

Survey on Techniques Involved in Image Segmentation

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ABSTRACT

Image segmentation is one of the most essential image processing step to discriminate various objects in the image, it usually assist as the pre-processing step before image feature extraction, image pattern recognition and image compression. The goal of image segmentation is to rationalize and change the depiction of an image into something which is very important and easy to examine. This paper focuses on study of different image segmentation methods, techniques and analysis which is used for image segmentation and their merits and limitations. Then we talked about different foundation involved in image segmentation and find the gap between them which needs to be linked so as to refine the image segmentation efficiency and performance.

Keywords: - Image segmentation, Classification, grayscale image, Otsu's method, JSEG algorithm, k-means clustering.

I. INTRODUCTION

In the area of computer vision, the image segmentation is an essential issue, which can segment the focused parts from the image containing substantial information [6]. The motive of segmentation is to break down the image into different parts that are useful with respect to a particular application. It has immense application in various fields like, medical image (Computer guided surgery) Finger print Recognition, Face recognition real-time visual tracking, Locate objects in satellite images etc. Much more segmentation methods have been introduced in literature survey.

Image segmentation is the process of splitting a digital image into multiple significant regions or set of pixels with respect to a certain application. The main motive of segmentation is to diminish the information for easy analysis it is also useful in Image compression and Image analysis. Transformation of colour image to grayscale image is one of the image processing approaches used in different fields beneficially. Transformation of a colour image to a grayscale image necessitate more knowledge concerning to the colour image [4].

In the algorithms of image segmentation, thresholding is easy and swift, As a classic thresholding method, the Otsu method is robust and beneficial, and is broadly used in image segmentation The Otsu method can acquire a firm segmentation standard, so it is commonly used in the detection of surface inadequacy [21]. JSEG (Joint Systems Engineering Group) algorithm is very effectual to overcome the problems of the immense computation it is based on regional growth and unsupervised colour texture and image segmentation boundary is very accurate [6].

In one more algorithm K-means is the clustering algorithm used to determine the natural spectral groupings available in a data set. It is an unsupervised the pixels in the precipitate area have near by the duplicate characteristic of data. Thus, the spatial relationship of neighbouring pixels is main distinctive that can be of considerable aid in image segmentation [17]. General boundary- detection techniques have taken precedence of this spatial information for image segmentation.

The dataset is split-up into K clusters and data points are unexpectedly allocate to the clusters and the result of these cluster is same number data points [17]. Clustering is a technique to different groups of objects. The object in a one cluster are as near as possible and it as far from objects in another cluster. K-means clustering needs to be specify the number of clusters to split-up and a distance metric to measure the quantity of how close two objects are to each other. K-means clustering is a most famous method for image segmentation [10] [17].

II. RELATED WORK

A. Classification:

Segmentation classified as follows:

1. Edge Based
2. Region Based
3. Feature Based Clustering
4. Threshold
5. Model Based

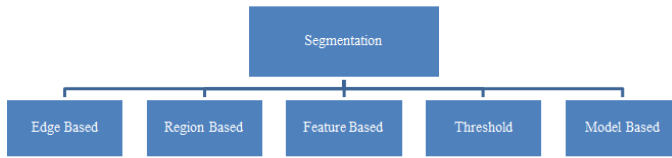


Fig.1. Various types of segmentation [11]

1) **Edge-Based:** In the edge based technique the boundary is identified to segment. Edges in an image are perceived to identify the disruption in the image. In this technique, there is no need for the detected edges to be closed. There are various edge detectors algorithms that are used to segment the image. The advantage of this technique is fetching information from the weak boundary of image. The edge based segmentation is very accurate for spatial resolution. Segmentation can also be done through edges of objects in image. There will be some gap between the edges as it is not closed. So, the gap is filled by edge linking technique [11].

2) **Region-Based:** In this technique, corresponding pixels of objects are grouped for segmentation. For segmentation method, boundaries are identified. In every step at least one pixel is associated to the region and is taken into consideration. After recognizing the change in the texture and color, the edge flow is turn into a vector. From this the edges are detected for further segmentation [11].

3) **Feature Based clustering:** Segmentation done by clustering is most popular term in the image processing, k-means is used for segmentation process in textured images, the related pixels formed clusters to segment the image. By feature clustering segmentation is done and according to the color component it will be changed. Segmentation completely based on characteristics of the image. Features are taken into description for segmentation. Distinction in the extremity and color values are used for segmentation.

4) **Thresholding Method:** Thresholding algorithms can be choosing manually according to a previous comprehension. These algorithms are further divided into following types.

- Edge-Based
- Region-Based

i. **Edge-Based:** This algorithm is associated with the information about edges. The pattern of an object can be represented by edge point. Canny edge detector and Laplacian edge detector these are the common edge detection algorithms which are used to find edge pixels while removing noise influence.

ii. **Region-Based:** Differentiate to edge-detection method segmentation algorithms forms on region are comparatively easy and further resistant to noise. The image partitioned into different region that are similar according to a position of predefined basis [18] [16].



Fig.2. Thersholding[11].

5) **Model Based:** It may also do by using Gaussian Markov Random Field (GMRF) where the spatial Satellites between pixels are examined for the process. Gaussian Markov Model (GMM) based Segmentation is utilized for region growing [26]. The feature space is also detected by using this technique [27].

B. Grayscale Image

Color image to grayscale image conversion is one of the most image processing precedence used in different meadow fruitfully, In publication institution color image printing is more costly than that of grayscale image, hence the color image have permuted into grayscale image to decrease the printing cost of low priced edition books, so for various purposes conversion of color to grayscale image is required [4]. The Gaussian pairing technique is used for converting color image to grayscale image it is applicable for image sampling, sampling color differences and dimensionality reduction. This technique has satisfied Continuous mapping, Saturation ordering Grayscale preservation, Luminance ordering, Global consistency, and Hue ordering [28]. Another method is L^*a^*b luminance.

Chrominance representation, the main characteristic of this technique the same color in the input image can map to various grayscale values based on the spatial surround [4].

C. Otsu's method

For image thresholding, Otsu method is the most successful technique. As we know, thresholding is very significant technique for segmentation. This method acquire a fixed segmentation quality, hence it is often used in detection of

surface defects. Sometimes traditional Otsu method did not give the accurate result so some techniques have been proposed to enhance the Otsu method. Sometimes images are polluted by noise and the traditional Otsu method can't get the accurate segmentation result [21]. Two-dimensional (2D) Otsu methods [21] [31] have superior anti-noise capacity than traditional Otsu method. With the help of this method, surface defect detection in a glass substrates segmentation is improved and it can resist noise also it is computationally efficient [21]. For searching global optimum threshold Otsu method is comprehensive algorithm, while K-means is a local optimal method.

D. JSEG Algorithm

T Now a day with the continual evolution of computer hardware & technology proceed, additional awareness has been given to color image. Build on foregoing image segmentation technology; JSEG (Joint Systems Engineering Group) is a novel approach for the image segmentation, segmentation results of this algorithm are more accurate. However, segmentation technology need to be improved, more algorithms are not fit to various types of images, which is difficult component for the extensive accomplishment of image segmentation. There are so many image segmentation methods, among them literature proposed an excellent JSEG algorithm [6]. The segmentation results of this algorithm are more exact and have a superior robustness. The primary process of JSEG technique [32] is differentiated into 2 stages - Color quantization [33] and spatial segmentation. The color quantization is intentional to decrease the numeral of colors of the primary color image to decrease the complexity of proposed the algorithm. To remove noise, JSEG algorithm uses (PGF) peer group filtering method, after that uses GLA algorithm to conclude pixel clustering & acquire a class map of image [6].

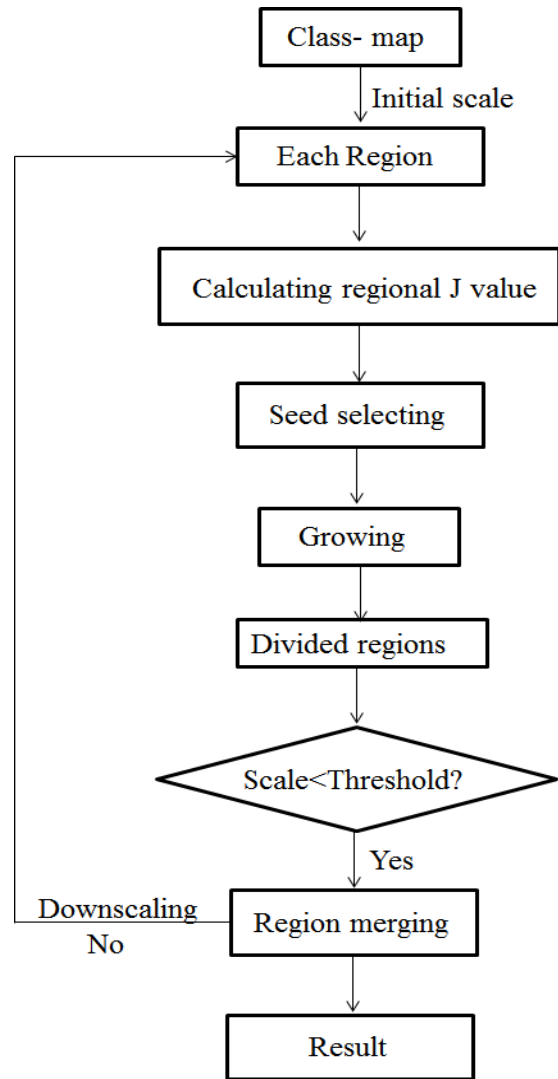


Fig. 3 Flow chart of the initial JSEG algorithm [6]



Fig.3.1 Original image



Fig.3.2 JSEG segmented result

• **J-Cut Algorithm:**

The conventional color image segmentation algorithm is initially to convert color image to gray image, and after that process it. The JSEG segmentation is definitive color image segmentation algorithm. According to this objective, the [6] proposed algorithm J-cut elongate and advances the color image segmentation algorithm. This algorithm is effective and very easy for understanding.



Fig.3.3 J-Cut segmented result

E. K-means Clustering

K- Means is a one of the most traditional partitioned based clustering algorithm introduced by Mac Queen in the year of 1967 to solve various clustering problems. This algorithm focus to group data into k clusters build on randomly chooses initial centroids. The grouping is organized by minimizing the Euclidean distances with one the data items and its associated centroid [14].

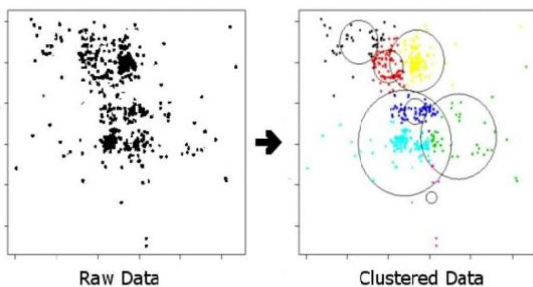


Fig. 4 K-Means Clustering

Clustering is a separation of images or data into different categories of related objects. Each and every individual group called cluster contain objects which are related between them and variant differentiate to the objects of further group [19]. K-means is well known partitioned method where it uses an iterative approach.

The k-means algorithm has the following important properties:

1. It is efficient in processing large data sets.
2. It often terminates at a local optimum
3. It works only on numeric values.
4. The clusters have convex shapes [23]

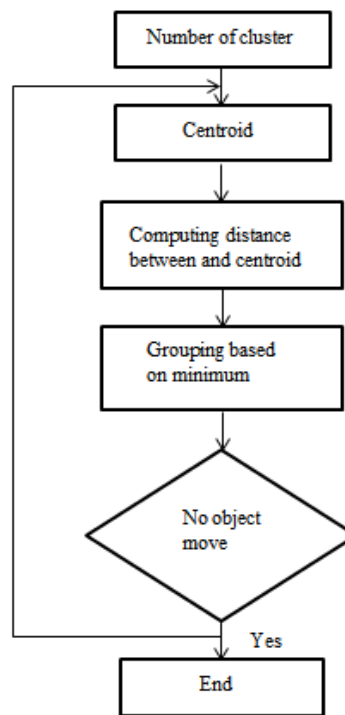


Fig.5. Flowchart of K-Means Clustering [19]

III. CONCLUSIONS

This paper presents as overview of various image segmentation techniques. And the composition of segmentation methodologies proposes for digital image processing is explained briefly. Various techniques are mentioned in this paper which is applied in very advance mission of identification of object or region image.

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