A Comparative Analysis among Basic Image Segmentation Methods

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Abstract: Image processing holds major development with new and emerging techniques, particularly in the field of segmentation. Image segmentation is a foremost method to be conceded in image analysis to distribute an image into numerous segments will make them improved by means of vision and understandability. Segmentation holds a number of methods to divide images which are widely applied in different applications. Proposed write up presents a brief summary on some of the segmentation methods like edge based, threshold, clustering and watershed segmentation to promote a comparative analysis which concludes the simplest and effective segmentation method.

Key words: Image segmentation, Edge based detection, Thresholding, Region Based Segmentation, Clustering, Watershed segmentation

INTRODUCTION

Segmentation divides an image into meaningful segments with same features and properties to represent an image better and to analyze easily. It is a significant step in high-level image processing techniques. The main purpose of segmentation is to reduce the data for easy analysis without loss in originality of image. Segmentation is based on several features that are existing in image either color or texture, generally used to identify objects and boundaries from images. The result of segmentation is a set of segments as a group to look after the entire image extracted from the input image. The process of Image segmentation is used to isolate the objects from the background in the given image, i.e., dividing the image into disjoint sections, such that each section is identical with reverence to a number of properties, which may be like grey rate or texture.

Segmentation Methods: Segmentation methods are categorized as edge based, threshold, region based, clustering based and watershed based segmentation

- Edge based
- Threshold based
- Region based
- Clustering based
- Watershed based

Edge Based: Edge is a fundamental feature of image includes wealthy details that are noteworthy for obtaining the image quality by object identification. Edge detection relates to the method of identifying and instituting pointed breaks in an image. So, edge detection is a crucial step in image analysis [1] Segmentation method based on the edge in an image and identified edges are projected to represent object borders and used to make out these objects [2] the procedure of segmentation with edges consist of of three steps [3]

- Work out an image containing all probable edges of an actual image
- Process the edges to sustain the boundaries of the object
- Relocate the result to a steady segmented image by filling in the object boundaries

Take up the standards of pixel between forefront and environments are different. It has some methods like Canny, Prewitt, Roberts, Sobel and LoG. However edges
of the objects can be identified by these techniques, a lot of wrong edges will be included [4] the advantage of this technique is retrieving information even from the weak boundary [5].

**Threshold Based:** Threshold based segmentation is a prevailing method for segmenting images which built on structures of an image. This one convierte the multilevel image into a binary image by selecting an appropriate threshold to divide image pixels into several segments [6] Histogram and slicing methods are to divide the image and also able to merge with pre and post processing methods [2] not applicable for multichannel images as it yield only two classes and its sensitivity towards noise does not account the spatial features put an end to the histogram of image and difficult the separation. Thresholding is the simplest way of segmentation through threshold values which are attained from the histogram of those edges from the original image [7] thresholding has fewer computations compared to other techniques. Widely used method for its simplicity and less computational timedone according to its grey levels, primarily divided as global and variable thresholding [8].

**Region Based:** Region based techniques primarily governed by means of declaration that neighboring pixels inside particular segment make sure matching information. Normal method is to match a pixel with its neighbors. If match found, it is significant to fix the pixel to the cluster with one or more neighbors. This segmentation is carried out by certain algorithms, seeded growing, unseeded growing, splitting and merging, fast scanning [3]. It is also called as Similarity Based Segmentation [9] there won’t be any break due to misplaced edge pixels in this region based segmentation [10].

The boundaries are recognized for segmentation and in every stage at least one pixel is connected to the region and is taken into concern [11]. In the case of region growing the seed point selection plays a vital role when there is no earlier content is well known. It strongly depends on the greatness rate of the object and backdrop and it constantly yield an unflat limit for the mined entity [4].

**Clustering Based:** Segmentation is also done through Clustering. Fuzzy clustering technique is to segment the color image, produce color groups with Fuzzy membership function to detect the color regions [12]. Pixels of the color image are grouped for segmentation by an unsupervised Fuzzy C means technique for ordinary images and results in fragmentation in case of images with noise [13] K-means clustering algorithm to segment texture images [14] Clustering is a process to bring objects together in such a way that models of related collection are much correlated to one another than models fit in to other group [15, 16] A similarity measure is well-defined among pixels and related pixels are gathered to form clusters. The aim is related to segmenting an image and certainly various clustering technique can readily be applied for image segmentation [2] the forthcoming clustering algorithms to represent essential structures in data can be concerned in abroad variation of applications, together with classification, image processing, pattern recognition, modeling and identification [6].

**Watershed Based:** Watershed algorithm divides the given input image into quite a lot of likely areas which have equivalent grey value [17] In order to discover the crest lines called watershed in which an algorithm called watershed transform algorithm is applied to incline image in the extraction of entity. The problem occurs is over segmentation which is mainly due to the noises and other rashness. Segmentation method called marker controller is down in order to reduce the over segmentation problem which obtains reasonable results [4] It follows a procedure [18],

- Compute a segmentation function, for dark regions of an image
- Compute foreground markers, to connect spots of pixels
- Compute background markers, for pixels which are not in image
- Modify the segmentation function to have minimum locations
- Computation of watershed transform

**RESULTS**

**Edge Based Segmentation Methods**

PREWITT
As per segmentation, several methods are exists. Segmentation can be applied to any type of image with techniques be different among applications. Threshold based segmentation is simplest, easiest and fast one among existing segmentation methods but it has a trouble that it’s not easy to find an apt threshold. Edge based segmentation has many methods in which Prewitt, Roberts, Sobel and LoG are sensitive to image noise whereas canny edge detection will obtain reasonable
results than other methods. Region based segmentation strongly relies on intensity values of the image and also it’s significant to select suitable regions. Watershed segmentation is to identify the internal parts of the image but causes over segmentation problem in direct application. Clustering can be used only in the larger images and does not provide any significance to data rather it break up images in to various set. Thus the every single segmentation method has its own good and bad factors which will be applied in any type of image with respect to the necessity and requirements and may achieve better results in combination of two or more methods.

REFERENCES

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