SKIN CANCER DETECTION USING PARTICLE SWARM OPTIMIZATION

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Abstract : Skin malignancy is the most well-known reason for death among people. Skin disease is unusual development of skin cells frequently creates on body presented to the daylight, yet can happen anyplace on the body. Since this cancer is visible on the skin, it is potentially detectable at a very early stage when it is curable. With the new innovation, early identification of skin growth is conceivable at beginning stage. Early technique for analysis skin growth location is Biopsy technique [1]. It is finished by evacuating skin cells and that example goes to different research centre testing. It is difficult and tedious process. In this paper we present Particle Swarm Optimization (PSO) for segmentation and Hidden Markov Model (HMM) for the classification of skin lesions. The input to the system is the skin lesion image and it goes under different pre-processing method for noise removal and image enhancement. At that point the picture is experienced to division utilizing PSO strategy. A few highlights of picture must be extricated utilizing GLCM system. These highlights are given as the contribution to classifier. Hidden Markov Model (HMM) is utilized for characterization reason. It conclude about the presence of skin cancer or not.

Index Terms - Pre-processing, skin lesion, particle swarm optimization, GLCM, hidden markov model, melanoma.

I. INTRODUCTION

Skin Cancer is the cancer affecting the skin. Skin cancer may appear as malignant or benign form. Benign Melanoma is simply appearance of moles on skin. Malignant melanoma is the appearance of sores that cause bleeding. Malignant Melanoma is the deadliest form of all skin cancers. It arises from cancerous growth in pigmented skin lesion. Malignant melanoma is named after the cell from which it presumably arises, the melanocyte. If diagnosed at the right time, this disease is curable. Melanoma diagnosis is difficult and needs sampling and laboratory tests. Melanoma can spread out to all parts of the body through lymphatic system or blood. The main problem to be considered dealing with melanoma is that, the first affliction of the disease can pave the way for future ones. Laboratory sampling often causes the inflammation or even spread of lesion. So, there has always been lack of less dangerous and time-consuming methods. Computer based diagnosis can improve the speed of skin cancer diagnosis which works according to the disease symptoms. The similarities among skin lesions make the diagnosis of malignant cells a difficult task. But, there are some unique symptoms of skin cancer, such as: Asymmetry, Border irregularity, Colour variation and Diameter. Those are popularly known as ABCD parameters. ABCD parameters. Asymmetry, Border irregularity, Colour, Diameter. Asymmetry is one half of the tumour

does not match the other half. Border Irregularity is the unevenness of images. Colour intensity change in the lesioned region is irregular. Malignant melanoma is having a diameter greater than 6mm.

II. LITERATURE REIVEW

Yuvaraj and Ragupathy, proposed a feature based approach, in which statistical features are extracted in the various selected regions. If the extracted features matches with the predefined features, then a seed point is fixed in that region [3]. This algorithm is robust against noise, but it will be hard and time consuming to pre-define the features.

Kawsar Ahmed, Tasnuba Jesmin, *"Early Prevention and Detection of Skin Cancer Risk using Data Mining"* [2] In this paper is proposed an effective Skin cancer prediction system based on data mining and provided an efficient approach for the extraction of significant pattern from data warehouse for efficient prediction of Skin cancer. The proposed method is implemented using Lotus Notes. The proposed method can efficiently and successfully predict the Skin cancer. And implemented software will be provided through online so that any person can easily check their Skin cancer risk level.

M.Chaithanya Krishna, S.Ranganayakulu, *"Skin Cancer Detection and Feature Extraction through Clustering Technique"* [4] In this paper, computer aided method for the detection of Melanoma Skin Cancer using Image Processing tools. The input to the system is the skin lesion image and then by applying novel image processing techniques, it analyses it to conclude about the presence of skin cancer. The Lesion Image analysis tools checks for the various Melanoma parameters Like Asymmetry, Border, Colour, Diameter,(ABCD) etc. by texture, size and shape analysis for image segmentation and feature stages. The extracted feature parameters are used to classify the image as Normal skin and Melanoma cancer lesion.

A.A.L.C. Amarathunga*," Expert System For Diagnosis Of Skin Diseases"* [5] This system uses technologies such as image processing and data mining for the diagnosis of the disease of the skin. The image of skin disease is taken and it must be subjected to various pre-processing for noise eliminating and enhancement of the image. This image is immediately segmentation of images using threshold values. Finally data mining techniques are used to identify the skin disease and to suggest medical treatments or advice for users. This expert system exhibits disease identification accuracy of 85% for Eczema, 95% for Impetigo and 85% for Melanoma.

C. Barata, M. Ruela, M. Francisco, T. Mendonc¸a, and J. S. Marques*, "Two systems for the detection of melanomas in dermoscopy images using texture and color features"* [6] In this paper, proposed two systems for melanoma detection in dermoscopy images. The texture and color features have been used based on local and global features. Histogram computation, peak detection and threshold estimation were implemented to get adaptive threshold and segment the lesion.

Mariam A.Sheha *,"Automatic Detection of Melanoma Skin Cancer*" [7] This paper presents an automated method for melanoma diagnosis applied on a set of dermoscopy images. Features extracted are based on gray level Co-occurrence matrix (GLCM) and Using Multilayer perceptron classifier (MLP) to classify

between Melanocytic Nevi and Malignant melanoma. MLP classifier was proposed with two different techniques in training and testing process: Automatic MLP and Traditional MLP. Results indicated that texture analysis is a useful method for discrimination of melanocytic skin tumors with high accuracy. The first technique, Automatic iteration counter is faster but the second one, Default iteration counter gives a better accuracy, which is 100 % for the training set and 92 % for the test set.

III. PROPOSED METHOD

Several segmentation methods have been developed to locate and detect the skin lesions in images automatically, a few of them for the conventional macroscopic images and the others for the dermoscopy images. Skin cancer detection is implemented by using particle swarm optimization, GLCM and Hidden Markov Model (HMM). In figure 1, Particle swarm optimization used for segmentation, Gray Level Co-occurrence Matrix (GLCM) is used to extract features from an image that can be used for classification. HMM can be used to solve various sequence analysis problems, such as pair wise and multiple sequence alignments, gene annotation, classification, similarity search, and many others.

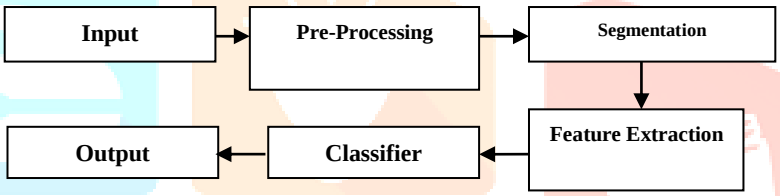


Figure 1**:** Block Diagram

Input image

Input to proposed system is dermoscopic images, dermoscopic images are images taken by dermatoscope. It is kind of magnifier used to take pictures of skin lesions (body part). It is hand held instrument make it very easier to diagnose skin disease.

Pre processing

Goal of pre-processing is an improvement of image data that reduces unwanted distortions and enhances some image features important for further image processing. Image pre-processing involves three main things 1) Gray scale conversion 2) Noise removal 3) Image enhancement.

Gray scale conversion

Gray scale image contains only brightness information. Each pixel value in gray scale image corresponds to an amount or quantity of light. The brightness graduation can be differentiated in gray scale image. Gray scale image measures only light intensity. 8 bit image will have brightness variation from 0 to 255 where '0' represents black and '255' represents white.

In gray scale conversion colour image is converted into gray scale image shows in Fig.(3). Gray scale images are easier and faster to process than colored images. All image processing technique are applied on gray scale image [7].

In our proposed system coloured or RBG image is converted into gray scale image by using weighted sum method by using following equations

Gray scale intensity= 0.299 R + 0.587 G + 0.114 B

Noise Removal

The objective of noise removal is to detect and removed unwanted noise from digital image. The difficulty is in deciding which features of an image are real and which are caused by noise. Noise is random variations in pixel values.

In our proposed system we are using median filter to remove unwanted noise shows in Fig.(4). Median filter is nonlinear filter, it leaves edges invariant. Median filter is implemented by sliding window of odd length [7]. Each sample value is sorted by magnitude, the centremost value is median of sample within the window, is a filter output.

Image enhancement

The objective of image enhancement is to process an image to increase visibility of feature of interest. Here contrast enhancement is used to get better quality result shows in Fig.(5).

Segmentation

Segmentation is process of removing region of interest from given image. Region of interest containing each pixel similar attributes. Here we are using particle swarm optimization for segmentation [8]. It is initialized with a group of particles and it searches for the best solution through an iterative process by computing the fitness value. The best value of the each particle is called ‘personal best’. The best fitness value in any particle during iteration is called ‘global best. Now, cast functions C1,C2 are obtained by using below equations.

C1= fix(m*Pbest)+1

C2= fix(n*Gbest)+1

threshold = 0.8*sum(C1,C2)/n

After threshold we obtained binary image that is black and white image shows in Fig.(6).

Feature extraction

Feature extraction plays an important role in extracting information present in given image. Here we are using GLCM for texture image analysis. GLCM is used to capture spatial dependency between image pixels. GLCM works on gray level image matrix to capture most common feature such as contrast, mean, energy, homogeneity [9].

Contrast:

$$\sum_i \sum_j (i-j)^2 C(i,j)$$

Energy:

$$\sum_i \sum_j C^2(i,j)$$

Homogeneity:

$$\sum_i \sum_j \frac{C(i,j)}{1 + |i-j|}$$

Mean (μ):

$$\frac{\sum_i^m \sum_j^n C(i,j)}{M * N}$$

The purpose of feature extraction (GLCM) is to suppressed the original image data set by measuring certain values or features that helps to classify different images from one another [8].

Classifier

Classifier is used to classify cancerous image from other skin diseases. For simplicity Hidden Markov Model classifier is used here. HMM takes set of images and predicts for each input image belongs to which of the two categories of cancerous and non-cancerous classes. Hidden Markov Model (HMM) is a statistical Markov model in which the system being modelled is assumed to be a Markov process with unobserved (i.e. hidden) states. In our proposed system output of GLCM is given as input to HMM classifier [9] which takes training data, testing data and grouping information which classifies whether given input image is cancerous or non-cancerous.

IV. RESULTS

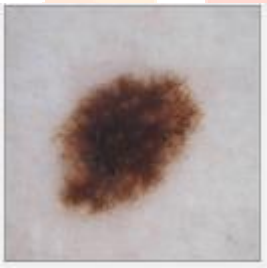


Figure 2**:** Input image

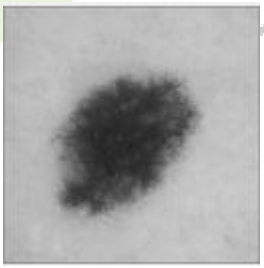


Figure 3**:** Gray scale image

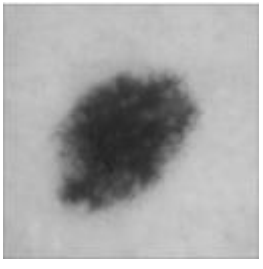


Figure 4**:** Noise free image

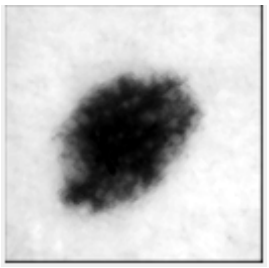
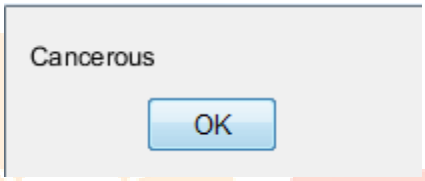


Figure 5**:** Enhanced image

Figure 6**:** Segmented image



Output

Accuracy (ACC) = $\frac{2TP}{2TP+FP+FN}$

ACC =92%

V. CONCLUSION

A Computer based early skin cancer detection system is proposed. It proves to be a better diagnosis method than the conventional Bioscopy method. The diagnosing methodology uses Digital Image Processing Techniques and particle swarm optimization for image segmentation and Hidden Markov Model for the classification of Malignant Melanoma from other skin diseases. Dermoscopic images were collected and they are processed by various Image processing techniques. The cancerous region is separated from healthy skin by the method of segmentation. The unique features of the segmented images were extracted using GLCM. Based on the features, the images were classified as Cancerous and Non-cancerous. From the results, the proposed technique successfully detects the skin cancer from images and gives better accuracy.

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