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Computerized Automated Detection of Skin Cancer

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Abstract: Skin cancers are the most common form of cancers in humans. An early detection of skin cancer can save the patients. Computer based skin cancer detection is most advantageous to patients, by which patients can detect the skin cancer without going to hospital or without using the help of a doctor. Computer based detection uses Image Processing and the Artificial Intelligence techniques. The various stages of detection involves collection of dermoscopic images, filtering the images for removing hair and noises, segmenting the images using method of Maximum Entropy Threshold, feature extraction using the Gray Level Co-occurrence Matrix, and classification done using Artificial Neural Network.

Keywords: Skin cancer, Image Segmentation, Feature Extraction, Artificial Neural Network.

I. INTRODUCTION

Digital Image Processing is basically modification of image using computer. The basic components of image processing system are image acquisition, image storage, image processing, display and transmission. Digital image processing system allows the enhancement of the image features of interest while attenuating details that are unrelated in the given context and then extract the amount of useful info. Computer based skin cancer detection are more advantageous to patients. Early detection of skin cancer is very much important for the patient because this skin cancer directly lead to the death of a person. Computer based detection uses the imaging techniques and Artificial Intelligence. Skin cancer is a deadly condition affecting the skin. Skin cancer may appear in the two form i.e Malignant and Benign form. Benign Melanoma is the process of simply appearance of moles on the skin. Malignant melanoma is the appearance of source that causes bleeding. Malignant Melanoma is the most deadly form of all skin cancers. It comes from the cancerous growth of pigmented skin lesion. It is a slowly spreading condition that begins in the melanocytes in skin. Melanocytes are the pigments giving colour to the skin.

It generally starts as small lesion later spreads to the other skin areas. So early detection is an inevitable one. Considering all the facts mentioned above, a Computer Aided Diagnosis of skin cancer is proposed. This methodology uses both image processing and artificial intelligence for classification.

II. EXISTING SYSTEM

Conventional diagnosis method to skin cancer detection is Biopsy method. A biopsy is a method to remove a piece of tissue or a sample of cells from patient body so that it can be analyzed in a laboratory. It is very painful. Conventional Biopsy Method is time consuming for patient as well as doctor because it takes lot of time for testing. Biopsy is done by removing or scraping off skin and that sample goes to a series of laboratory testing. There is possibility of splitting of lesion into other part of body. It is most dangerous.

III. PROPOSED SYSTEM

Conventional diagnosis method for skin cancer detection is Biopsy method. Computer based skin cancer detection is more usable to patients, by which patients can detect the skin cancer without going to any hospital. Skin cancers detect and removed early are almost always curable. To obviate these problems, many image processing techniques and the neural network system (NN) scan be used in this study for detection skin cancer. Neural Network is used to solve highly complex problems. In this proposed system, the feed forward multilayer network is used and Back propagation Algorithm is used.

IV. LITERATURE SURVEY

No	Researchers Name	year	Paper name	Technique
1.	M. Emre Celebi, Hassan A Kingravi, Bakhtiyar Uddin	2007	"A methodological approach to the classification of dermoscopy images"[7]	Technique : Dermoscopic image classification Advantages : automatic border detection, Exact shape feature
2.	Bareqa Saluh, Muhmd Alshraideh, Reha Beidas and Ferial Hayajneh	2011	"Skin Cancer Recognition by Using a Neuro-Fuzzy System"[11]	Technique : Neural Network and Fuzzy system Advantages: It avoids complexity, avoid dependency on clinics.

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3.	Aswin.R. B	2013	"Implementation of the ANN for the Skin Cancer Detection"[13]	Technique : 2D Wavelet Transform Advantages : It reduce the complexity of classification

V. SKIN CANCER DETECTION METHODS

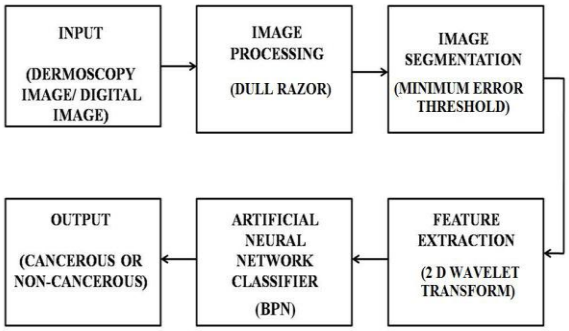


Fig.1. Diagrammatic Representation

A. Dermoscopy

Dermoscopy refers to the examination of the skin using the skin surface microscopy. The process includes placing oil between the skin and the optics. Dermoscopy is mainly used to compute pigmented lesions in order to distinguish between malignant skin lesions such as a melanoma and pigmented basal cell, from benign melanocytic naevi and keratoses keratosis.

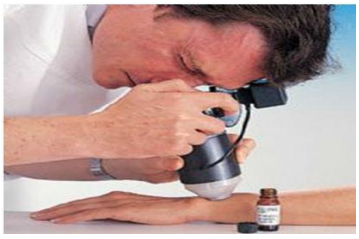
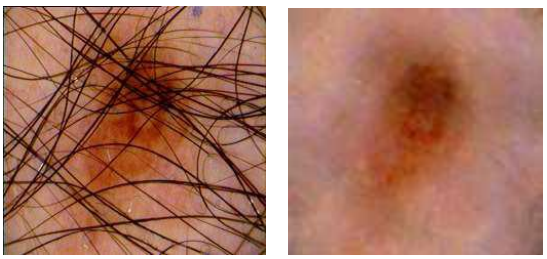


Fig.2. Dermoscopy

B. Dull Razor Filter

The Dermoscopic images are in digital format. This method is used to remove the small noise, fine hair and bubbles in an image. The hair removal is performed here by using Dull Razor Filter.



(a) With hair (b) without hair

Fig.3. Result of Dull Razor

C. Gray Scale Conversions

The image size is taken as 360x360 pixels for experiment. Before preprocessing of images it is important to convert the color image into grayscale image by eliminating hue and saturation after we can perform pre-processing. The algorithm is to transform RGB values into grayscale values by for obtaining a weighted sum of R, G and B Component:

$$I=0.2989\times R+0.5870\times G+0.1140\times B$$

D. Noise Filtering

Median filtering is used to remove noise for minimizing the small structures like thin hair and isolated islands of pixels like small air bubbles. It is used to remove pepper and salt noise. The median filter considers every pixel in the image in turn and looks at it's nearby neighbors to check whether or not it is representative of its surroundings.

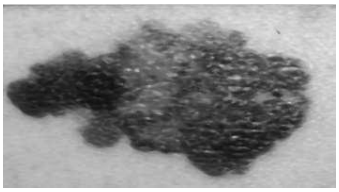
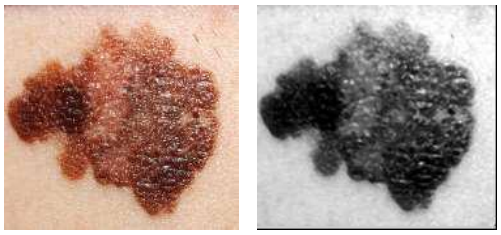


Fig.4. Noise Filtering

E. Image Normalization

In this normalization step, we are increase image clarity and obtain better performance. Normalization is a one of the simple image enhancement technique that tries to improve the contrast in image by `stretching' the range of a intensity values (gray values) it contains to span a desired range of values.



a) Without hair b) Normalized image

Fig.5. Image Normalization

F. Feature Extraction

The main step to detect the cancer is selection and extraction of the features; as we know performance of system are more dependent on optimization of features' selection than the classification method. We implemented feature extraction using Gray level Co-occurrence Matrix.

G. Gray Level Co-occurrence Matrix

Gray Level Co-occurrence Matrix (GLCM) is the matrix where the number of rows and columns is equal to number of gray levels (pixel values). The GLCM is a tabulation of how often various combinations of pixel brightness values occur in an image. The Preprocessed image in gray scale is given as input to GLCM.

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H. Artificial Neural Network

Classifier is used to classify malignant melanoma from other skin diseases. For computational simplicity Artificial Neural Network based classifier is used. In this proposed system, Back propagation algorithm is used for training method. The neural network classifier structure include of Input layer, Hidden layer and Output layer. In this methodology, there is one hidden layer with ten hidden neurons and Output layer with one output neuron. Here the Activation function used is Log sigmoid function.

I. Maximum Entropy Thresholding

Segmentation removes the healthy skin from image and finds the region of interest. Usually the cancer cells remain in the image after segmentation. Segmentation method used is Maximum Entropy Threshold Segmentation. The input to thresholding operation is typically a grayscale. After the segmentation, the output is a binary image.

Fig.6. After Thresholding

VI. RESULT

The ANN classifier is setup in MATLAB software. It is trained using the two method i.e. known datasets and desired outputs. Then fifty datasets are given as inputs to the network, for classification. This system classifies the given data sets into cancerous and non-cancerous. The obtained results are compared with the diagnostic results of a dermatologist. The classified outputs are display in the MATLAB window.

VII. CONCLUSION

A skin cancer detection system is proposed. It proves to be a better diagnosis method than the conventional biopsy method. This detection method is very advantageous to patients, because it find result faster than biopsy method. This detection method will time consuming. This skin cancer detection method differentiated two types of skin cancer (Melanoma and Non-Melanoma) from each other and found the stages of cancer. This methodology uses digital image processing technique and artificial neural networks for the classification of cancer image and non-cancer image. We will implement two feature extraction techniques. Feature is extracted using this GLCM and 2D Wavelet Transform.

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