

# Ant Colony based Metaheuristic Technique for Color Image Segmentation

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## ABSTRACT

Image Segmentation is an essential procedure of image processing as well as knowing it. Mainly it's known due to the method of splitting the image into various elements of homogeneity. The goal of image segmentation is to make simpler presentation of an image into incredible which is meaningful as well as easy to understand. It is mainly utilized to know the location of objects, boundaries, lines etc in the digital images. Clustering technique is a method which shows the data set or pixels are replaced by cluster, pixels might be together because of the same color, texture etc. This paper represents the effect of mixed regions on image segmentation and color images contain maximum information for efficient image segmentation.

## Keywords

Image Processing, Image Segmentation Techniques, FELICM, Ant Colony Optimization.

## 1. INTRODUCTION

Image processing is handling of images applying mathematical procedures by several type of signal processing for that put in a graphic, in the type of picture or video frame; the result of image processing might be graphic as well as several features and metrics associated with given picture. Mostly image processing methods include the image as a two dimensional signal and apply normal signal-processing methods to it. An image is a two dimensional function like  $S(a, b)$  where  $a$  and  $b$  are coordinates of plan. When the values of  $a$ ,  $b$  and the amplitude values of are all finite and discrete quantities, that image is known as digital image. Image processing usually describes digital image processing, but optical and analog image processing is also possible as well.

### 1.1 Applications of the Image Processing

Some applications of digital image processing are as follow

#### 1.1.1 X-Ray Imaging

X-Ray is one of the oldest ways to obtain EM rays used for imaging. X-Ray is employed in medical diagnostics. The utilization of X-Ray in medical imaging is computerized axial to zoography.

#### 1.1.2 Imaging in ultra violet Band

Ultra violet can be utilized in fluorescence microscopy.

#### 1.1.3 Digital camera images

Digital cameras model have digital image handling pieces which are being used to improve row data from image sensor into color corrected picture within an ordinary image file extendable. The pictures gathered from video cameras are further procedures to advance the feature.

#### 1.1.4 Intelligent Transportation System

Digital image handling has wide role in vehicles system like number plate recognition.

#### 1.1.5 Electron Microscopy

It runs on the microscope that able to increase every little details with very extreme resolving power.

#### 1.1.6 Ultra sound

It is employed for medical values where extreme rate of recurrence breed bead sound waves are delivered by tissue.

#### 1.1.7 Gamma Ray Imaging

It can be employed for complete several scan obtained by using gamma ray imaging but whereas these images are chosen by utilizing gamma ray detectors, then every time noise are approved due to error detectors. With this detection of error bones is complicated to progress this trouble. In such a difficulty we may use image processing to determine the problems.

## 2. IMAGE SEGMENTATION TECHNIQUES

Image segmentation is the procedure of splitting a digital image into multiple sections (units of pixels, also called as super pixels). The purpose of segmentation is always to simplify as well as alter the illustration of graphic into incredible that's more significant as well as more simple to understand. It is essential for the fundamental tasks in image controlling and computer perspective. It makes essential beginning step for following object recognition and interpretation. The main aim is to divide the confirmed image into regions that contains distinct objects. The most frequent kind of segmentation is based on the theory that different objects within image have different and around constant colors. This is done by image segmentation is a position of segments that cover the complete image.

### 2.1 Edge Detection Methods

Edge detection process is to change images to edge images which take advantage of the change in image's grey tones. Edges are representation of insufficient continuity or ending, transformation result with this method is acquired not including any conversions in physical qualities of the key image. Image has different parts of various color levels. The design of the objects is differentiate in Figure 1.

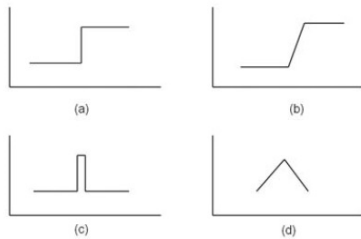


Fig 1: (a) Step Edge (b) Ramp Edge (c) Line Edge (d) Roof Edge

## 2.2 Region Based Methods

In remote sensing image analysis, the segmentation procedure is very initial steps. In the scene, relevant objects of image are representing when it divided into regions. The segmentation process can take place in two ways:

### 2.2.1. Region-based segmentation

In which, images are dividing into a number of homogeneous regions with distinctive label each.

### 2.2.3. Edge detection

In which, boundaries are determining between homogeneous regions of different properties.

## 3. FELICM

Fuzzy C-Means that advantage and Local data is recognized as FELICM, it presents the pixels' weights inside local neighbor windows to reduce the edge degradation. This type of process can be utilized to conquer the isolated allocation of pixels within sections of image.

## 3.1 Mean Shift

It's a way of clustering segmentation which is a non parametric iterative algorithm. It's applied during kernel thickness estimation. For every data point, mean transfer shows a window approximately as well as computes the mean of data point.

## 4. ANT COLONY OPTIMIZATION

This ACO algorithm is depending on meta-heuristic looking algorithm. This reflection is scrounging actions from ant varieties motivated and ant colony optimization approach improvement of random direct seek approach. Example, ants discover nearest course relating to the ant colony as well as a meals source by means of swapping specifics of your option that you should adopted. If the ants go through grub origin, they give secretions and incapacitated; such secretion chase can be applied near ants for convey collectively. Ant's probability would choose to adopt some sort of way relative to the amount from secretion. Applying straightforward responsive agencies permits the conversion through the natural for unreal auld like settlement. These factors interact personally through swapping data by means of surrounding alterations. It can be unreal pismire speak circuitously by means of unreal secretion chase. This offered near works on the particular list of ants acting forward to a picture determined through the local picture strength valuations edition. This kind of variance ensures a secretion matrix, while using like sizing picture, while in turn acts the particular boundary data and every picture place. Referable for big graphic sizing in order to cut calculation clip, the particular ant colony optimization approach depicted under was severally used upon non overlapping 128\*128 graphic windows. Ant Colony Optimization is a loop approach.

## 5. RELATED WORK

Islam, Mohammed et al. [1] developed a method utilizing edge-based image segmentation methods for quality inspection that satisfies the professional requirements in pharmaceutical applications. The evaluation of an image with this might require complicated image processing techniques. Artan, Yusuf et al. [2] introduced a semi-supervised image segmentation method using machine learning techniques and super pixels. The proposed method yielded superior segmentation results over several semi-supervised methods including the popular random walker algorithm. Huilin, Gao et al. [3] presented a technique of CT image segmentation based on region growing method, and the application form of effective segmentation of the lung tissue to chest CT images. Weighed against any other segmentation methods, the outcome showed that the segmentation method that has been proposed in this paper does better in CT image segmentation. The outcomes obtained have the significance in clinical applications and auxiliary diagnosis. Zhu, Shaohua, and Zhaohua Wu [4], chosen chip mechanism as study thing, completing the conversion of the color space on the basis of the theory of Graphic and Image processing and achieving the conversion from the non-uniform RGB color space to HSV space for human eyes observation in the shape of MATLAB. Khanna, Anita, [5] presented an automatic segmentation method based on unsupervised segmentation done on Ultrasound (US) images received from radiologist. Here they presented three unsupervised methods namely thresholding, K-means clustering and expectation maximization and evaluate their results. Chebbout, Samira, [6] compared the effectiveness of three clustering methods involving RGB, HSV and CIE L\*a\*b\* color spaces and a variety of real color images. The strategies were K-means clustering algorithm. R. Samet. [7] Proposed Fuzzy Rule-Based Image Segmentation technique to segment rock thin section images. The obtained outcomes of proposed Fuzzy Rule-Based Image Segmentation and Fuzzy C-Means techniques were compared. Implementation results revealed that proposed image segmentation technique has better accuracy than known ones. Vij, Sugandhi et al. [8] discussed quantitative evaluation measures for color image segmentation predicated on these techniques. Color image segmentation can be considered as an extension of gray level image segmentation. Quantitative measures like discrete entropy, root mean square error, and visible color difference were proposed for color images. Rincon-Montes, V. et al. [9] described a quantitative evaluation method for the accuracy of two different segmentation techniques for the therapy planning of Magnetic Resonance guided High Intensity Focused Ultrasound (MRGHIFU). Jiang, Ching-Fen, and Ka-Pei Tsai. [10] Proposed a cell segmentation method combining double-thresholding and disk-based reconstruction to solve the difficulties arising from shape deformation and uneven illumination during cell culture. The qualitative and quantitative comparisons show that the proposed segmentation method increases accuracy in detection of the cell centroid.

## 6. GAPS IN LITERATURE

These are the gaps in existing research on image enhancement methods.

1. The effect of mixed regions on image segmentation has ignored in the most of the existing techniques.



11	0.0634	0.0031
12	0.1361	0.0138
13	0.1136	0.0069
14	0.1242	0.0155
15	0.1519	0.0167

### 7.2.2 Peak Signal Noise Ratio (PSNR)

The calculated values are 68.7873 and 73.1916 for image 1 and image 2 respectively.

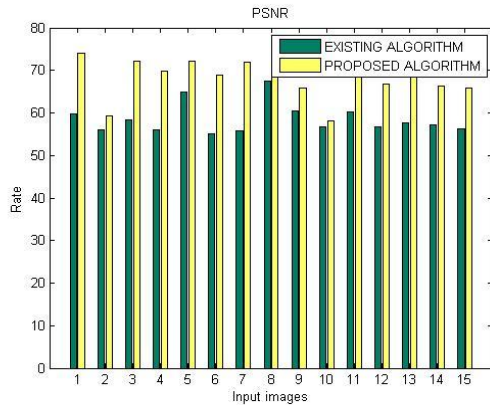


Fig 5. PSNR Analysis

Table 2 has clearly shown that the PSNR is maximum in the case of the proposed algorithm therefore proposed algorithm is providing better results over the existing methods.

Table 2. PSNR Analysis

Image	Existing Results	Proposed Results
1	59.7477	74.0062
2	55.9519	59.3013
3	58.3301	72.2465
4	56.0488	69.8982
5	64.9820	72.2701
6	55.0810	68.7873
7	55.8363	71.8747
8	67.4394	72.7843
9	60.4939	65.8304
10	56.7276	58.2377
11	60.1463	73.1916
12	56.8256	66.7797
13	57.6113	69.7793
14	57.2238	66.2708
15	56.3505	65.9447

## 8. CONCLUSION

The aim of image segmentation is to simplify the representation of an image into something that is more meaningful and easier to understand. Clustering technique is a method in this data set or say pixels are replaced by cluster, pixels which together because of the same color, texture etc. In this paper we have implemented ant colony based edge detector to differentiate the mixed regions and the results of the have shown significant improvement. The implemented an ACO based metaheuristic for color image segmentation is done using parameters like mean square error and peak signal noise ratio. Implemented an ACO based metaheuristic for color image segmentation outperforms the existing technique FELICM.

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