End.

Figure 5: Fuzzy Based DBSCAN Clustering algorithm.

To gain the global values autonomous from the range of pixel data, for parameters of *ε* and *MinPts*the data are normalized and *ε*value between [0, 1] is obtained to suppress the scale-dependency problem. Minpts used in conventional dbscan is replaced with a new global parameter known as

Minpts= $\varepsilon 2.w^{max}$
$\varepsilon 2 = \xi = MinPts/w_{max.}$ For a constant $\varepsilon 1$, the fuzzy neighborhood set of point $x \in X$ is formed by:
$FuzzyN(x; \varepsilon 1) = \{<y, Nx(y)> | y \in X, Nx(y) \geq \varepsilon 1\}$…… (1)
A fuzzy core point is obtained by the following equation:
$cardFuzzyN(x; \varepsilon 1, \varepsilon 2) \equiv \sum_{y \in N(x; \varepsilon 1)} Nx(y) \geq \varepsilon 2$…… (2)

$max_{i=1..n}\ w_i$, is the neighborhood set cardinality of the point $x_i$for a fixed ε_1, i.e., $w_i = |N(x_i \varepsilon_1)|$ where $|N(x_i; \varepsilon_1)|$ indicates the fuzzy cardinality of the set $N(x_i; \varepsilon_1)$. The function *Nxi* could be any fuzzy neighborhood function and the result of the process could be different according to its selection. Similarly, $\varepsilon 2$ is obtained by

This phase of research work is to transform DBSCAN algorithm to the Fuzzy Based DBSCAN algorithm and using the benefit of fuzzy sets theory is plausible. Consequently, the Fuzzy Based DBSCAN method could be more robust to the scale and density variations within the real time tiger image dataset. The Fuzzy Based DBSCAN clustering algorithm is shown in the figure 5:

Fuzzy Mountain Clustering Algorithm

The mountain clustering method is a grid- based procedure for determining the approximate locations of cluster centers in data sets with clustering tendencies. The efficient approach to approximate estimation of cluster centers on the source of a density measure called the mountain function. The rules that are associated with higher values of the peaks of the mountain function determined. From the centers of the clusters that are obtained by the mountain function process are determinant the initial estimates of the parameters of the reference antecedent and resultant fuzzy sets of the principles.

$$M(v) = \sum_{i=1}^{N} \exp\left(-\frac{\|v - x_i\|^2}{2\sigma^2}\right) \quad \text{……. (3)}$$

Where $x_i$the ith data point and σ is an application specific constant implies that each data point x_i contributes to the height of the mountain function at v, and the contribution is inversely proportional to the distance between $x_i$and v. The mountain function can be viewed as a measure of data density. The constant s determines the height as well as the smoothness of the resultant mountain function. This procedure of updating the mountain capacity and decision the following bunch focuses proceeds until the point when an adequate number of group focuses are accomplished.

- Load the image dataset.
- Assign the input parameter as α and β.
- Select the random position of fuzzy partition k.
- Compute the cluster density using histogram function.
- Strong uniform fuzzy partition to calculate the estimate fuzzy mountain function based cluster density.

$$(X \mid U, V) = \sum_{i=1}^{n} \sum_{k=1}^{c} u_{ki}^{m} \|x_i - v_k\|^2 \rightarrow \min, \quad m \geq 1$$

$$\sum_{k=1}^{c} u_{ki} = 1, \quad i = 1..n$$

- Update the cluster density

$$M_t(x_j) = M_{t-1}(x_j) - M^* e$$

- Re-estimate the cluster density values

$$\frac{M_t^*}{M_0^*} < \gamma$$

where γ: threshold to stop the cluster center selection.

- End.

Figure 6: Fuzzy Based Mountain Clustering Algorithm.

MODIFIED K-MEANS ALGORITHM

This algorithm partitions the entire space into unique segments and calculates the frequency of data point in every segment. The segment which has maximum frequency of data point can have the maximum probability to contain the centroid of cluster. Similar like the traditional K-mean algorithm the number of cluster's centriod (k) will be provided by the user and the number of divisions will be k*k ('k' vertically as well

as 'k' horizontally).A simple data structure is required to store some information in every iteration, which is to be used in next iteration. This technique avoids calculating the distance of each data object to the cluster centers repeatedly and thus the running time is saved. This technique can effectively recover the speed of clustering and accuracy, reducing the computational complexity of the K-means.

- Load the image dataset.
- Initialize the k fuzzy cluster centers randomly.
- Assign the input parameter as m and number of cluster is K and membership parameter is U_{ki}.
- Calculate the cluster distance K, $d^2(x_i, c_k)$ is the distance from x_i, controls c_k.
- Find the cluster data points K and m, U_{ri} is the membership function.
- To minimize the cost function, membership degrees and cluster centers.
- While the stop condition is not satisfied do.
- Compute the membership matrix U_{ri} according to the step 5.
- Update the fuzzy cluster centers, according to the step 6.
- End.

Figure 7: Fuzzy Based Modified K-Means Clustering Algorithm.

Fuzzy Based ISODATA Clustering Algorithm

The third phase of research work is based upon ISODATA clustering algorithm is called Fuzzy Based ISODATA clustering algorithm. The algorithm can only cluster object into specific classes, but can't discriminate whether classes meet the "meaningful distance". Based on this, reference sample system and investigation sample will be collected to be cluster. The Fuzzy Based ISODATA clustering algorithm is shown in the figure 8:

- Load the image dataset.
- Initialize the input parameters as indicate U^* and object reference samples U_{ij}^*.
- Standardize the data of original characteristic indicators matrix U^* by range method to get U, define $M_j = max(U_{1j}^*, U_{2j}^*, \ldots, U_{nj}^*) = min(U_{1j}^*, U_{2j}^*, \ldots, U_{nj}^*)$ for column j of U^*, calculate U_{ij}^*.
- Start iterative operation based on original cluster center matrix $V^{(0)}$ of reference sample $r^{(1)}$

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

where c is on behalf of classes member.

- Modify cluster center matrix for $r^{(l)}$, $V^{(l+1)} = (V_1{}^{(l+1)}, V_2{}^{(l+1)}, \ldots V_c{}^{(l+1)})^T$.
- Repeat step 3), compare and, for given $r^{(l)}$ *and* $r^{(l+1)}$ *for a given* precision $\varepsilon > 0$, if $\max\left\{r_{ik}^{(l)} - r_{ik}^{(l+1)}\right\} \le \varepsilon$.
- Update the optimal cluster center matrix, $V^* = (V_1{}^*, V_2{}^*, \ldots V_c{}^*)^T$, $\forall u_k \in U$, object u_k should be classified to class i.
- End.

Figure 8: Fuzzy Based ISODATA Clustering Algorithm.

RESULTS AND DISCUSSIONS

Clustering is based on the age and color of the image of the tiger which has been already segmented. In order to check the performance of our color image segmentation approach, the real time tiger image data sets has been used. The data sets are collected from various resources on the web page and the data set has varying types of size and colors of images.

This paper focuses on the system that have collected 500 different images of an adult tiger. The image is differentiated by colors. Clustering is done on the different age group of tigers and with the different skin color and stirpes. It is segmented based on different ages and colors of the tiger. By clustering, each images are grouped by its difference in the age and color. Clustering is based on the age and color of the image of the

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tiger which has been already segmented. In order to check the performance of our color image segmentation approach, the real time tiger image data sets has been used. The data sets are collected from various resources on the web page and the data set has varying types of size and colors of images. The images differ in the format such as .gif, .jpg, .png, .trf.

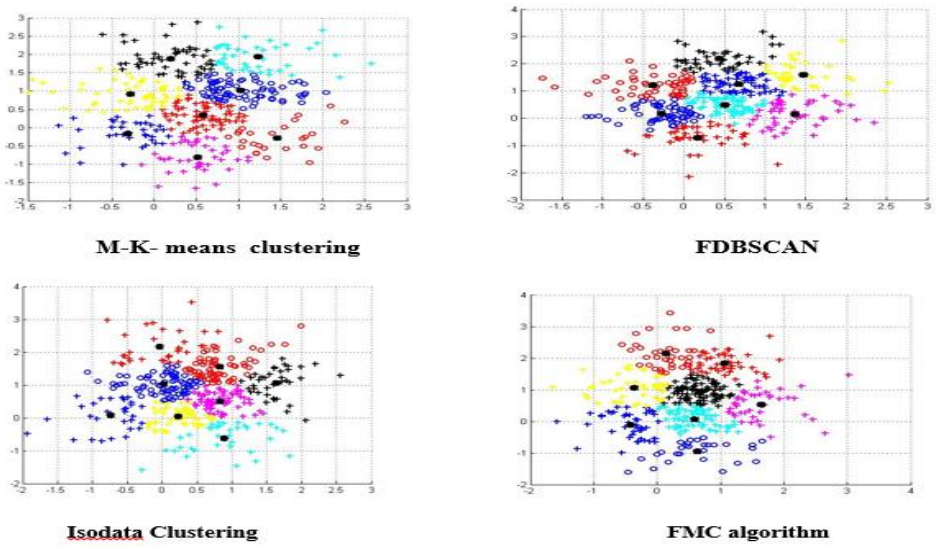

Figure 9: Data clustering for the proposed algorithms

The figure 6 represents the data clustering for proposed methods like M-K-Means, FBDBSCAN algorithm, FBISODA TA clustering algorithm and FBM clustering algorithm and these are the proposed algorithm to process with original tiger image dataset. Every clustering method is highly efficient to cluster the data that resulting in better performance of which inturn the results in better clusters .

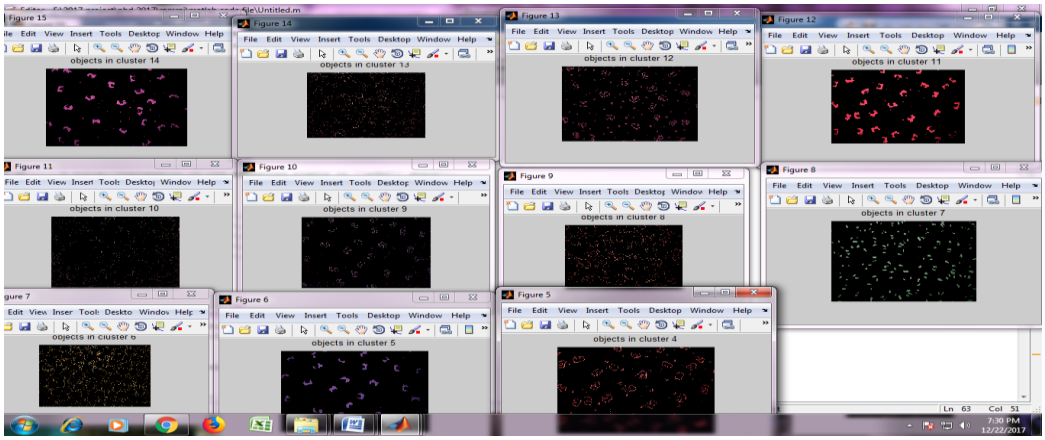

Figure 10: Color Pixel Classification using 1N Rule.

The above figure 10 is represented by the segmentation of color object to the color image segmentation. Color pixel is separated into the color image, color images has adapted into multiple color pixel in the single image and it separates the individual color pixels to the separate window.

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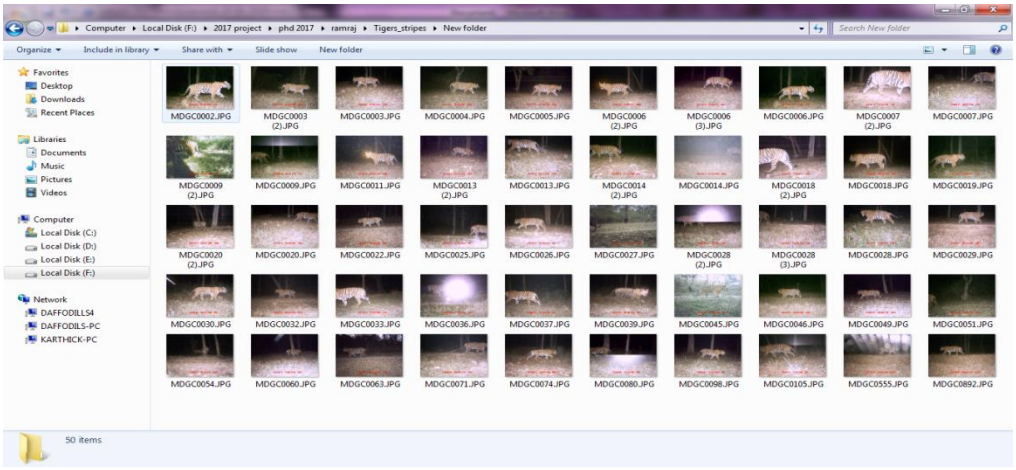

Figure 11: Real Time Tiger Image Dataset.

The above figure 11 shows that the real time tiger image dataset. To collect the various resources on the tiger image and it stores the image database. This work inculcates the collection of nearly 500 images of the tiger, of which the images fall under different age groups.

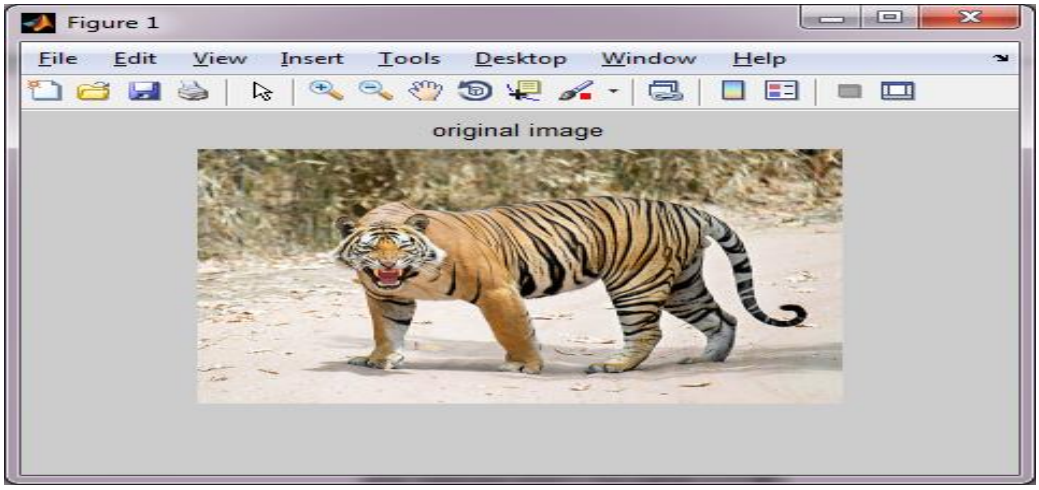

Figure 12: Original Input Image.

Pre-Processing

The pre-processing stage is based on removing unwanted noise from the image or pixels. The Wiener Filter can be a pre-processing or post processing methodology. The Wiener Filter often applied in the frequency domain. The Wiener Filter is the MSE-optimal stationary linear filter for images degraded by additive noise and blurring. The Wiener Filtering executes an optimal tradeoff between inverse filtering and noise smoothing. It removes the additive noise and inverts the blurring simultaneously, as shown in figure 13.

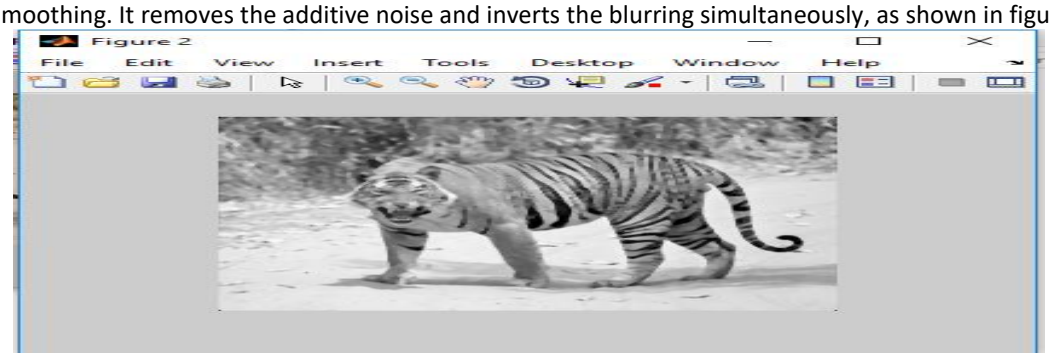

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Figure 13: Applying the Wiener Filtering techniques for preprocessing stage.

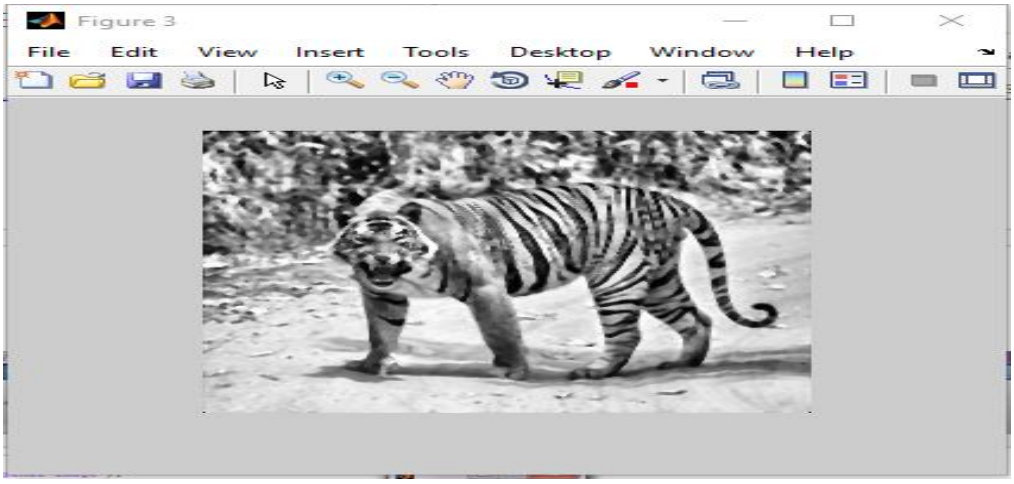

Figure 14: Applying for CLAHE Method.

The CLAHE enhancement method is as shown in figure 14. Contrast enhancement is a process that makes the image features stand out more clearly by making optimal use of the color available on the display or output device. Contrast manipulations involve changing the range of values in an image in order to increase contrast. The following method, CLAHE is used to improve the visibility level of foggy image or pixels. The CLAHE enhancement method is employed to improve the quality level of the real time images of tiger.

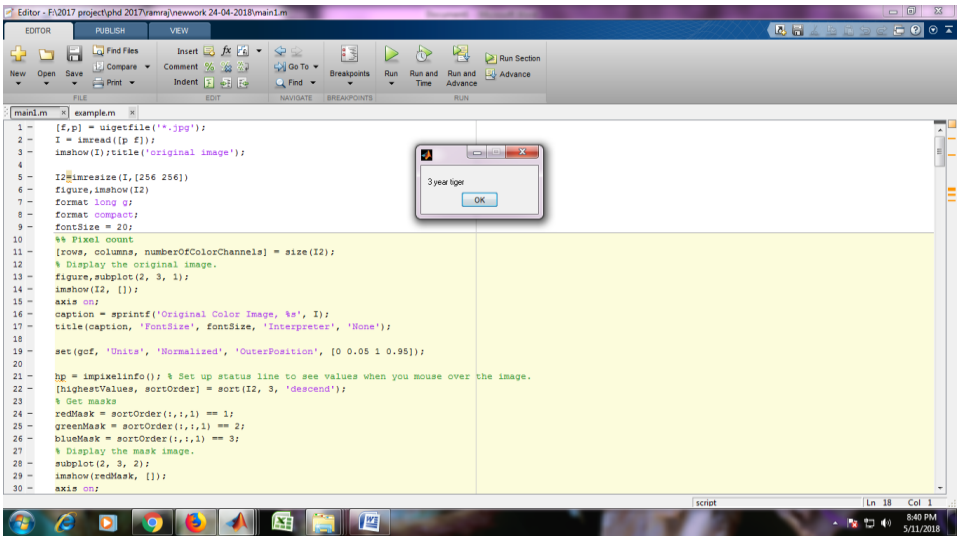

Figure 15: find the age of tiger and it is based on original image.

As shown in Figure 15, finds the age of tiger based on the input original image as shown in figure 12. The age of the tiger is calculated based on the parameter of its skin color. The skin color is based on RGB value, and the pixel value of color is calculated.

ACCURACY CALCULATION

The accuracy of a test is its ability to differentiate the tiger based on its age. The age is calculated based on the skin color of the pixel of the image of the tiger. To estimate the accuracy of a test, we should calculate the proportion of true positive and true negative in all evaluated condition. Mathematically, this is basically used formula

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$$AC = \frac{TP+TN}{TP+TN+FP+FN} \quad \text{.....(4)}$$

Table 1, 2 and 3: Data clustering for existing and proposed methods on 10 to100 iteration to the real time tiger image dataset (Accuracy, Time Period Calculation, and RMSE).

RMSE CALCULATION

Root Mean Square Error (RMSE) is the standard deviation of the residuals (prediction errors). Residuals are a measure of how far from the regression line data points are; RMSE is a measure of how spread out these residuals are. In other words, it tells you how concentrated the data is around the line of best fit. Root mean square error is commonly used in climatology, forecasting, and regression analysis to verify experimental results.

$$\mathrm{RMSE}_{fo} = [\sum_{i=1}^{N} (z_{f_i} - z_{o_i})^2 / N]^{1/2}$$

Algorithms					
Iteration	**K- Means**	**E.K-Means**	**FISODATA**	**FDBSCAN**	**FMC**
10 iteration	85.6	89.5	92.3	93.5	94.6
20 iteration	84.6	86.5	91.3	92.5	94.6
30 iteration	86.6	89.5	91.3	92.5	94.6
40 iteration	87.7	90.5	93.3	95.5	96.6
50 iteration	89.4	90.5	94.8	92.7	94.2
60 iteration	89.7	91.5	92.3	94.5	96.4
70 iteration	87.6	86.6	93.4	92.3	95.4
80 iteration	90.6	92.5	95.3	95.8	96.8
100 iteration	92.4	92.3	96.3	94.2	97.6
Total Average Accuracy	**88.24444**	**89.93333333**	**93.36666667**	**93.72222222**	**95.64444444**

Algorithms					
Iteration	**K- Means**	**E.K-Means**	**FISODATA**	**FDBSCAN**	**FMC**
10 iteration	3.6	3.1	2.7	2.4	1.8
20 iteration	3.5	3.2	1.6	2.1	1.7
30 iteration	3.2	2.8	2.4	2.1	1.8
40 iteration	3.3	2.8	2.5	2.1	1.6
50 iteration	3.6	3.1	2.8	2.6	2.1
60 iteration	3.4	2.7	2.4	1.6	1.4

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70 iteration	3.52	1.56	1.43	2.56	1.32
80 iteration	3.52	1.56	1.66	1.5	1.1
100 iteration	2.43	1.12	0.74	1.62	0.32
Total Average Time Per Sec	**3.341111111**	**2.437777778**	**2.025555556**	**2.064444444**	**1.46**

Error Rate	**Algorithm**				
	Iteration	**K-Means**	**M-K-Means**	**FISODATA**	**FDBSCAN**	**FMC**
	10 iteration	0.723	0.683	0.6234	0.542	0.421
	20 iteration	0.692	0.653	0.586	0.549	0.514
	30 iteration	0.623	0.584	0.523	0.489	0.472
	40 iteration	0.632	0.572	0.546	0.519	0.495
	50 iteration	0.623	0.583	0.523	0.476	0.432
	60 iteration	0.642	0.615	0.543	0.516	0.463
	70 iteration	0.678	0.464	0.452	0.415	0.413
	80 iteration	0.617	0.569	0.538	0.492	0.402
	100 iteration	0.605	0.4312	0.412	0.402	0.396
	Total Average error Ratio	0.648333333	0.572688889	0.527377778	0.48888889	0.4453333

The above table 1, 2 and 3 shows that the data clustering for existing and proposed methods like K-Means, M-K-Means, FBDBSCAN, FBISODATA, FBMC is 10 to 100 iteration for the real time tiger image dataset. As to calculate the Accuracy, Time Period and RMSE for the given dataset. These algorithms are compared taking in to account both accuracy and time period calculation for the real time tiger image dataset. Where the FBMC algorithm accuracy level is higher than the other algorithms and less execution time is taken on these algorithm. When these algorithms are compared with the other algorithms and much efficient result to be generate the FBMC.

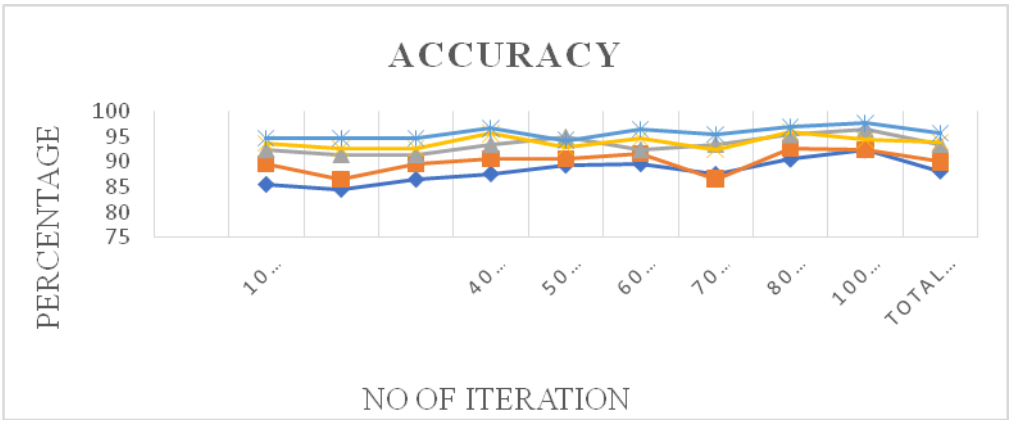

Figure 16: Overall accuracy chart on data (tiger image dataset) clustering for existing and proposed methods as 10 to 100 iteration.

The above figure 16 shows that the data clustering for 10 to 100 iteration compared with the accuracy of Existing and Proposed methods as K-Means, M-K-Means, FBDBSCAN, FBISODATA and FBMC clustering. The accuracy chart is figurated on table 1.

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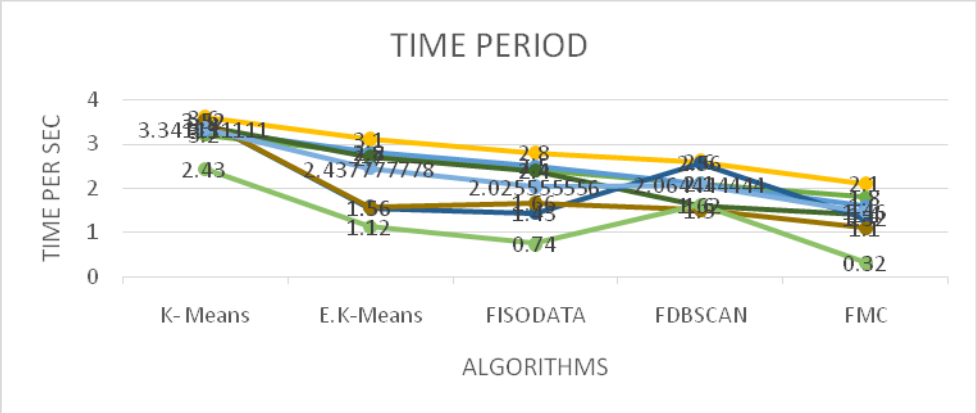

Figure 17: overall time period calculation for the real time dataset (tiger image), data clustering with the existing and proposed methods on 10 to 100 iterations.

The above figure 17 shows that the data clustering for 10 to 100 iteration compared with the time period calculation of Existing and Proposed methods as K-Means, M-K-Means, FBDBSCAN, FBISODATA and FBMC clustering. The overall time period calculation is based on table 2.

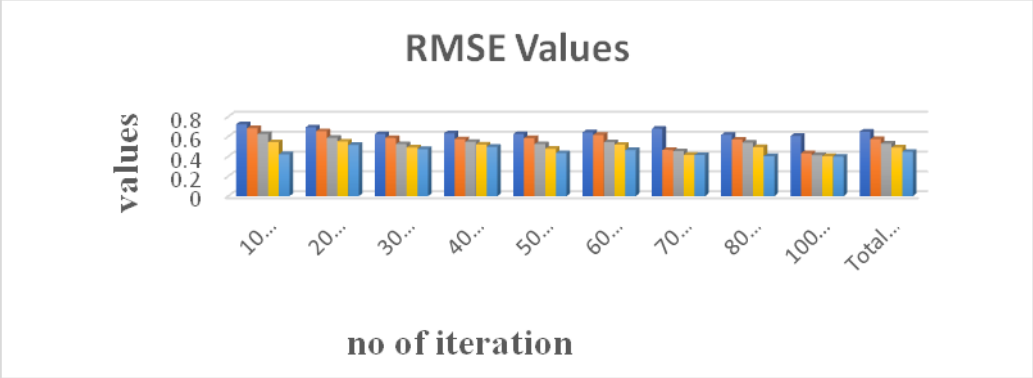

Figure 18: RMSE value for the real time tiger image dataset.

As shown in the figure 18, to find the RMSE value for the real time tiger image dataset, the iteration compared with 10 to 100 of existing and proposed algorithms like K-Means, M-K-Means, FISODATA, FDBSCAN and FMC clustering. The overall RMSE value is based on table 3.

IMAGE RETRIEVAL TIME

Table 4: Image retrieval time is taken by existing and proposed algorithms is based on tiger image dataset.

IMAGE RETRIEVAL TIME		
ALGORITHMS	K-Means	2.6
	M-K-Means	2.12
	FISODATA	1.86
	FDBSCAN	1.45
	FMC	1.2

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The above table 4.4 shows that the image retrieval time is taken by Existing and Proposed methods like K-Means, Modified K-Means, FBISODATA, FDBSCAN and FBMC is the real time tiger image dataset. These algorithms are compared taking into account the time period calculation for the real time tiger image dataset. When these algorithms are compared with the other algorithms and much efficient retrieval time result to be generated the FBMC.

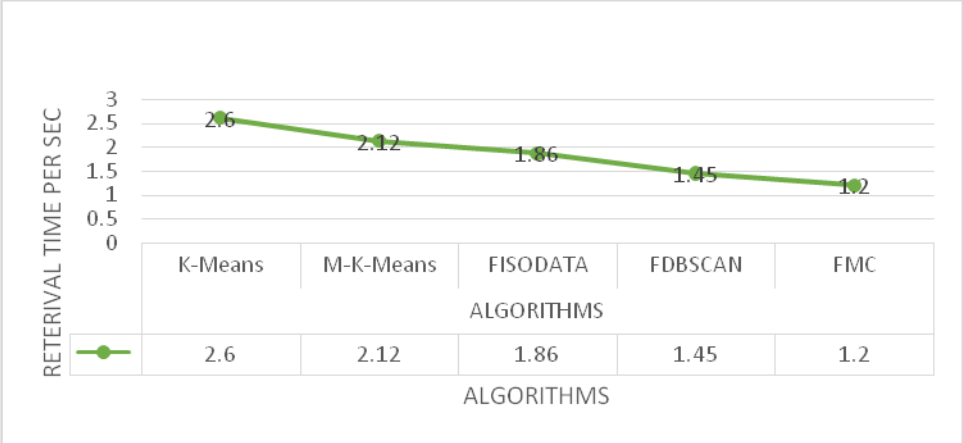

Figure 19: overall retrieval time is taken by Existing and Proposed methods.

The above figure 19. Shows that the image retrieval time is taken by algorithms compared with the Existing and Proposed methods like K-Means, Modified K-Means, FBISODATA, FDBSCAN and FBM clustering. The overall image retrieval time calculation based on table 4.

CONCLUSION

This thesis proposes on four new clustering algorithm like M-K-Means, FBDBSCAN (Fuzzy Based-Density Based Spatial Clustering with Application and Noise), FBISODATA (Fuzzy Based Iterative Self organizing Data Analysis Techniques Algorithms) and FBMC (fuzzy Based Mountain Clustering). This research work focuses on color pixel based image segmentation as pixel classification and pixel clustering, to find the age of tiger. The proposed algorithms when executed results in high performance, the clustering result is much effective and efficient. When compared the results on the proposed methods has highest accuracy rate on FBMC. The results are evident highly with increase in iterations.

REFERENCES

[1] S.M. Aqil Burney, Humera Tariq., June 2014 “K-Means Cluster Analysis for Image Segmentation” International Journal of Computer Application, Vol: 96, No: 4, Pp: 01-08.

[2] Gunjan Mathur, Hemant Puohit., December 2014 “Performance Analysis of Color Image Segmentation Using K-Means Clustering Algorithm in Different Color Spaces” IOSR Journal of VLSI and Signal Processing (IOSR-JVSP), Vol: 04, No: 06, Pp: 01-04.

[3] Nameirakpam Dhanachandra, YambemJinaChanu., July-September 2015 “Image Segmentation Method Using K-Means Clustering Algorithm for Color Image” Advanced Reseach in Electrical and Electronic Engineering, Vol: 02, No: 11, Pp: 68-72.

[4] Nameirakpam Dhanachandra, YambemJinaChanu., IMCIP-2015 “Image Segmentation Using K-Means Clustering and Subtractive Clustering Algorithm” Procedia Computer Science, Vol: 54, Pp: 764-771.

[5] Y.V.Jhala, A.Sadhu., November 2017 “Field Guide For Aging Tigers” BMC Zoology, ReseachGate.

[6] Md. Rakib Hassan, Romana Rahman Ema& Tajul Islam., 2017 “Color Image Segmentation using Automated K-Means Clustering with RGB and HSV Color Spaces” Global Journal of Computer Science And Technology: FGraphics& Vision, Vol: 17, No: 02.

[7] M. Merzougui, M.Nasri, B.Bouali., March 2013 “Image Segmentation Using Isodata Clustering with Parameters Estimated by Evolutionary Approach: Application to Quality Control.” International Journal of Computer Application, Vol: 66, No: 19, Pp: 25-30.

[8] Oka Sudana, Dharma Putra, Made Sudarma, Rukmi Sari Hartati, AyuWirdiani., January 2018 " Image Clustering of Complex Balines Character with DBSCAN Algorithm." Journal of Engineering Technology, Vol: 06, No: 02, Pp: 548-558.

[9] Nishchal K.Varma, Payal Gupta, Pooja Agrawal, Yan Cui., October 2009 "MRI Brain Image Segmentation for Spotting Tumors Using Improved Mountain ClusteringApproach." IEEE Applied Imagery Pattern Recognition Workshop, 2009, Pp: 01-08.

[10] Faten Abu Shmmala, WesamAshour., January 2013 "Color Based Image Segmentation Using Different Versions of K-Means in Two Spaces." Global Advanced Research Journal of Engineering, Technology and Innovation, Vol: 01, No: 09, Pp: 030-041.

[11] Nikita Shama, Mahendra Mishra, Manish Shivastava., May 2012 "Colour Image Segmentation Techniques and Issues:" International Journal of Scientific & Technology Research, Vol: 01, No: 04, Pp: 09-12.

[12] D. Napoleon, A. Shameena, R. Santhoshi., 2013 "Color Image Segmentation Using OTSU Method and Color Space." International Journal of Computer Application, and International Conference on Innovation in Communication, Information and Computing (ICICIC) 2013, Pp: 05-08.

[13] Noor A. Ibraheem, Rafiqul Z. Khan, Mokhtar M. Hasan., August 2013 "Comparative Study of Skin Color Based Segmentation Techniques." International Journal of Applied Information Systems, Vol: 05, No: 10, Pp: 24-38.

[14] Preeti Rani, RaghuvinderBharadwaj., July 2016 "An Approach of Colour Based Image Segmentation Technique for Differentiate Objects Using MATLAB Simulation." International Journal of Advanced Research in Computer and Communication Engineering, Vol: 05, No: 07, Pp: 553-556.