

A Review Paper on Segmentation and Clustering Techniques

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Abstract— Image Segmentation process is referring to separating an image bases on some characteristics like color, quality or intensity. For improving weak edges then must use the watershed technique that is region based segmentation. But it is difficult to make a perfect segmentation [1]. For making a good result of the segmentation than improve the watershed technique with the help of clustering techniques. The new segmentation algorithm is based upon improving the watershed technique, using clustering technique. In this new work study, discussed the main aspects of algorithm with their applications, merits or demerits also. The scientific method of that technique is explained and logical detail is avoided for simplicity [4]. At the end, for reducing the blurring and improving the quality of an image, than used the hybrid approach that is combination of a watershed segmentation technique with the clustering technique that produce a fuze (mixture) for providing better texture of an image segmented.

Key words: Segmentation, Clustering Techniques

I. INTRODUCTION

Digital image processing is a process of performing image processing on digital image. Any image is represented as $F(x, y)$. The (x, y) are spatial coordinate and F is a frequency. So that F is a frequency at any pair with the co-ordinate $F(x, y)$ is called grey scale image. When co-ordinate (x, y) and function of F is all are finite, then discrete function call the digital image. This process is called a Digital Image processing [11].

Digital Image processing is nearly co-related with the computer graphics and vision. It comes with wider range of algorithm, for input data can avoid problem such as noise and distortion [2]

II. IMAGE SEGMENTATION

It Is A Process Of Separating A Digital Image Into Smaller Number Of Pixels Called Super Pixel [3]. It Is Basically Used to Locate The Pixels And Edges Such As (Lines, Curves) In An Image. The Conclusion of Image Segmentation Is Set of Pixel That Covered The Entire Image [6].

A. Fundamental Steps of Image Segmentation:

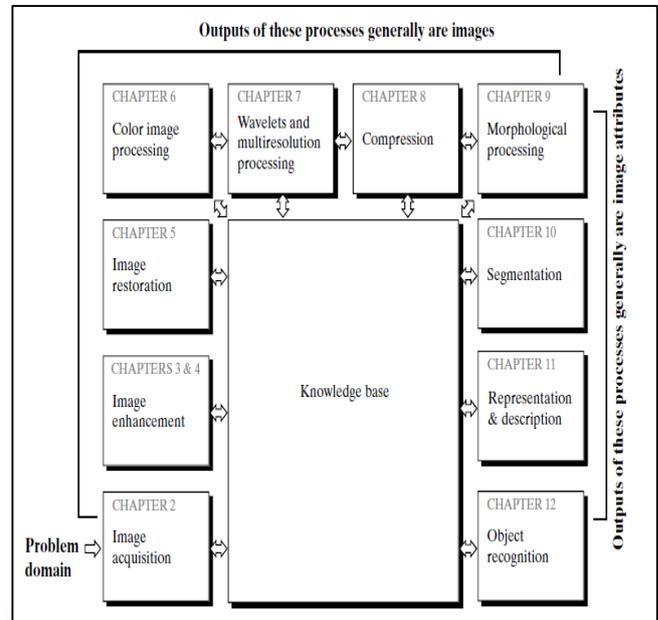


Fig. 1: Fundamental step of digital image processing [13]

B. Image Acquisition:

It means how we can acquire the Image. In this process we need a object, light sources or any capturing source. They provide some symbols regarding the existence of Digital image.

C. Image Enhancement:

It refers to enhancing an image. So that result is more suitable or perfect over than original image.

D. Image Restoration:

Image Restoration is totally practically whereas Image Enhancement is totally theoretically. It concerned with improving the appearance of an image based on logical concept of image degradation.

E. Color Image Processing:

It deals with the colored Image and produce 3 Type of image.

1) Pure Black And White:

In this the intensity value of pixel is either 0 or 1.

2) Grey Scale Image:

The intensity value of pixel is lies between 0 and 1.

3) Color Image:

It deal with the colored pictures such as: RGB: It deal with primary colors that are Red Green Blue

CMY: It deal with the secondary colors that are Cyan Magenta Yellow

HIS – Hue Saturated Intensity

F. Wavelet and Multi-Resolution Processing:

Wavelets are established for defining an image into multiple degree of resolution called Wavelet and Multi-resolution

Processing. At the top the resolution is high on other side at the bottom the resolution is low.

G. Compression:

Compression is used for transferring the media such as (Audio, Text, Video). Compression refers to that technique those are compressed the storage space that is used for save an image or the bandwidth that is used for transmit it.

H. Morphological Process:

It deals with that equipment those are used for extracting an image component which is used for defining and manufacturing the shape.

I. Segmentation:

It is a process of separating the complex task or image into multiple sub task called pixels. It always follows the output of Morphological Process technique.

J. Representation and Description:

A raw pixel data that containing all the pixels in an image and boundaries of an image.

K. Object Reorganization:

This is a process of the object a depend upon its description.

L. Knowledge Base:

It refers to the knowledge about a particular problem. It is coded in Digital image processing in the form at knowledge data base.

III. SEGMENTATION

It is a process of separating the task into multiple parts of segment called pixel that is dividing on the bases of color, intensity or quality [2].

The separating pixels is also called objects the Aim of Segmentation is achieving a meaningful data from the huge database system that gives effective result. The segmented object are covered the entire image.

It play important role for analyzing an image [3], But if the image quality is poor or blurring image due to noise and some other reasons. So identify these problem with the use of Hybrid approach that is combination of watershed segmentation technique with clustering technique and provide the better mixture of that image i.e. free from noise or smooth image [1].

IV. SEGMENTATION TECHNIQUES

The three types of segmentation are:

A. Edge Detection:

It is defined as group of pixels that is visible between two regions. The pixel is surrounded by closed border and they can be detected in the intensity level of an image that is totally different from grey level [6]. In this the pixels and objects are closely bounded with each other. The edge is developed from edge Detector.

It is in the form of hierarchical structure and it plays a significant role for analyzing an image and also provides a physical content of an object [2]. This technique provide better quality object that is useful for reducing the noise in an image. The following types of edges are:-

- 1) Step Edge

- 2) Ramp Edge
- 3) Roof Edge
- 4) Spike Edge [2]

B. Thresholding:

It is very useful or meaningful technique for image segmentation. It is used for converting a grey scale image into binary images [6]. It is denoted by (T), only single value is selected for converting grey level image into binary image and other values are must be lesser than T.

Because the Binary Image contain the whole data regarding content, edge and shape of object. It plays a very important role to decreasing the complexity of data and simplifies the process of description and representation [2].

- 1) Global Thresholding:-It deals with the intensity value of input image that have contain a two peak value of an image. It tells the sense of intensity separation between two points of an image. All pixels that having intensity value is below than threshold value are set to zero; otherwise they set to one [6].
- 2) Variable Thresholding:-The image is divided into equal number of segments that have taken a unique variable for each segment .this process is called a variable thresholding [6].

C. Region Based Segmentation:

In edge based segmentation the partitioning of an image is based on edge. In this segmentation technique the partitioning is done with Region [2].

In this the set of pixels are closely related together [6]. In any image Region are set of pixel that have similar property. Each pixel is assigned to a unique edge or Region. It is a very popular method for reducing the noise and improving the appearance of any Region.

It is simplest method and no time consuming process. They provide faster and accurate results. It can easily implement at the compiled time. It is of two types:-

- 1) Region growing method:-It is a technique of collecting of pixels into the larger regions [6].
- 2) Region splitting merging method: - When the entire image is taken as a unique region and then they divided into sub regions called splitting [6].Each sub region is compare with adjacent region and then merges them [2].

V. WATERSHED

Watershed is a recently developed methodology. It is belongs to the region based segmentation technique [1]. This technique is used for solve the shortcomings (Problems) of segmentation methods. They provide the better understanding, accurate result, smoothing image and reduced the blurring effect of an image. There are so many numbers of techniques of watershed. It is defined in the edge on the nodes and in the graphs both the nodes and edges defined on the hybrid line [4].The watershed algorithm is automatic technique and does not need any parameters for describing the incomplete condition of the image segmentation. It convert the image into gradient image [7].The watershed technique is one of the ancient segmentation technique that considered the grey level image as a topographic image [9].

It is very popular technique used for detecting the edges in an image. Most important features of watershed transform is that they always reduce the contouring effect and

require the low complexity and less time from the other segmentation techniques [9]. The watershed transformation has two basic ways of approaching image segmentation

- 1) Boundary based segmentation that discovers and examines the basic changes of an image.
- 2) Region based segmentation that finds out the pixels and region equalities [10].

For improving the watershed technique and produce a better texture of an image we can use the clustering segmentation technique. The watershed technique is used for evaluate the features properties which is used for mark the pixel that are called pixel marker and feature is applied for the background [10]. That provides the better quality segmented image. The result of watershed transform is universe segmentation. The watershed implementation methods are mainly three types:-

- 1) Distance transformation approach
- 2) Gradient method
- 3) Marker controlled approach [9].

VI. CLUSTERING

It is the technique of collection of data into the cluster such as highly intra cluster similarity and lower intra cluster similarity [12]. Clustering is applied for describing the instinctual features of the data [8]. It is denoted as unsupervised problem and also deal with find out the structure in a grouping of unlabeled data.

They also define as “the process of collecting objects into groups whose members are binded with similar property in some way” [12]. A cluster is refers to grouping of objects that are “common” between them and are “different” to the objects belonging to other clusters. There are two types of cluster which is divided on the basis of data structure:-

- 1) Distance based clustering:- If two or more than objects are belong to the one cluster and closely related to a given distance called a distance based clustering [8].
- 2) Conceptual clustering:- If two or more objects belong to same cluster but one object represent the common concept to all the objects called conceptual clustering [12].

The Clustering Algorithms are:-

- 1) Exclusive Clustering:- In this case data are grouped into the exclusive form. When the data is represent in one cluster than could not be used in another cluster.
- 2) Overlapping Clustering:- It is used for fuzzy type of clustering, so each object belongs to a one or more cluster [12].
- 3) Hierarchical Clustering:- It is defining the similarities between two closest clusters.
- 4) Probabilistic Clustering:- This type of algorithm is totally based on probabilistic approach.

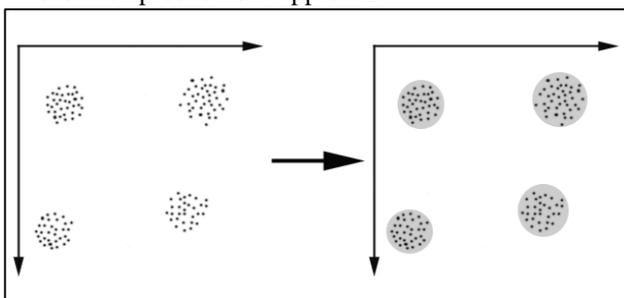


Fig. 3: Clustering [14]

Important features of clustering are:-

- 1) It is deal with any data types.
- 2) It is able to deal with noise clusters.
- 3) Clustering is useful for find out the scalability of both time and space.
- 4) High complexity.
- 5) Easily interpreted and maintain it.
- 6) More accurate and replicable.

VII. CONCLUSION

In this paper, we discussed the image segmentation, fundamental step of image segmentation and also discuss techniques of image segmentation. For improving the quality and producing better texture of segmented image so we studied the watershed segmentation algorithm with clustering technique.

The watershed algorithm provides better segmented effect [1]. But for reducing the shortcoming and improve the watershed technique than we will study the clustering technique. That provide better result with accuracy and texture of segmented image.

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