HIGH IMAGE RESOLUTION FOR INDUSTRIAL APPLICATIONS USING LLOYDS CLUSTER SEGMENTATION TECHNIQUE

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Abstract:-

Thresholding is a commonly used technique for image segmentation. This paper presents an efficient iterative algorithm for finding optimal thresholds that minimize a weighted sum-of-squared-error objective function. We have proved that the proposed algorithm is mathematically equivalent to the well-known Otsu's method, but requires much less computation. The computational complexity of the proposed algorithm is Lloyds clustering. Although the algorithm may be applied most directly to the Euclidean plane, similar algorithms may also be applied to higher-dimensional spaces or to spaces with other non-Euclidean metrics. The Lloyds clustering Experimental results have verified the theoretical analysis and the efficiency of the proposed algorithm.

Keywords*:-Binarization, Thersholding Image Segmentation, Lloyds Clustering.*

INTRODUCTION:-

DIGITAL images are subject to a wide variety of distortions during acquisition, processing, compression, storage, transmission and reproduction, any of which may result in a degradation of visual quality. For applications in which images are ultimately to be viewed by human beings, the only "correct" method of quantifying visual image quality is through subjective evaluation. In practice, however, subjective evaluation is usually too inconvenient, time-consuming and expensive. The goal of research in objective image quality assessment is to develop quantitative measures that can automatically predict perceived image quality. An objective image quality metric can play a variety of roles in image processing applications. First, it can be used to dynamically monitor and adjust image quality. Image enhancement techniques are the algorithms which improve the quality of images by removing blurring and noise, increasing contrast and sharpness of digital medical images. There are many image enhancement approaches (theories) like Contrast stretching, Range compression, Histogram equalization and noise smoothing. A certain amount of trial and error usually is required before a particular image enhancement approach is selected. There is no general theory of image enhancement. When an image is processed for visual interpretation, the viewer is the ultimate judge of how well a particular method works. Visual evaluation of image quality is a highly subjective process.

Image segmentation

Image segmentation is the fundamental approach for digital image processing. In image processing, segmentation is the first step to preprocess the images to extract the objects and make it easier to analyze The segmentation process identifies the group of pixels having similar properties within the image. Segmentation is a valuable tool in many fields in our daily life like industry, health care's, Digital image

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processing, remote sensing, Road traffic image, content based retrieval, pattern recognition, and computer vision etc. binarization techniques for grayscale documents can be grouped into two broad categories: global binarization and local binarization. Global binarization methods like that of Otsu method try to find a single threshold value for the whole document. But all the method should be applied to all the type of images for that an algorithm like Lloyds means should be considered to classify the depth and extension region of the identified area.

EXISTING METHOD:-

Otsu Thersholding:-

The Otsu's thresholding method may be recommended as the simplest and standard method for automatic threshold selection, which can be applied to various practical problems. Although the Otsu's thresholding method is usually applied to images with a bimodal histogram, it may also provide a meaningful result for unimodal or multimodal histograms where a precise delineation of the objects present on the scene is not a requirement. The key concept behind this method is to obtain an optimal threshold that maximizes a function of the threshold level.

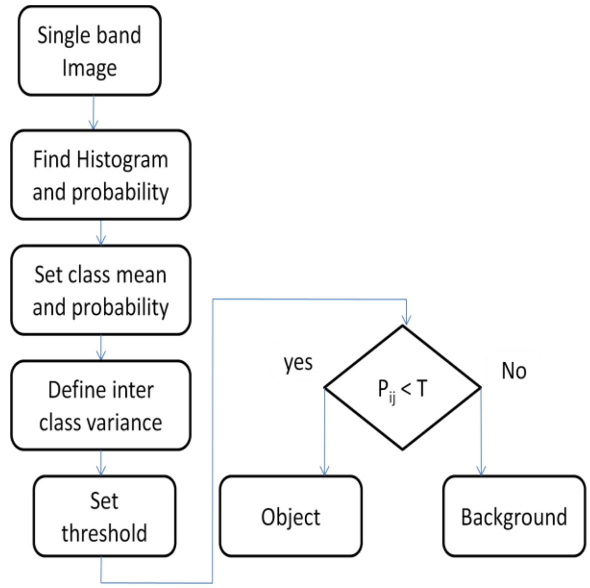

Figure:-Algorithm for Otsu Method

The optimal threshold is selected by a discriminant criterion, in order to maximize the separability of the resultant classes in gray levels. The procedure utilizes only the zeroth- and the first-order cumulative moments of the gray level histogram.

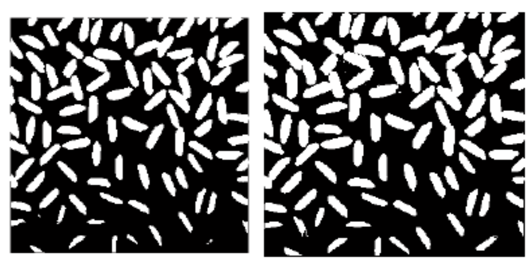

Figure:-Otsu segmentation

PROPOESD METHOD:-

Lloyd's Clustering:-

Lloyd's algorithm is an algorithm named after Stuart P. Lloyd for finding evenly-spaced sets of points in subsets of Euclidean spaces, and partitions of these subsets into well-shaped and uniformly sized convex cells. Like the closely related k-means clustering algorithm, it repeatedly finds the centroid of each set in the partition, and then re-

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partitions the input according to which of these centroids is closest. However, Lloyd's algorithm differs from k-means clustering in that its input is a continuous geometric region rather than a discrete set of points. Thus, when re-partitioning the input, Lloyd's algorithm uses Voronoi diagrams rather than simply determining the nearest center to each of a finite set of points as the k-means algorithm does.

Although the algorithm may be applied most directly to the Euclidean plane, similar algorithms may also be applied to higher-dimensional spaces or to spaces with other non-Euclidean metrics. Lloyd's algorithm can be used to construct close approximations to centroidal Voronoi tessellations of the input, which can be used for quantization, ditherin, and stippling. Other applications of Lloyd's algorithm include smoothing of triangle meshes in the finite element method.

Block Diagram:-

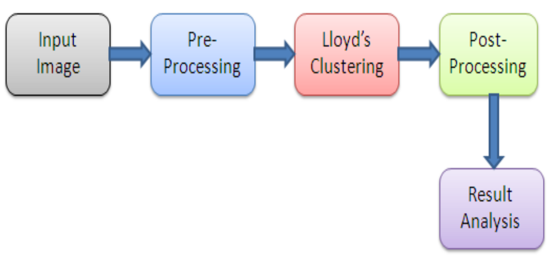

Figure:-Block Diagram for Proposed Method

IMAGE:-

Digital image is represented and manipulated as matrices containing the light intensity or color information at each sampled point (pixel). Color image contains three planes [Red Green Blue]. The combinations of the intensities of RGB represent the color and intensity at each pixel. Therefore a color image can be represented by 3 dimensional matrices.

Size = (no of rows X no of columns X 3 colors).

If 'f' represents an image, 'x' represents number of rows, 'y' represents number of columns and 'z' represents the RGB plane, then f(x, y, z) is used to represent intensity at position (x, y, z). If we use 8 bits to represent intensity of each color, then we can represent 28 intensities (levels), i.e. from 0 to 255 levels. Therefore the value of f(x, y, z) lies in between 0 to 255 (0 to L-1), where L represents number of levels.

Lloyd's Clustering- Algorithm description

Lloyd's algorithm starts by an initial placement of some number k of point sites in the input domain. In mesh smoothing applications, these would be the vertices of the mesh to be smoothed; in other applications they may be placed at random, or by intersecting a uniform triangular mesh of the appropriate size with the input domain.

It then repeatedly executes the following relaxation step:

- The Voronoi diagram of the k sites is computed.
- Each cell of the Voronoi diagram is integrated and the centroid is computed.
- Each site is then moved to the centroid of its Voronoi cell.

Because Voronoi diagram construction algorithms can be highly non-trivial, especially for inputs of dimension higher than two, the steps of calculating this diagram and finding the centroids of its cells may be approximated by a suitable discretization in which, for each cell of a fine grid, the closest site is determined, after which the centroid for a site's cell is approximated by averaging the centers of the grid cells assigned to it. Alternatively, Monte Carlo methods may be used, in which random sample points are generated according to some fixed underlying probability distribution, assigned to the

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closest site, and averaged to approximate the centroid for each site.

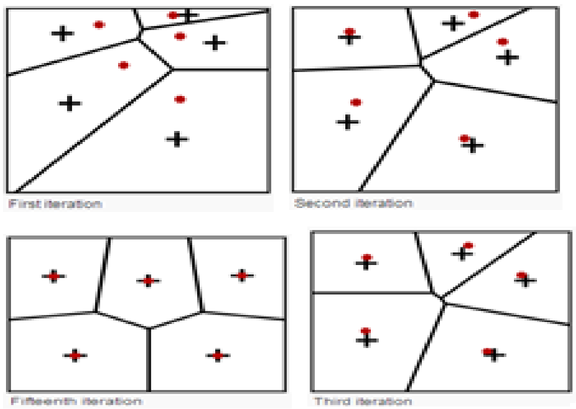

Figure:-Lloyds clustering

Lloyd's method was originally used for scalar quantization, but it is clear that the method extends for vector quantization as well. As such, it is extensively used in data compression techniques in information theory. Lloyd's method is used in computer graphics because the resulting distribution has blue noise characteristics (see also Colors of noise), meaning there are few low-frequency components that could be interpreted as artifacts. It is particularly well-suited to picking sample positions for dithering. Lloyd's algorithm is also used to generate dot drawings in the style of stippling In this application, the centroids can be weighted based on a reference image to produce stipple illustrations matching an input image.

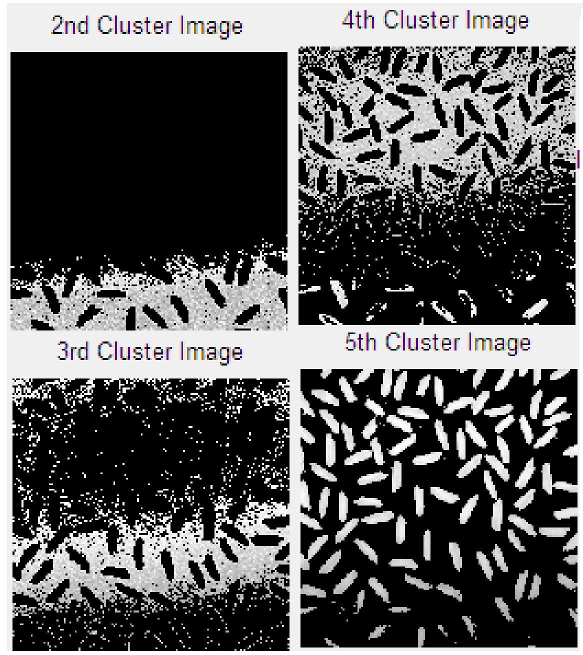

Figure: - Lloyds clustering Images

Post-Processing:-

In binary morphology, an image is viewed as a subset of an Euclidean space or the integer grid , for some dimension .

Structuring Element

The basic idea in binary morphology is to probe an image with a simple, pre-defined shape, drawing conclusions on how this shape fits or misses the shapes in the image. This simple "probe" is called structuring element, and is itself a binary image (i.e., a subset of the space or grid).

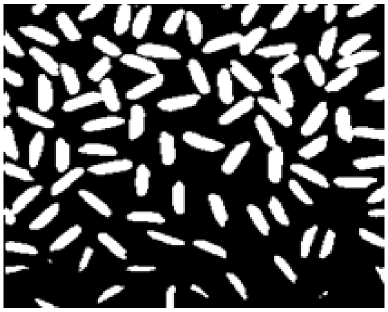

Figure:-segmented image

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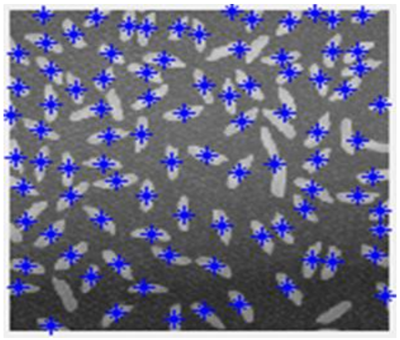

Figure:-Highlighted image

Experimental Result:-

Sensitivity and specificity are statistical measures of the performance of a binary classification test, also known in statistics as classification function:

Sensitivity:-

Sensitivity (also called the true positive rate, or the recall in some fields) measures the proportion of positives that are correctly identified as such (e.g., the percentage of sick people who are correctly identified as having the condition).

Sensitivity=TP/ (TP+FN)

Specificity:-

Specificity (also called the true negative rate) measures the proportion of negatives that are correctly identified as such (e.g., the percentage of healthy people who are correctly identified as not having the condition).

Specificity=TN/ (TN+FP)

METHOD	Otsu's Metho	Lloyd's Clustering
PARAMETER		
Sensitivity	50	50
Specificity	50	98.8624
Accuracy	50	98.8603

Table:-Compression for Existing Method and Proposed Method

Accuracy:-

Accuracy is also used as a statistical measure of how well a binary classification test correctly identifies or excludes a condition. That is, the accuracy is the proportion of true results (both true positives and true negatives) among the total number of cases examined. To make the context clear by the semantics, it is often referred to as the "rand accuracy. It is a parameter of the test.

Accuracy =(Tp+Tn)/(Tp+Tn+Fp+Fn)

Where TP is the number of true positive pixels, FP is the number of false positive pixels, TF is the number of true negative pixels, and FN is the number of false negative pixels.

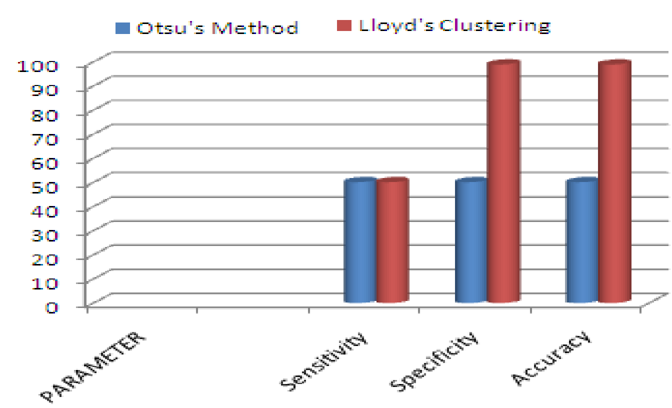

Figure:-Bar Graph for Sensitivity, Specificity and Accuracy Values.

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CONCLUSION:-

In this paper two methods are proposed for gray scale image segmentation. The iterative triclass method can able to identify the target region even in the presence of background noise This method aiming at removal of background noise from images and it has, better adaptability of various kinds of noise at different areas of the same image based on low computational cost. The iterative threshold quickly decreases after first or second iterations, implying it is fast to reach satisfactory results and the weak objects are gradually classified into foreground. Simultaneously, the area of the TBD region reduces as the iterative process proceeds. However, the results of the iterative method show even when the histogram of the image is not bi modal that the new method can perform very well and it can achieve good results in different types of histogram. Lioyd's method also produce very good results. Results show that the method can achieve better performance in challenging cases.

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