

An Introduction of Image Segmentation Techniques

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Abstract— An image is a collection of the fixed number of elements, each element having a specific location and values. Several processes are included in image processing like acquiring an image, extracting individual characters, segmentations for suitable computer processing, etc. We combine those pixels which have the same attributes using image segmentation technique. Image segmentation provides a meaningful representation of an image. Segmentation is the process to divide an image into an integral region or object. This paper is about some widely used techniques of Image Segmentation.

Keywords: Image Processing, Region, Clustering, Pixel, Thresholding, Edge Detection, Segmentation

I. INTRODUCTION

An image is a visual representation of something or someone. It is a binary representation of visual information. For the understanding of an image or extricate the desired information from the image, the method of image segmentation is used. Digital image processing focuses on obtaining the desired data from the input image in a way that it will not affect that image. The task of image segmentation is subdividing a digital image into various segments, which are used for processing that image. Specifically, the process of allocating a label to each pixel in the image is that which pixels have the same label share some visible properties. The result of the image segmentation is a set of sections that consist of a complete picture or a series of outlines retrieve from the image. Each of the pixels in the area resembles some distinct or light features, such as color, intensity, or design. In computer representation, image processing is any input signal process, an input image, photographs or video frames.

Image segmentation aims to change the representation of the image and make it simple for better understanding, which is easier to analyze as shown in fig 1.

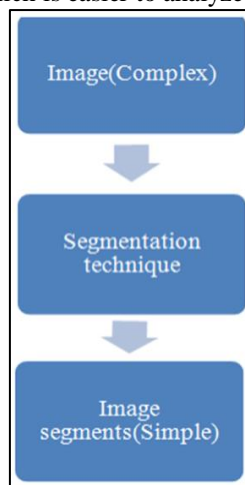


Fig. 1: Segmentation Technique

II. TECHNIQUES USED FOR IMAGE SEGMENTATION

Scientists and researchers develop various techniques for the task of image segmentation, some of the commonly used image segmentation techniques are shown in Fig. 2. The two basic properties of image segmentation based on intensity value: Breakdown and similarity. After an image is segmented into regions, each region is represented in an appropriate form for computer processing.

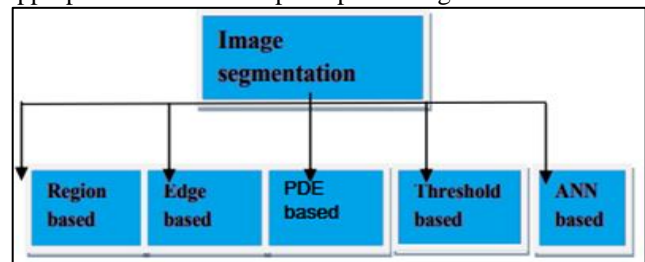


Fig. 2: Image Segmentation Techniques

Segmentation algorithms have been developed to divide images; they are based on two basic characteristics, breakdown and similarity. In partition based on discontinuity and subdivision is carried out based on immediate changes in intensity levels or gray level of the image. In this method our interest focuses mainly on the spotting of isolated points, lines and edges. In the group based on similarity, those pixels that are similar in some way include approaches such as thresholding, regional growth, and division and merging of regions.

III. CLASSIFICATION OF SEGMENTATION TECHNIQUES

Segmentation techniques are classified into the following categories.

- Region based method
- Edge-based technique
- Fuzzy based segmentation
- Segmentation by Thresholding
- Segmentation by ANN

A. Region Based Method

The growth zone modes are mainly based on the presumption that adjacent pixels have the same values in the region. Comparing a pixel with a neighborhood is the usual way. If similar criteria are met, the pixel can be configured so that the cluster matches one or more neighbors. The standard choice of comparison is important, and sound effects are affected in all cases.

Thus, the pixels for a single object are divided into divisions. The intersection technique is related to division based on this area. The area detected for the section should be closed. Depending on the region, division is also called comparison based division. There is no room in this area-based division for the absence of edge pixels, edges are marked for separation. After recognizing a change in color

and design, the flow of the border becomes a vector. From this map further show up for division.

B. Region Growing

The region growing method combines pixels or sub region into wider regions subjected to predefined norms. The fundamental approach is selecting initial set of seed points. The choosing of seed point is based on user's wish. Region increases by adding to each seed with those adjacent pixels that have similar properties [11]. The procedure needs to select a seed pixel, and then combine the same pixels around the seed pixel region where the seed pixels are found.



Fig. 3: Original Image



Fig. 4: Segmentation Using Region Growing

1) Edge-Based Technique

Image segmentation process consists of several step however, the primary step is of edge detection. Divide an object into a certain object and its respective background. Image splits by keeping track of intensity in the edge detection image or changing the pixel. Two main ways to find edge detection in the gray histogram and gradient image decomposition. Edge Deficiency Operators are divided into two sections. It is the first-order directive operator and second-order product managers. Second-order operators provide reliable results. Effective Edge Detector is the second product manager.

2) Sobel Edge Detection

The method for detecting Sobel edges is represented in early 70's by Sobel. Sobel calculates not only the size of the edges, but also their direction. The operator uses the 3x3 model horizontally and then vertically. One core just rotated 90°.

-1	-2	-1				-1	0	-1
0	0	0				-2	0	+2
+1	+2	+1				-1	0	+1
G_x						G_y		

Fig. 5: Sobel Convolution Masks

3) Canny Edge Detection

Initially, an image is captured and segmented using the smart edge detection method. To do this, the image is first converted from RGB to grey. Before locating and detecting the edges noise filtering in the original image is needed. Canny algorithm use Gaussian filter. It can be calculated using a simple mask.

After levelling the image and removing the noise, the next step is to determine the edge resistance by taking the image gradient. Thus, the approximate resistance of the edge of the magnitude of the absolute gradient at each point is determined by approximate gradient in the columns of the X direction, and the other, the estimation of the gradient in the lines of the Y direction.

After finding the edge resistance, the edge direction is determined using the XY direction gradient. Not the maximum deletion is used to draw along the edge to the edge and suppress any pixel value that sets it to 0, which is not considered an edge. In the output image, it will give a thin line.

The hysteresis is used as a means of removing the bands. Corrugation is an interruption of the edge boundary caused by the operator's exit, which oscillates above and below the threshold. To prevent the border from appearing as a dotted line, the hysteresis uses two thresholds, one high and one low. Therefore, the image is segmented using edge detection.



Fig. 6: Edge Detection

C. PDE Based Segmentation

The method that relies on the partial differential equation is the quick methods of segmentation. This method is best for critical time taking applications. It has basically two methods of PDE: non-linear isotropic diffusion filter (used to improve edges) and non-quadratic convex variation restoration. Fuzzy edges and boundaries are the result of PDE that can be moved using nearby operators. For reducing image noise and the segmentation region in image fourth-order PDE method is used. These dams are constructed second-order PDE method is used to better detect edges and boundaries.

D. Threshold Segmentation

Simplest approach of image segmentation is based on intensity levels and it is known as threshold. The threshold can be implemented globally or locally. The global

thresholds distinguish the pixels of the object and the background when compared to the selected threshold value and use the binary separation to segment the image. The local threshold is also called the adaptive threshold. In this method, the threshold value varies depending on the image based on the local attribute of the divided areas.

The histogram threshold is used to segment this image. There are some pre and post processing methods necessary for segmenting the threshold. The main methods for determining the thresholds are suggested by the various researchers the mean value method, the P mosaic method, the histogram-dependent method, the edge maximization method and the visual method.

E. ANN Based Segmentation

Segmentation methods based on artificial neural networks imitate the learning procedure of the human brain in order to Decision making. Nowadays, ANN based segmentation is used for the segmentation of medical images. A neural network comprises of a large number of joined nodes and each join has a specific weight this method is completely free of PDE. In this, problems are solved using neuronal net. This method has two basic steps: feature extraction and segmentation by neural network.

IV. FUTURE SCOPE

Image segmentation plays as the primary approach for digital image processing. Segmentation is the initial step to preprocess the image to extract the object.

Due to further progress in image processing techniques there will be millions and millions of smart machines in the world soon, transforming world's management. Advancement in image processing techniques and artificial intelligence will involve verbal commands, predict the information requirements of governments, translating languages, tracking and recognizing people and objects, detect medical and health issues, performing operations, mutate the defects in human DNA. With increasing power and growth of modern computing, the concept of computation can go further in future, image processing methods will improve.

V. CONCLUSION

Image Segmentation is a crucial part of processing an image in computer science. Processing an image is widely used in research areas. In image processing we have many techniques to segment and process images. In this paper we study the different types of Image Segmentation technique, in which we decide to use edge, based Image Segmentation Techniques to segment images by identifying edges of objects in image and perform a comparative analysis of them

In a computer vision (an application of Artificial Intelligence), segmentation means the procedure of dividing a digital image in the several segments (sets of pixels, also called super pixels).

In this review paper of segmentation techniques of images, are detailed described and compared. These all techniques are suitable for checking object and boundaries, Medical field, Object detection, Face Recognition, Pattern

Recognition fields. But from the researches we can say that it is clear for each image there is no single method, and all techniques are not suitable for a certain type of image. Due to the need for image segmentation in many applications, it has a complex future.

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