

ANALYSIS AND DETECTION OF DERMATITIS DISEASES USING IMAGE SEGMENTATION ALGORITHM METHOD

¹Prafulla N. Aerkewar, ²Dr. G. H. Agrawal,

¹ Ph.D. Research scholar, ² Professor,

¹Department of Electronics Engineering

¹B.D.College of Engg., Sevagram, Dist. Wardha, RTMNU, India

Abstract— The aim to publish this research paper to classify dermatitis disease using new an advanced technique of image segmentation called k-means clustering method. The process of clustering image segmentation method extract different features of input test image of dermatitis disease and compare with database images features values. This method suggest appropriate procedure such that the all dermatitis disease having skin lesion on body are classified in to four category using k-means image segmentation and nntool of Matlab. Through the image segmentation technique and nntool can be analyze and study the segmentation properties of skin lesions occurs in dermatitis disease. A skin lesion is a superficial growth or patch of the skin that does not resemble the area surrounding it. It have also been proposed that which are suitable for the processing of various images for different types of patches for various skin diseases. The skin lesion in different dermatitis diseases are different in appearance and have different properties though they looks similar in some circumstances. The main objective to classify the lesions of different dermatitis diseases based on its twelve parameters like contrast, Energy, Homogeneity etc where it would be able to classify the similar patch in to different disease.

Index Terms— Segmentation, Disease, Dermatitis, Lesion, Patch, Leprosy, Vitiligo, Psoriasis, Feature Extraction, Feature Selection, Entropy, Autocorrelation

I. INTRODUCTION

In day to day life, any person, rich or poor may cause patches on body due to many diseases such as Leprosy, Scar tissue, Contact dermatitis, Vitiligo, Psoriasis, Ring Worm, Eczema which may have the main issue that the skin is affected and may have the similar appearing symptoms like patches on some part of body or all over the body. As the patches on the body are looks similar but may cause by different reason. So due to similar appearance it may cause misdiagnosis and wrong treatment may be given. Most of the time, it is complicated when such a thing happens complication like reaction of a treatment may affect a life of victim.

So to avoid such misdiagnosis, image segmentation using k-means suggest the methodology for perfect diagnosis of the dermatological disease and helps in the analysis of such a disease, which can analyze the prior situation also. There are different image segmentation procedure that can be apply to build up such a powerful electronics tool which may create revolution in field of medical as well as engineering field. This effective technique work on analyzing the different parameter of skin lesion image, nntool and fuzzy logic of pervious database particular skin disease patch image.

II. METHODOLOGY

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The database of Images is collected via personal contacts with a patients or finding person having patch or patches on body. Also visited private skin care clinic and taken guidance regarding dermatitis disease. Total 70 people are contacted via visiting Maharogi seva Samiti, Dattapur and some private clinic. Also personally contacted some people. 14 samples of each category have been taken for analysis. Out of 70 people 30 people does have any patch on body so they come under other category. Out of remaining 40 people 30 found the patient of leprosy. Among 30 patient 14 sample are tested using algorithm and detected Leprosy correctly. Some Image samples are taken from patches image taken from internet. Sample images of Vitiligo and psoriasis also detected correctly. For analysis. Above database is segmented using k-Means clustering method. This method uses the means clustering to cluster the dermatological lesions. By using the cluster values we classify the types of dermatological ulcers. Fuzzy K-Nearest neighbor classification is used to classify the types of dermatological ulcers. Each sample should be classified similarly to its surrounding samples, therefore, a unknown sample could be predicated by considering the classification of its nearest neighbor samples. Given a sample set values, a fuzzy M class partition of these vectors specify the membership degrees of each sample corresponding to each class.

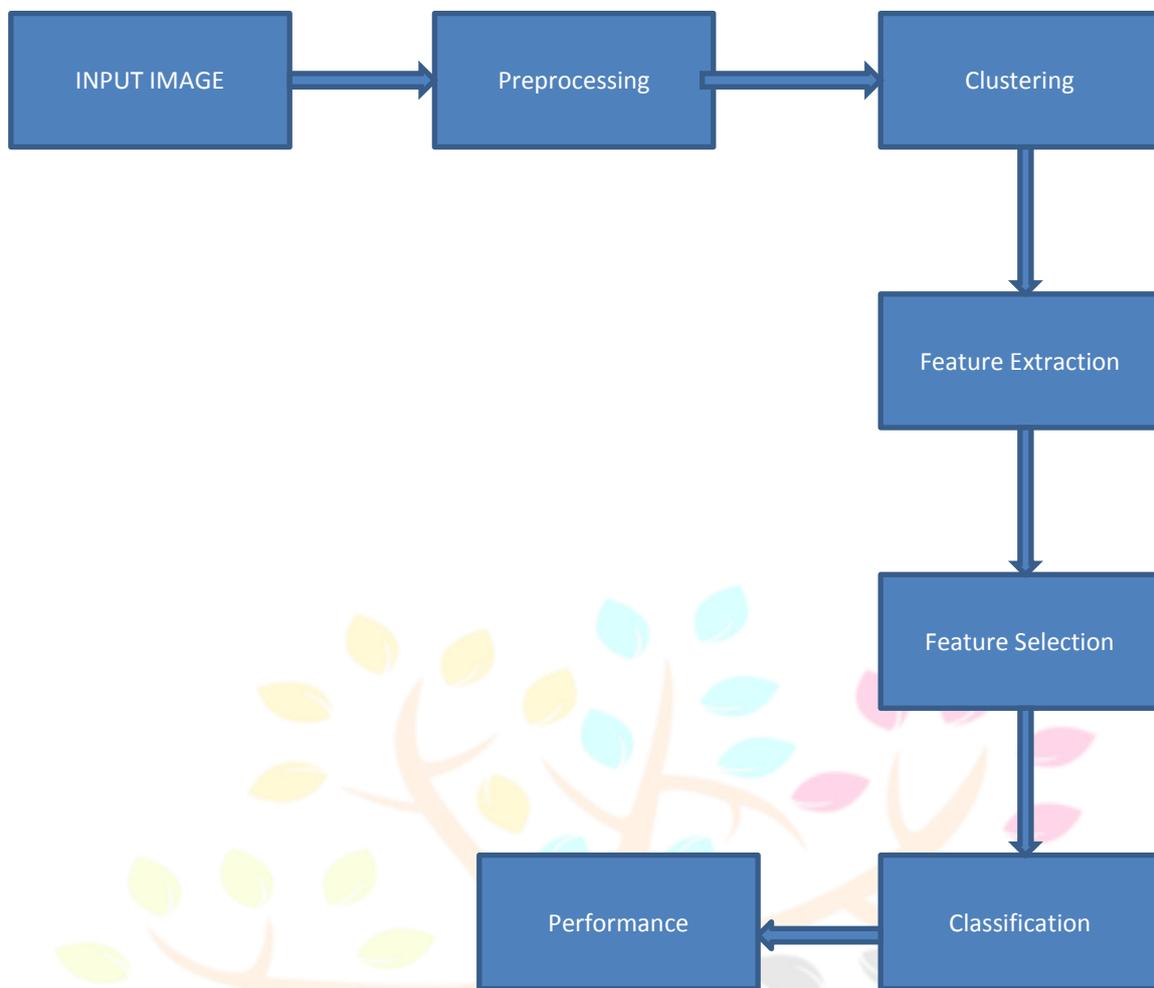


Figure 1:- Process Steps

Feature Extraction and Feature Selection:-

The collected database of skin lesions are processed using k-means clustering and median filter and denoise image is generated. The denoised image forwarded for feature extraction and many features like energy, Entropy, Autocorrelation, homogeneity are extracted from database. The same 12 features are extracted from the test image to be diagnosis. Following are the parameters used for train and test images for feature extraction using below procedure.

Contrast: Contrast is a measure of the local variations present in an image. If there is a large amount of variation in an image the $P[i,j]$'s will be concentrated away from the main diagonal and contrast will be high (typically $k=2, n=1$).

Homogeneity:- A homogeneous image will result in a *co-occurrence matrix* with a combination of high and low $P[i,j]$'s.

Where the *range of gray levels* is small the $P[i,j]$ will tend to be clustered around the main diagonal.

Entropy: Entropy is a measure of information content. It measures the randomness of intensity distribution. Such a matrix corresponds to an image in which there are no preferred gray level pairs for the distance vector d . Entropy is highest when all entries in $P[i,j]$ are of similar magnitude, and small when the entries in $P[i,j]$ are unequal.

Correlation: Correlation is a measure of image linearity.

Correlation will be high if an image contains a considerable amount of linear structure.

Energy: One approach to generating texture features is to use local kernels to detect various types of texture. After the convolution with the specified kernel, the *texture energy measure (TEM)* is computed by summing the absolute values in a local neighborhood: If n kernels are applied, the result is an n -dimensional feature vector at each pixel of the image being analyzed.

Maximum Probability: This is simply the largest entry in the matrix, and corresponds to the strongest response. This could be the maximum in any of the matrices or the maximum overall.

Cluster Shade

Local Homogeneity, Inverse Difference Moment (IDM) :

IDM is also influenced by the homogeneity of the image. Because of the weighting factor IDM will get small contributions from inhomogeneous areas. The result is a low IDM value for inhomogeneous images, and a relatively higher value for homogeneous images.

Sum of Squares, Variance :

This feature puts relatively high weights on the elements that differ from the average value of $P(i, j)$.

Autocorrelation :

Other statistical approaches include an autocorrelation function, which has been used for analyzing the regularity. This function evaluates the linear spatial relationships between primitives. The set of autocorrelation coefficients shown below are used as texture features: where p, q is the positional difference in the i, j direction, and M, N are image dimensions.

III. ALGORITHM

Algorithm is design as per the following module that perform possible analysis for applied digital image of dermatitis skin patch by calculating above discussed features.

Load Image:

In this module we initially load the test image which is to be classified. It can be done by using the `uigetfile` and `imread` functions in the matlab. To display the input image we use `imshow` function. After the loading the input image we will convert into gray scale image using `rgb2gray` function.

Preprocessing:

After the gray scale conversion we apply median filter to that image.

The Median filter is a nonlinear digital filtering technique, often used to remove noise. Such noise reduction is a typical pre-processing step to improve the results of later processing. Median filtering is very widely used in digital image processing because, under certain conditions, it preserves edges while removing noise.

Feature Extraction:

The feature values are extracted from the filtered test image. We extract the GLCM feature for the input image. The Gray Level Co occurrence Matrix (GLCM) method is a way of extracting second order statistical texture features. A GLCM is a matrix where the number of rows and columns is equal to the number of gray levels in the image.

Texture Feature Extraction:

When the input data to an algorithm is too large to be processed and it is suspected to be notoriously redundant (much data, but not much information) then the input data will be transformed into a reduced representation set of features (also named features vector). Transforming the input data into the set of features is called *feature extraction*. The features provide the characteristics of the input type to the classifier by considering the description of the relevant properties of the image into a feature space. If the features extracted are carefully chosen, it is expected that they will extract the relevant information from the input data in order to perform the desired task using this reduced representation instead of the full size input. Feature extraction involves simplifying the amount of resources required to describe a large set of data accurately. When performing complex data one of the major problems stems from the number of variables involved.

GLCM

A gray level co-occurrence matrix (GLCM) contains information about the positions of pixels having similar gray level values. A co-occurrence matrix is a two-dimensional array, \mathbf{P} , in which both the rows and the columns represent a set of possible image values. A GLCM $\mathbf{P}_{\mathbf{d}}[i,j]$ is defined by first specifying a displacement vector $\mathbf{d}=(dx,dy)$ and counting all pairs of pixels separated by \mathbf{d} having gray levels i and j . The GLCM is defined by: where n_{ij} is the number of occurrences of the pixel, values (i,j) lying at distance \mathbf{d} in the image. The co-occurrence matrix $\mathbf{P}_{\mathbf{d}}$ has dimension $n \times n$, where n is the number of gray levels in the image.

IV. RESULT AND DISCUSSION

The developed advanced image segmentation algorithm for analysis and detection of Dermatitis disease is useful for the classification of dermatitis disease using k-Means clustering method of segmentation and can classify disease into 4 category based on the database stored in nntool and using fuzzy logic it matched the parameter of test image to the database image. This algorithm extract the 12 feature 12 database and a test image of patch of disease and compare them. On the basis best matched 5 feature it classify to one of the four category. In this paper analysis of Leprosy test image is given. This algorithm first remove the noise of image and then perform k-means clustering image segmentation to extract features like energy, contrast, homogeneity etc and match with 12 featured of stored database of all images. Best 5 matched feature help to analyze and detect disease. The result of best selected 5 features of 56 database images and feature of test image is shown in table 1

Figures and Tables:-

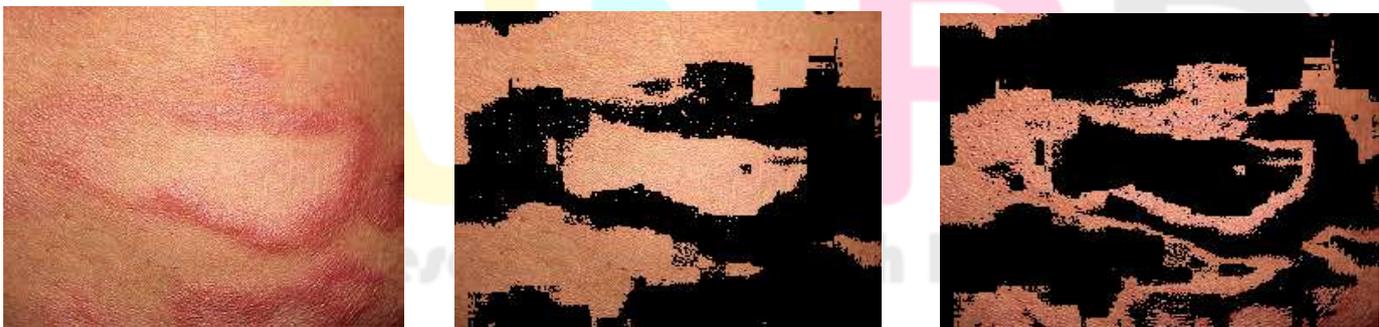


Figure2:-Original Leprosy Image , Cluster 1 and cluster 2

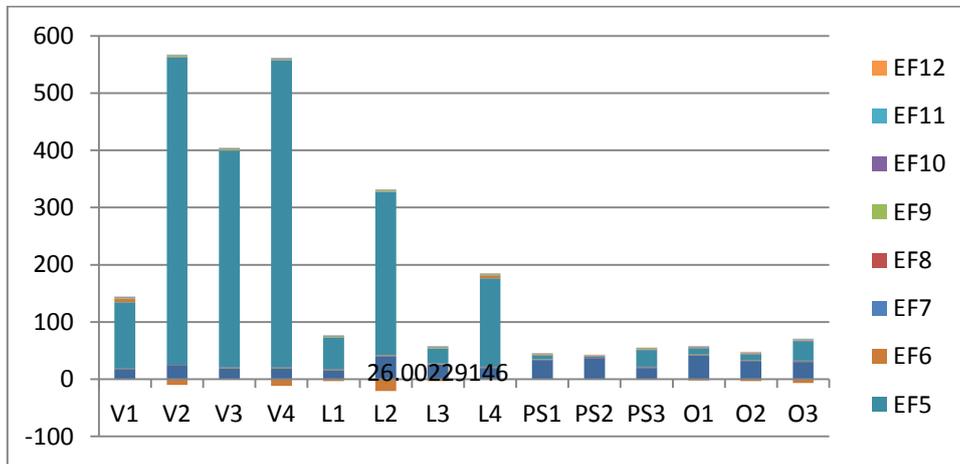


Figure 3 :-Extracted Features of Database Images

Table 3. :- Feature Selection from database Images

D/SF	SF2	SF6	SF7	SF9	SF11
V1	0.086276	5.604067101	0.084522638	1.889989266	0.957914001
V2	0.104608	-9.90310833	0.103561762	2.334412978	0.948323696
V3	0.159295	-	0.150713583	2.301827294	0.925501353
V4	0.048459	11.76409795	0.048335999	1.968351237	0.975844304
L1	0.062562	3.011302797	0.061392717	1.743200925	0.969413424
L2	0.338183	20.43554273	0.162985974	2.198008489	0.934270481
L3	0.14081	3.095041448	0.140378937	1.723164149	0.929851421
L4	0.296168	4.449272776	0.163078248	2.11744276	0.930085783
PS1	0.331831	0.102013195	0.304241511	1.780842948	0.850606896
PS2	0.035771	0.275658367	0.034541093	0.486516574	0.98282902
PS3	0.099194	0.130603877	0.096733514	1.703467587	0.951877135
O1	0.028882	2.001389204	0.027374508	1.063497453	0.98641857
O2	0.173321	-2.96093316	0.171936516	1.244621825	0.914156541
O3	0.125631	6.474990211	0.124461737	1.46382656	0.937867473

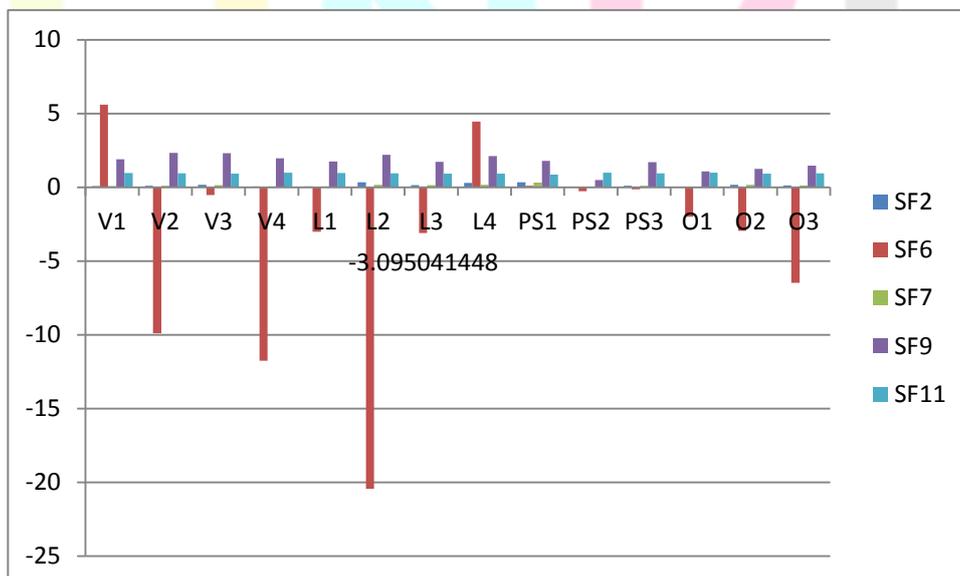


Figure 4.:-Selected Features of Database Images

Table 4:-Selected features to classify Test Image in to Disease

DL3/SF	SF2	SF6	SF7	SF9	SF11
DL3	0.14081	3.095041448	0.140378937	1.723164149	0.929851421

V. Conclusion

The advanced image segmentation algorithm is useful to classify the input test image of any disease into one of the four category like Leprosy, Vitiligo, Psoriasis or Other. It first perform the segmentation using K-means segmentation method to 12 extract features of test image and then using feature selection module of fuzzy logic it classify in to appropriate disease.

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