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SURVEY OF IMAGE ENHANCEMENT PROCESSING USING K-MEAN

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ABSTRACT

Most of the image processing techniques such as edge detection, segmentation, object tracking, pattern recognition etc. do not perform well in the occurrence of noise. Thus, image restoration as a preprocessing step is performed before applying the image to any of the above mention techniques. Medical image processing is now a day's one of the best tools to make an educational model from a raw image of each part of the body, and segmentation is the most important step in which used to extract significant features. Image segmentation is very essential and critical to image processing and pattern recognition. Various clustering based segmentation methods have been proposed. However, it is very difficult to choose the method best suited to the type of data

Keywords: Image Processing, Segmentation , Clusterin., K-Mean

I. INTRODUCTION

Digital image processing can be defined as the science of modifying digital images by means of a digital computer. Since both **the descriptions** and the computers that process them are digital in nature. An image is a visual representation of an object, a person, or a scene produced by an optical device such as a mirror, a lens, or a camera. This illustration is two dimensional (2D), although it corresponds to one of the infinitely any projection of a real-globe three-dimensional (3D) object or scene.

It is helpful to divide the material into two broad categories: methods whose input and output are metaphors and methods whose input may be images but whose outputs are attributing extracted from those images.

Image attainment Acquisition could be as simple as being given an image that is already in digital form. Generally, image acquisition stage involves preprocessing, such as, scaling.

Image enhancement is the process of manipulate an image so that the result is more suitable than the original of specific application.

Image restoration is an area that also deals with humanizing the appearance of an image.

Color image processing is an area that has been gaining in importance because of the significant add to in the use of digital images over internet.

Morphological processing deals with the tools used for extracting image components that are useful in representation and description of shape.

Segmentation procedures partition an image into its constituent's part or objects. A rugged segmentation procedure bring the process a long way towards successful solution of imaging troubles that require objects to be identified individually.

Representation and explanation almost always follow the output of a segmentation stage, which usually is raw pixel data, constituting either the border of a region or all the points in the region itself. **Description,** also called feature selection, deals with extract attributes that result in some quantitative information of interest.

II. IMAGE SEGMENTATION

Images are measured as one of the most important medium of conveying information, in the field of computer vision, by understanding images the in order extracted from them can be used for other tasks for example: navigation of robots, extracting malign tissues from body scans, finding of cancerous cells, and identification of an airport from remote sensing data. Now there is a need of a technique, with the help of which, we can understand images and extract information or items, image segmentation fulfill above requirements. Thus, image segmentation is the first step in image analysis. Some time picture denoising is done before the segmentation to avoid from the false contour selection for segmentation to segment the image without loss of in a row for medical diagnosing purpose is a challenging job [3].

Image segmentation refers to the process of partition a digital image into multiple segments i.e. set of pixels, pixels in a region are comparable according to some homogeneity criteria such as color, intensity or texture, so as to locate and identify objects and borders in an image [2]. Image segmentation is used to change the representation of an image into something that is more meaningful and easier to examine. Practical application of image segmentation range from filtering of noisy images, medical applications (find tumors and other pathologies, Measure tissue volumes, Computer guided surgery, Diagnosis, dealing planning, study of anatomical structure), Locate objects in satellite images (roads, forests, etc.), Face Recognition, Finger print credit, etc. Many segmentation methods have been proposed in the literature. The choice of a segmentation method over another and the level of segmentation are decided by the particular type of image and characteristics of the problem being considered. Several general-purpose algorithms and techniques have been developed for image segmentation [3].

III.IMAGE SEGMENTATION TECHNIQUES

Based on different technologies, image segmentation approaches are currently separated into following categories, based on two properties of image.

- Detecting Discontinuities*:* It means to partition an image based on sudden changes in intensity, this includes image segmentation algorithms like edge detection.

- Detecting Similarities*:* It means to divider an image into regions that are similar according to a set of predefined norm this includes image segmentation algorithms like thresholding, region growing, region splitting and merging.

3.1Segmentation Based on Edge Detection

This technique attempts to resolve image segmentation by detecting the edges or pixels between different regions that have fast transition in intensity are extracted [4-7] and linked to form closed object borders. The result is a binary image [4]. Based on theory there are two main edge based segmentation methods- gray histogram and gradient based method [6].

3.1. 1 Gray Histogram Technique

The result of edge detection technique depends mainly on collection of threshold T, and it is really difficult to search for maximum and minimum gray stage intensity because gray histogram is uneven for the crash of noise, thus we approximately substitute the curves of object and environment with two conic Gaussian curves [6], whose intersection is the valley of histogram. Threshold T is the gray importance of intersection point of that valley.

3.1.2 Gradient Based Method

Gradient is the first derivative for image f(x, y), when there is abrupt alter in intensity near edge and there is little image noise, gradient based method works well [6]. This method involves convolving gradient operators with the image. High value of the gradient magnitude is possible place of rapid change between two different regions. These are edge pixels, they have to be linked to form closed limitations of the regions. Common edge detection operators used in gradient based method are Sobel operator, canny worker Laplace worker, Laplacian of Gaussian (LOG) operator & so on, canny is most promising one [1], but takes more time as compared to Sobel operator. Edge detection methods requires a balance between detecting accuracy and noise protection in practice, if the level of detecting accuracy is too high, noise may bring in fake edges making the outline of images difficult and if the degree of noise immunity is too excessive [6], some parts of the image outline may get invisible and the position of objects may be mistaken. Thus, edge detection algorithms are suitable for images that are simple and noise-free as well often produce missing edges or extra edges on complex and noisy images [8].

3.2 Thresholding Method

Image segmentation by thresholding is a simple but powerful approach for segmenting images having light objects on dark background [2]. Thresholding technique is based on image space regions i.e. on characteristics of image [6]. Thresholding operation convert a multilevel image into a binary image i.e., it choose a proper threshold T, to divide image pixels into several regions and separate objects from background. Any pixel (x, y) is considered as a piece of object if its intensity is greater than or equal to threshold value i.e., $f(x, y) \geq T$ else pixel belongs to background [15]. As per the selection of thresholding value, two types of thresholding methods are in existence global and local thresholding. When T is stable, the approach is called global thresholding

otherwise it is called local thresholding. overall thresholding methods can fail when the background illumination is uneven. In local thresholding, multiple thresholds are used to pay off for uneven illumination [8]. Threshold selection is typically done interactively however; it is possible to gain automatic threshold selection algorithms. Limitation of thresholding method is that, only two classes are generated, and it cannot be practical to multichannel images. In addition, thresholding does not take into account the spatial characteristics of an picture due to this it is sensitive to noise [6], as both of these artifacts corrupt the histogram of the image, making division more difficult.

IV. SEGMENTATION BASED ON CLUSTERING

Clustering is an unsupervised learning task, where one wants to identify a finite set of categories known as clusters to classify pixels [3]. Clustering use no teaching stages rather train themselves using available data. Clustering is mainly used when classes are known in advance. A match criteria is defined between pixels [4], and then similar pixels are grouped together to form clusters. The combination of pixels into clusters is based on the principle of maximizing the intra class similarity and maximizing the inter class connection. The quality of a clustering result depends on both the similarity measure used by the method and its performance. Clustering algorithms are classified as hard clustering, k- means clustering, fuzzy clustering, etc.

4.1 Hard Clustering

Hard clustering assumes sharp boundaries between clusters [8]; pixel belongs to one and only one cluster. A well-liked and well known hard clustering algorithm is K-means clustering algorithm [3].

K-means algorithm is a clustering method to partition n pixels into k clusters, where$k < n$. K-means algorithm Developed by Mac Queen in 1965 and then sophisticated by Hartigan and Wong in 1979. K-means algorithm is a clustering technique [3], which classify pixels in an image into K number of clusters, where K is a positive integer, according to some similarity feature like grey level intensity of pixels and distance of pixel intensities [4], from centroid pixel intensity. The main advantages of this algorithm are its simplicity and low computational cost, which allow it to run efficiently on large data sets.[13]

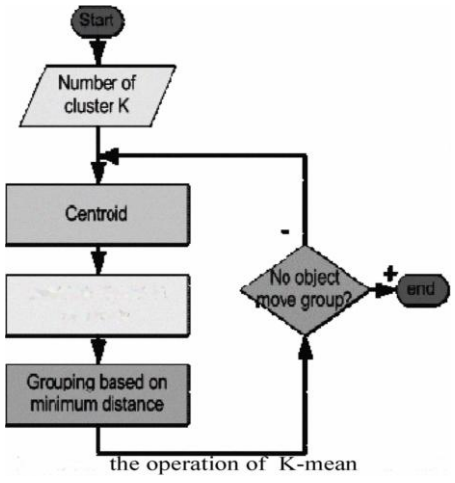

Fig 1.1 K-mean Clustering

The main drawback is that: K the number of clusters must be determined [6], it does not yield the same result each time the algorithm is executed and the resulting clusters depend on the initial assignments of centroids. The process is as follow

1. Randomly choose number of clusters K.
2. Compute the histogram of pixel intensities.
3. Randomly choose K pixels of different intensities as Centroids.
4. Centroids are finding out by calculating mean of pixel values in a region and place Centroids as much far away from each other as possible.
5. Now, compare a pixel to every Centroid and assign pixel to closest Centroid to form a cluster,

$$C(i) := arg\ min\ ||x^{(i)} - U_j\ ||$$

6. When all pixels have been assigned, initial clustering has been completed.
7. Recalculate position of Centroids in K clusters [13]

$$U_i := \frac{\sum_{i=1}^{m} 1\{c_{(i)} = j\}}{\sum_{i=1}^{m} 1\{c_{(i)} = j\}} x^{(i)}$$

8. Repeat step 5 & 6, until Centroids no longer move.

V. IMAGE ENHANCEMENT

Image enhancement [14] is one of the major research fields in image processing. In any applications such as medical application, military application, media etc., the image enhancement plays an important role. There are many techniques proposed by different authors in order to remove the noise from the image and produce the clear visual of the image. Also, there are many filters and image smoothing methods available. All these available techniques are designed for particular kind of noises. Recently, neural networks tum to be a very effective tool to support the image enhancement. Neural network is applied in image enhancement because it provides many advantages over the other techniques. Also, neural network can be suitable for removal of all kinds of

1. noises based on its training data.
2. Image separated into K clusters.

VI. CONCLUSION

Image segmentation is a key technology in image processing which partition an image into its constituent regions. k means segmentation techniques are practical approaches for color image segmentation**.** This paper discusses quantitative evaluation measures for color image segmentation based on these techniques. Segmentation of images holds an important position in the area of image processing. It becomes more important

while typically dealing with medical images where pre-surgery and post surgery decisions are required for the purpose of initiating and speeding up the recovery process.

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