International Academic Institute for Science and Technology

International Academic Journal of Science and Engineering
Vol. 2, No. 1, 2015, pp. 19-28.

ISSN 2454-3896

International Academic Journal of Science and Engineering

www.iaiest.com

Modify improved ant colony for fuzzy Clustring in image segmentation

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Abstract

(M.I.ACA) (Modify Improved Ant Colony Algorithm optimized) Method of processing image is. This method of using cluster pixels, to a process of segmentation is Accelerates cluster. Chart optimized histogram using three features images Neighborhood of Pixels, gradient, Gray value has found the optimal initial centers. And by finding initial cluster centers facilitate. Clusters based on the rule MIACA also integrate acquisitions.

Keywords: Improved ant colony ,Fuzzy clustering, Image segmentation ,Improved histogram

Introduction:

Digital image processing is a new knowledge that its previous record has been coming after being invented digital computer.
This new science has improved in two aspects theoretical and practical in recent decades.
Image processing in many sciences and industries same of these applications are connected to image processing that basically these aren't useable without it.
Many factors such as illumination image contrast and image noises even image size influence on segmentation.
So great attention has been shown in this field and different methods have been purposed.
Commonly of these methods for producing regions or recognizing contours are based on two strategies.

[1] The parts recognition of an image has been considered homogeneity.
[2] The parts recognition of an image has had different features.

Different edge detection operators, making use of difference features an image and finding the contours of
Different objects in the image segment this process
For e.g threshold technique by comparing the image features with a threshold segments image and is asserted to be one of the simplest methods in an image segmentation are preferred for its less calculation.
Generally the template matching is simple since it is in essence a convolution between the template and image. But becomes time spending when the image is complex or the image size is large.
Therefore the designing of the template often needs much mathematical effort.
Clustering methods view an image as a set of multi – dimensional data. It is based on certain homogeneity criterion like Euclidean distance that the image is classified in different parts.
If we get help of fuzzy theory (4) neural networks (2) and evolutionary techniques (3), we can get much better segmentation results.
First, feature extraction should be done before clustering and it is a problem of over segmentation should be considered.
Although, by considering variation methods is a new theory is problem, but attention to these problems have been caused much methods have been brought up correction and rapidity of image segmentation.
But when time becomes consuming these problems have been overcome.
The rest of this paper is organized as follows: section 2 describes improved ant colony algorithm (ACA) and using parts and using them in improved (ACA) have been described.
Section 3: by general interpreting histogram diagram and the benefits of the tridimensional histogram and the benefits of the tridimensional histogram diagram are able to elimination improved ACA draw back in image with approaching colored specter.
Furthermore using of improved ACA for merging clusters
Has been described to increase care and image final quality.
This paper explains the examples about much ability edge detection. Finally a conclusion is drawn in section 4.

Back Ground

In rule of ant colony when going from location i to location j for finding and carrying forming a pheromone trail from this way . Then, it will come back to location i from this ay pheromone trail.
Concentration becomes weak with the elapse of time due to evaporation .now we have the way with different concentration pheromone , the next ants consider the way as the optimal way that pheromone concentration is more than the other ways.
The first step in analyzing the image is segmentation the image has been divided to organizational component.
The image segmentation algorithms are divided based on gray value changes
The main objects in this classify are appeared the isolated points, lines and edges image.

There are 3 types of discontinuities in a digital image i.e isolated points, lines and edges. Searching discontinuities in an image help to know organizational component.
The most common way to look for discontinuities is to run a mask (3*3) through the image this procedure involves computing the sum of products of the coefficients with the gray levels contained in the region encompassed by the mask.

The response of the mask at any point in the image is given by $R = w_1 z_1 + w_2 z_2 + \cdots + w_9 z_9$

w_1	w_2	w_3
w_4	w_5	w_6
w_7	w_8	w_9

Where z_i is the gray level of the pixel associated with coefficient mask w_i.
Now we briefly point to knowing isolated points, lines and edges.
The detection isolated points in an image is simple.
If $|R| \geq T$ *then* the point will appear in the mask center.
Basically this formulation measures the weight differences between the center point and its neighbors. The idea is that an isolated point will be quite different from it is surrounding and thus be easily detectable by this type of mask.
If a certain point in the image, $|R_i| > |R_j|$ for all $j \neq i$ that point is said to be more likely associated with a line in the direction of mask j.
An image has been made of its things and background.
Between the things there are border lines. There is a line among back ground and the thing.
Technically edge detection is told .The edges in an image help to separate the component of the image.
The first important feature is considered the gray value changes.
According to the fact that and noise pixels always have unexpected changes in gray value regard to the other parts of an image. The gray value with little changes regions are related to back ground and its things in an image. So, the gray value gradient of pixel which well represents the gray value changes are considered as another important feature.
The gray value gradient pixels are used for separating edges and noise pixels from the background and its thing.

Attention to high gradient pixels their neighboring regions in the image different.

It is often considered much smaller regions are related to noise pixel and the larger regions are related to the edges.

About edge defection methods which searching contours according to difference of an image features in many order difference operators such as Sobel ,Prewiffe ,Log and Canny are used.
But these are chosen based on kind of operators that are usually mistaken as edges.
Therefore, detect edges without or with fewer influence of noises is important.
By using combining rules the features such as gradient and neighborhood of the pixel are extracted from image and clustering process by ACA (1).
Improved ACA is based on clustering and ant colony rule.
Initialization of the clustering centers and improvement of the heuristic function is the feature of the algorithm. It comes as follow.
For decreasing computational quantity, limited amount of pixel as clustering centers are gotten histogram diagram which will be described in the next section.
We can approximately select the first n clustering centers.

Technically, the clustering results of an image with respect to gray values.
It can be mention that the gradient of the back ground and object pixel which consider for large part of the image is zero. The gradient of much less part of the image is much larger.
It is approximately set according to:
Gf =$\frac{1}{m}$ (max $_{j=1,\dots n}$ ($\sum_{i=1}^{m} grad$ (i,j))
Grad (i ,j) is the gradient of pixel (i ,j) and m × n is the size of the image.
According to gradient for the clustering centers whose gradient feature is zero set the neighboring feature to 8.For these with larger gradient feature if the gray feature is much larger the neighboring features are 6,other wise if the gray feature is small the neighboring features are3.
It's important which is calculated clustering probability for deciding when as ant is belong to a cluster .there for η_{ij} the heuristic function and a key component of clustering probability plays an important role .In ACA the heuristic function is an inverse proportion to d_{ij} with the increase of η_{ij} the clustering probability will be increased.
Heuristic function is improved by using the follow relation.

$$\eta_{ij} = \frac{r}{d_{ij}} = \frac{r}{\sqrt{\sum_{k=1}^{m} p_k (x_{ik} - c_{ik})^2}} \qquad (1)$$

Where r is the clustering radius which is often no less that one.
While calculating d_{ij} instead of using each pixel in the image like ACA .we use c_{ik} the clustering center because the number of clustering centers is much less then of the image pixels the calculating time will be much discreased.
But this using is only for choosing pixels.
The all clusters, merging are used from clusters merging role.
The relation (1) describes:
When the distance to the clustering center is larger consequently the η_{ij} is smaller .As a result the clustering probability will be smaller.
Now we describe the ACA algorithm.
Step 1: initialize the parameters of x,β,r and λ.
Step 2: initialize clustering centers.
Step 3: for each ant, calculate the distance to the clustering centering centersd_{ij}. If d_{ij}=0, the probability is 1.
Otherwise, if d_{ij}<r, calculate η_{ij} according to formula 1.
Step 4: according formula η_{ij} and

$$\rho_{ij} = \begin{cases} \frac{ph_{ij}^{\alpha}(t)\eta_{ij}^{\beta}(t)}{\sum_{s \in S} ph_{is}^{\alpha}(t)\eta_{is}^{\beta}} & j \in S \\ 0 & \end{cases} \qquad (2)$$

Where m is the dimension of vector x . ρ the weight decided by the importance of each component and r the clustering radius . $ph_{ij}(t)$ Represent the pheromone concentration on path (i,j) at time t.
S=$\{X_s | d_{sj} \leq r, s = 1,2, \dots, n\}$ is the set of all available paths.
If the probability is larger than λ put the ant to that class .refresh the pheromone concentration following formula:

$$Ph_{ij}(t') = \rho\, ph_{ij}(t) + \Delta\, ph_{ij} \qquad (3)$$

Where p represents the evaporating degree of pheromone concentration will the past of time and $\Delta\, p_{ij}$ is the increase of pheromone concentration on path (i,j) after this cycle:

$$\Delta\, p_{ij} = \sum_{k=1}^{h} \Delta\, ph_{ij}^{k} \qquad (4)$$

Where $\Delta\, p_{ij}^{k}$ is the pheromone concentration left on oath (i,j) by the kth ant.
Then refresh the clustering centers by

$$\overline{c_j} = \frac{1}{j} \sum_{k=1}^{j} X_k \qquad (5)$$

Otherwise leave the ant into a new set waiting for next cycle.
Step 5: calculate the distance between the clustering centers .if the distance is less than the given threshold. Merge the classes and refresh the clustering centers.
Just as it was told, improved ACA by using clustering can have better speed than ACA and it greatly reduces the superiority time quantity to the noises and edges and object ones.

Main

Clustering of one branch of learning is no monitoring and automatic process during which, the specimens clubs that its members are similar to these are divided into clusters called.

Therefore cluster is a set of objects in which one or more members of the collection with features similar to each other and with objects in the clusters (collections) are similar to other **non** .
Can be similar for the different criteria considered .Distance criterion for example, can be used to Clustering and objects that are closer to each other as a cluster considers that this type Clustering, Clustering based on the distance called.
For example, the following two forms of Clustering input samples to the left four similar clusters are divided into the right side. In this example, each of the input samples belonging to one of the clusters and there is no sample belongs to is more than one cluster.

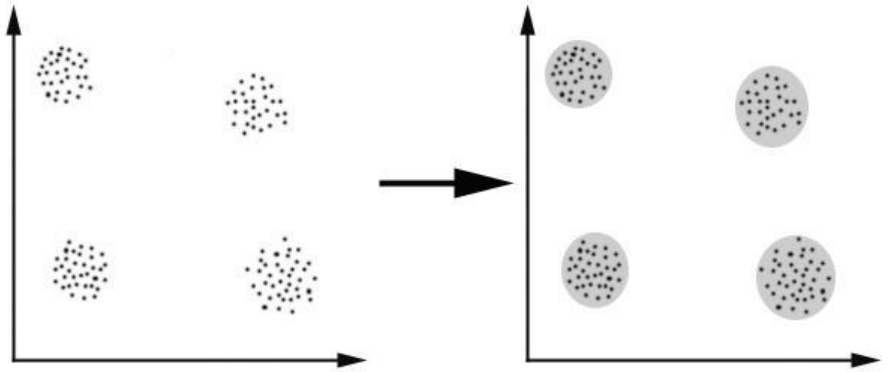

Fig.1.entrance sample clustering

For each of these clusters can be considered a representative .In fact, Clustering algorithms often have thus a series of representative samples of primary input is considered. Then the rate of similarity with representative samples, will be determined by the sample belongs to which cluster. After this stage new representative samples belonging to the cluster is calculated again with representative samples are compared to determine which clusters that belong to. This work is repeated until enough job representing clusters do not change
For better understanding and more mention of the following samples covered:

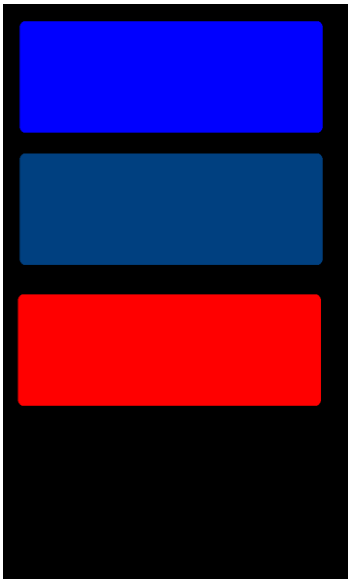

Fig.2.image1

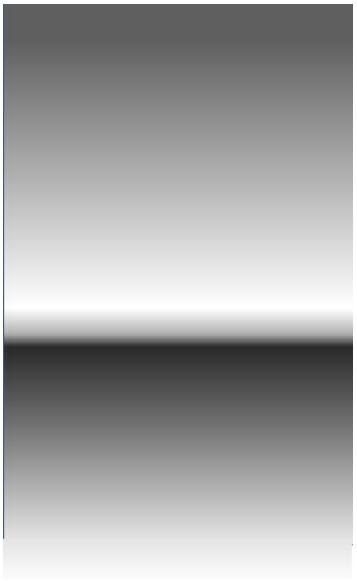

Fig.3.image2

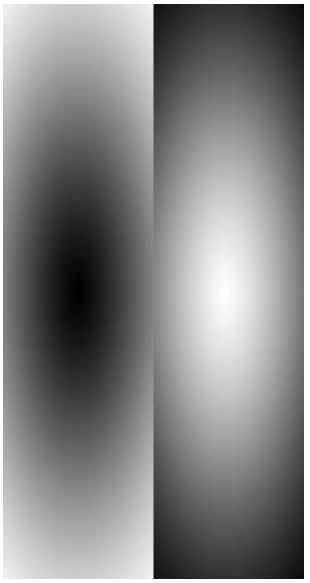

Fig.4.image3

Considering the above images as seen with the underlying files, 1 black homogeneous and three-color spectrum of the same sizes are drawn.
The color spectrum that the clustering of each class and a colored pixels representative cluster it will be joining the cluster diagram Figure 1 Cluster 1 cluster is indicated. But the color spectrum files, 2, 3 because many are forming and it can condone some of the specific cluster can be separated, Therefore, expected number of cluster for clustering large files that need 2,3 to 2,3 cluster diagram of expression cluster diagram explored 2,3.

As the ACA algorithm were improved living initially need to chart Histogram Clusters primary centers are formed. Histogram a diagram files ACA has improved two-dimensional diagram based on only one characteristic (rate of accumulation of pixels in different gray levels) for images before the following is drawn.

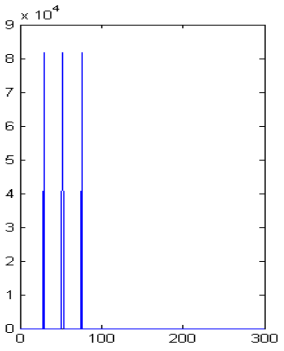

Fig.5.clustring Diagram 1

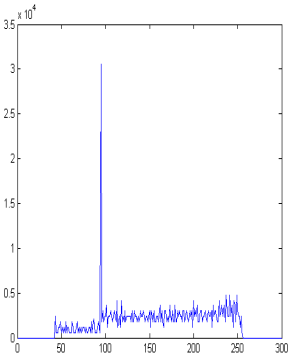

Fig.6.clustring Diagram 2

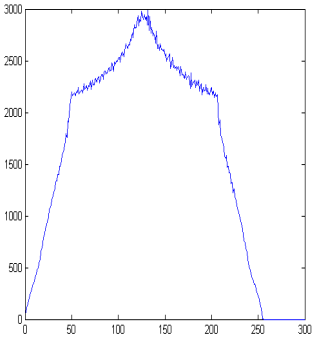

Fig.7.clustring Diagram 3

Histogram spectrum images in 2 and 3 are like each other.

1- 3Histogram

Histogram figure 2, a large number of the cluster representative centers are very close together. This distance is causing to merge Clusters. . This sample is very similar diagram Histogram 3. Between the cluster centers is very low. This cause is less distance, the cluster will merge Game. The difference in the two diagrams that histogram Figure 2, with peaks gathering centers are close together and sometimes are the same

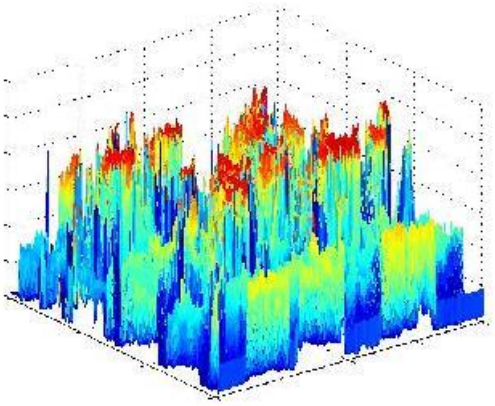

Fig.8.Histogram diagram (3D)

But the chart Histogram 3, centers peaks with a constant growth accommodation. But in any case is one of the two results. What the charts 2 and 3 were Histogram lack of separate peaks in the initial cluster centers were considered. . Use of only one specificity, the different gray level has been formed to chart Histogram is a strain .To obtain the initial cluster centers is incapable. Considering what is given in Section 2 files with two other features are, Gradient and size of the neighborhood, that two other properties to be used to provide optimal Histogram chart. With regard to the above chart Histogram optimized based on three features of the cluster centers has been the primary can be obtained In addition to the amount of pixels with a spectrum of color assembly factors have influenced neighboring area.

Considering what was mentioned, although the cluster instead of each pixel cluster of pixels that are set to rule the ACA would exert but if you want to select the cluster faster acquisitions and higher ability to do improved ACA We can cluster the integration will help.

Instead of just rule based on distance cluster centers, we use the integration of the improved ACA integration we use cluster

Each cluster of words, rather than an ant and use the improved ACA with the specific characteristics for each cluster is used.

Merged cluster to cluster previous predisposition to absorb them will depend on. This type of integration will help us to have problems like the tendency of a particular cluster also lost.

This type of integration will help us to have problems like the tendency of a particular cluster also lost .The ability of a cluster, cluster to attract more and weaker cluster merger should not be done. In this case following expression has been clearly.

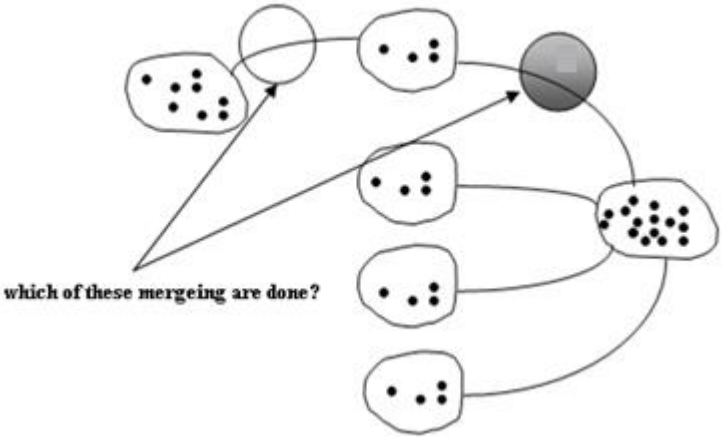

Fig. 9. Cluster merging

In the above two large cluster A and B have the four smaller cluster desire to be merged them.
If you order the smaller cluster merging them the same number and line connection between any two cluster acquisitions like the two we will consider then cluster in the cluster of four rows with the desire to merge the two Clusters A and B are equally. Figure 9 with applying ant algorithms, integration of the Cluster B will be approved.
Figure 10 Figure 11 Histogram chart can be expressed. And shape of the M. I. ACA 12 (using Histogram optimum cluster with improved rule ACA) shows:

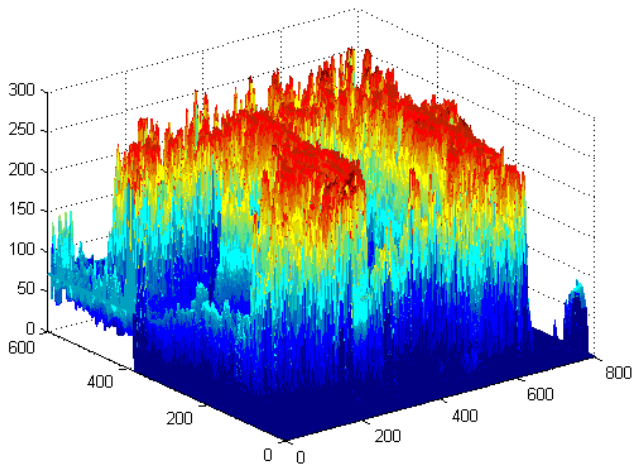

Fig. 10.Histogram diagram

Fig. 11.main image

Fig. 12.M.I.ACA

Following example is another MIACA.

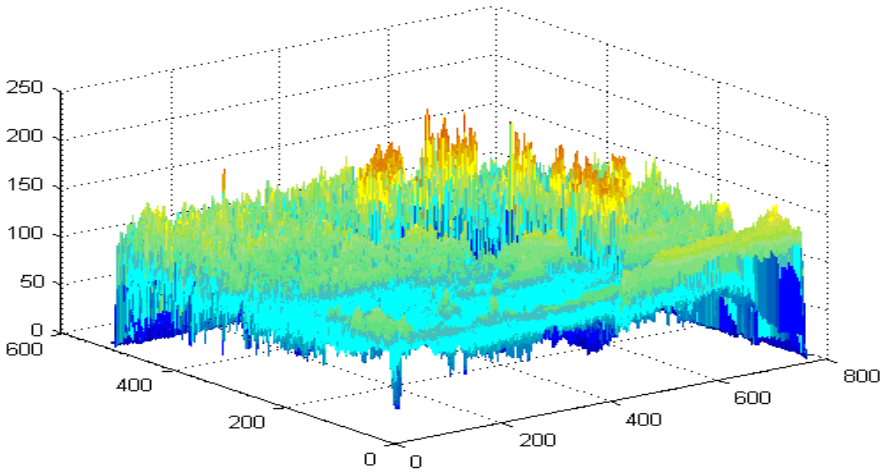

Fig. 13.Histogram diagram fig14

Fig. 14.main image

Fig. 15.M.I.ACA

4- Conclusions

This article M. I. ACA optimized Histogram using graph based on three features of image. Improved ACA disability in all primary centers Clusters prismatic images (images with large color spectrum), is covered. In addition to consistency of using improved ACA, the ability and accuracy of a cluster merger has also helped. Images obtained from this method in addition to a more optimal time, edge are more the precision and quality. This method is efficient in Image Segmentation.

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