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RESEARCH ARTICLE

Detection of Dead Tissues by Medical Image Using CLUSTERING

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Abstract: This paper presents a new approach for image segmentation by applying k-means clustering and fuzzy c-means clustering. In image segmentation, clustering techniques are very important as they are intuitive and are also easy to implement. In This paper proposes a colour based segmentation method that uses K-means clustering and fuzzy c-means clustering technique. The k-means clustering is an instinct technique used to partition an image into k clusters. It produces accurate segmentation results only when applied to images defined by homogenous regions with respect to texture and colour since no local constraints are applied to impose spatial continuity for medical images. In others side Fuzzy clustering, which defines fuzzy techniques to cluster data and they consider that an object can be classified to more than one clusters. This type of technique leads to clustering schemes that are compatible with everyday life experience as they handle the uncertainty of real data. The most important fuzzy clustering algorithm is Fuzzy C-Means. In this clustering process, there are no predefined classes. Clustering produces initial categories in which values of a data set are classified during the classification process.

Keywords:- K-means Clustering, Fuzzy C-means clustering, Segmentation

I. INTRODUCTION

Image segmentation plays very important role in diagnosis of medical images. The objective of image segmentation on the basis of clustering is to partition an image into non overlapping, and homogeneous parts with respect to variation in intensity level and texture of that medical image. India is the second most popular country of the world and has changing socio-politic demographic and morbidity patterns that have been drawing global attention in recent years. About 75% of health infrastructure, medical man power and other health resources are concentrated in urban areas where 27% of the population lives. Contagious, infectious and waterborne diseases such as diarrhea, amoebiasis, typhoid, infectious hepatitis, worm infestations, measles malaria, tuberculosis,

whooping cough, respiratory infections, pneumonia and reproductive tract infections dominate the morbidity pattern, especially in rural areas. For problem identification of any medical images or for extraction of information from affected parts clustering approach is used. Detection of dead tissues based on clustering plays an important role in image understanding, image analysis and image processing. Because of its simplicity and efficiency, clustering approaches were one of the first techniques used for the textured natural images [1].

II. MEDICAL IMAGING

Medical imaging is the technique, process and art of creating visual representations of the interior of a body for clinical analysis and medical intervention. Medical imaging seeks to reveal internal structures hidden by the skin and bones, as well as to diagnose and treat disease. This rapidly evolving field of medicine originated in the first decade of the 19th century, when Wilhelm Rontgen, a professor of physics at Wurzburg University in Germany, discovered electromagnetic radiation. After the World War Two, the development of computer technology has triggered an amazing revolution in medical imaging techniques. There is a continuous drive not only to improve the diagnostic yield of medical imaging techniques for clinical use, but also the management of the huge amount of digital information available to medical imaging departments[2].

III. SEGMENTATION BASED ON CLUSTERING

The segmentation is based on the measurements taken from the image and might be greylevel, colour, texture, depth or motion. Some popular clustering algorithms like k-means and fuzzy c-means are often used in image segmentation [5] Adjacent regions are significantly different with respect. Clustering refers to the process of grouping samples so that the samples are similar within each group. The groups are called clusters. Clustering is a technique used in statistical data analysis, data mining, pattern recognition, image analysis also extracts information etc. Clustering is an unsupervised learning task, where one needs to identify a finite set of categories known as clusters to classify pixels. Clustering is mainly used when classes are known in advance. The grouping of pixels into clusters is based on the principle of maximizing the intra class similarity and maximizing the inter class similarity. The quality of a clustering result depends on both the similarity measure used by the method and its implementation. Clustering algorithms are classified as hard clustering, fuzzy clustering etc.

HARD CLUSTERING

Hard clustering assumes sharp boundaries between clusters, a pixel belongs to one and only one cluster. A popular and well known hard clustering algorithm is k-means clustering algorithm. K-means algorithm is a clustering technique to partition n pixels into k clusters, where k < n.

IV. K-MEANS CLUSTERING

K-means is one of the simplest unsupervised learning algorithms. The procedure follows a simple and easy way to classify a given data set through a certain number of clusters (assume k clusters) fixed a priori. The main idea is to define k centroids, one for each cluster. So, the better choice is to place them as much as possible far away from each other. The next step is to take each point belonging to a given data set and associate it to the nearest centroid. When no point is pending, the first step is completed and an early group age is done. At this point we need to re-calculate k new centroids as bary centers of the clusters resulting from the previous step. After we have these k new centroids, a new binding has to be done between the same data set points and the nearest new centroid. A loop has been generated.. In other words centroids do not move anymore.Finally, this algorithm aims at minimizing an *objective function*, in this case a squared error function. The objective function

$$J = \sum_{j=1}^{k} \sum_{i=1}^{n} \left\| x_i^{(j)} - c_j \right\|^2 ,$$

$$\left\| x_i^{(j)} - c_j \right\|^2$$

where is a chosen distance measure between a data point $x_i^{(j)}$ and the cluster centre c_j, is an indicator of the distance of the *n* data points from their respective cluster centres. In statistics and data mining, k-means clustering is a method of cluster analysis which aims to partition n observations into k clusters in which each observation belongs to the cluster with the nearest mean

V. FUZZY C-MEANS CLUSTERING

In present scenario, one of the most difficult task in image analysis & computer vision is to classify the pixel in an image correctly, when there is no crisp boundaries between objects in an image thus in order to resolve this difficult, fuzzy clustering techniques are used. fuzzy clustering divides the input pixels into clusters or groups on the basis of some similarity criterion. Fuzzy c-means is a method of clustering which allows one piece of data to belong to two or more clusters. It is based on minimization of the following objective function:

$$J_m = \sum_{i=1}^{N}\sum_{j=1}^{C} u_{ij}^{m} \left\| x_i - c_j \right\|^2 \quad , \quad 1 \le m < \infty$$

where m is any real number greater than 1, u_{ij} is the degree of membership of x_i in the cluster j, x_i is the ith of d-dimensional measured data, c_j is the d-dimension center of the cluster, and ||*|| is any norm expressing the similarity between any measured data and the center.

Fuzzy partitioning is carried out through an iterative optimization of the objective function shown above, with the update of membership u_{ij} and the cluster centers c_j by:

$$u_{ij} = \frac{1}{\sum_{k=1}^{C}\left(\frac{\left\| x_i - c_j \right\|}{\left\| x_i - c_k \right\|}\right)^{\frac{2}{m-1}}} \quad , \quad c_j = \frac{\sum_{i=1}^{N} u_{ij}^{m} \cdot x_i}{\sum_{i=1}^{N} u_{ij}^{m}}$$

This iteration will stop when $\max_{ij}\left\{\left|u_{ij}^{(k+1)} - u_{ij}^{(k)}\right|\right\} < \varepsilon$, where ε is a termination criterion between 0 and 1, whereas k are the iteration steps. This procedure converges to a local minimum or a saddle point of J_m. The FCM is the most accepted method since it can preserve much more information than other approaches.

VI. MATERIALS AND METHODS

The following image is taken under consideration

Fig1- sample image for training

This image is collected from the internet. It shows the disease named Hives (Urticaria). A common allergic reaction that looks like welts, hives are often itchy, and sometimes stinging or burning. Hives vary in size and may join together to form larger areas. They may appear anywhere last minutes or days. Medications, foods, food additives, temperature extremes, and infections like strep throat are some causes of hives. Antihistamines can provide relief

Experimental Results

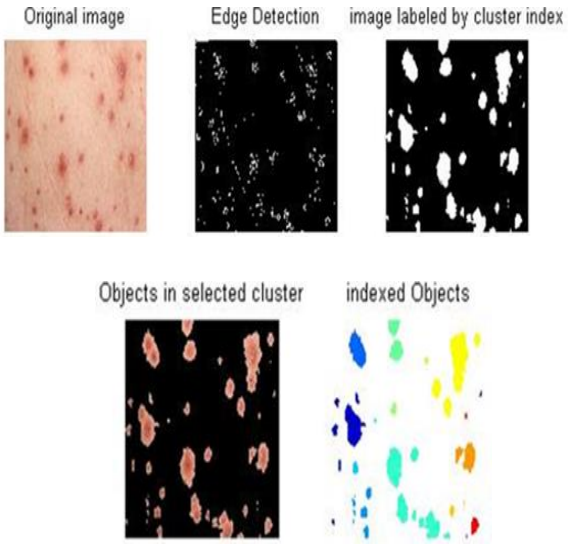

Fig2- various image obtained by applying k means clustering method

In K-means algorithm, we firstly initiate cluster centers and then decide the number of iteration by a lot of tries to get the good quality of segmentation. The Figure shows the segmented result using K-means clustering.

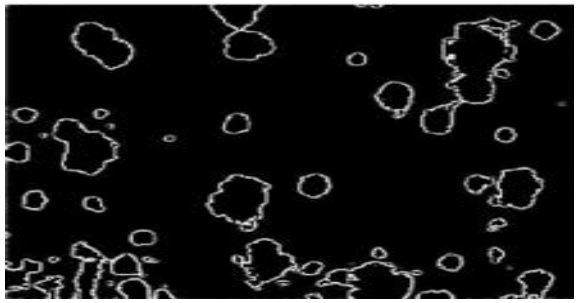

Fig3- image obtained by applying Fuzzy C-Means Clustering

VII. CONCLUSION

After successfully implemented k-means clustering algorithm. for smaller values of k the algorithms give good results. for larger values of k, the segmentation is very coarse; many clusters appear in the images at discrete places .this is because euclidean distance is not a very good metric for segmentation processes. different initial partitions can result in different final clusters. The result aims at developing an accurate and more reliable image which can be used in locating tumors, measure tissue volume, face recognition, finger print recognition and in locating an object clearly from a satellite image and in more[9]. it works well when clusters are not well separated from each other this could be happen in web images. we proposed a framework of unsupervised clustering of images based on the colour feature of the image. it minimizes intra-cluster variance.

The work is done on the images that do not have very sharp variation in RGB values. when various segmentation techniques are applied to such images the results were not satisfactory, the proper visualization of the dead tissues of the images was not possible. the use of such system gave 60-70 % improvement in results. images were obtained showing the proper detection of dead tissues including performance, regression plot. By using clustering on medical images each area, of live and dead tissue was clearly visible. it gave almost 85% improved results. This paper represents various methods of segmentation and clustering which can be helpful for medical image segmentation.

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