Skin Cancer Detection using Image Processing

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Abstract— Skin cancer is a widespread, global, and potentially deadly disease, which over the last three decades has afflicted more lives in the USA than all other forms of cancer combined. There have been a lot of promising recent works utilizing deep network architectures for developing automated skin lesion segmentation. Melanin is the pigment that discerns the color of human skin. The special cells produce melanin in the skin. If these cells are damaged or unhealthy, skin discoloration is visible. Skin pigment discoloration is a hazardous fact as a symptom of human skin disease with a possibility of losing natural beauty. The extracted information of the skin discoloration can work as a guide to diagnosis the disease. In this project, different imaging techniques like watershed method, edge detection and morphological operations are used to analyze and extract the information of discoloration lesion by measuring the pixel number of lesions on skin. In this paper, an image processing method that has been initially developed for plant disease recognition is appropriately adapted for the detection of skin disorders. The image analyzing results are visually examined by the skin specialist and are observed to be highly accurate. The visual results are presented in the description and the accuracy of mathematical analysis is 94.88 percent. This system will give more accuracy and will generate results faster than the traditional method, making this application an efficient and dependable system for dermatological disease detection. Furthermore, this can also be used as a reliable real time teaching tool for medical students in the dermatology stream.

Keywords— image processing, feature extraction, deep network architectures, skin lesion segmentation, watershed method, edge detection, morphological operations.

I. INTRODUCTION

In today's modern world, Skin cancer is one of the most common cause of death amongst humans. Skin cancer is an abnormal growth of skin cells most often which develops on body exposed to the sunlight, but can occur anywhere on the body.

Most of the skin cancers are curable at early stages. So, an early and fast detection of skin cancer can save the patient's life. With the new technology, early detection of skin cancer is possible at initial stage.

Formal method of diagnosis skin cancer detection is Biopsy method. It is done by removing skin cells and that sample goes to various laboratory testing. It is painful and time-consuming process. We have proposed skin cancer detection system using SVM for early detection of skin cancer disease. It is more advantageous to patients. The diagnosing methodology uses Image processing methods and Support Vector Machine (SVM) algorithm. But, most importantly, due to its higher magnification, Skin Cancer Detection Using SVM can prevent the unnecessary excision of perfectly harmless moles and skin lesions.

There have been many endeavors to implement traditional medicine across the different parts of the globe especially in the countries which are not technologically advanced, but the efforts have been met with challenges such as huge cost of medical tools and equipment and also lack of medical expertise. Skin cancer disease typically results from environmental factors along with other causes. The necessary tools required for early detection of these diseases are still not readily available in most populations globally. Here the proposed paper provides an approach to detect various kinds of these diseases. If no disease is found, the system provides a negative result

II. PROPOSED METHODOLOGY

Skin cancer detection using SVM is basically defined as the process of detecting the presence of cancerous cells in image. Skin cancer detection is implemented by using GLCM and Support Vector Machine (SVM). Gray Level Co-occurrence Matrix (GLCM) is used to extract features from an image that can be used for classification. SVM is machine learning technique, mainly used for classification and regression analysis. Different image techniques like watershed method, edge detection and morphological operations are used to analyze and extract the information of discoloration lesion by measuring the pixel number of lesions on skin.

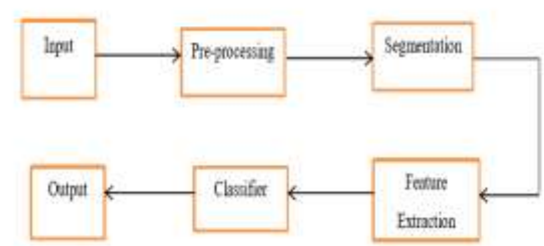


Fig.1 Block of image processing

A. Input image:

Picture of the affected area is taken using camera further it is sent to Raspberry pi where it undergoes pre-processing. This is shown in the figure 2(a) .

B. 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.

- Grayscale conversion:
  Grayscale image contains only brightness information. Each pixel value in grayscale image corresponds to an amount or quantity of light. The brightness graduation

can be differentiated in grayscale image. Grayscale image measures only light intensity.

In grayscale conversion color image is converted into grayscale image shows in fig 2(b). Grayscale images are easier and faster to process than colored images. All image processing technique are applied on grayscale image.

In our proposed system colored or RBG image is converted into grayscale image by using weighted sum method by using following equations.

$$\text{Grayscale intensity} = 0.299\,R + 0.587\,G + 0.114\,B$$

- 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 figure 2(c).

- 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 figure 2(d).

C. Segmentation:

Segmentation is process of removing region of interest from given image. Region of interest containing each pixel similar attributes. Here we are using maximum entropy thresholding for segmentation. Firstly gray level of original image is taken then histogram of gray scale image is calculated by using maximum entropy separate foreground from background. After maximum entropy we obtained binary image that is black and white image shows in figure 2(e).

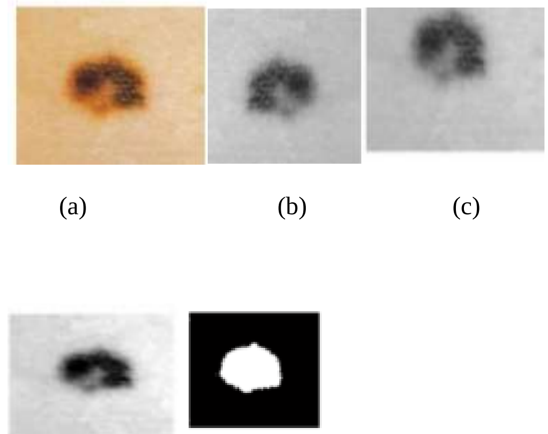
D. Feature extraction:

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.

E. Classifier

Classifier is used to classify cancerous image from other skin diseases. For simplicity Support Vector machine classifier is used here. SVM takes set of images and predicts for each input image belongs to which of the two categories of cancerous and non-cancerous classes. The purpose of SVM is create hyper plane that separates two classes with maximum gap between them. In our proposed system output of GLCM is given as input to SVM classifier which takes training data, testing data and grouping information which classifies whether given input image is cancerous or non-cancerous.

These are some of the skin cancer images from internet. They were undergone various pre-processing techniques like gray scale conversion, median filter maximum entropy, GLCM method, all features are given to SVM to classify cancerous and noncancerous image, output of above image would be cancerous.



(a) (b) (c)

(d) (e)

Fig.2 (a)Input Image (b)Gray scale image (c)Image Without Noise (d) Enhanced image (e)Segmented image

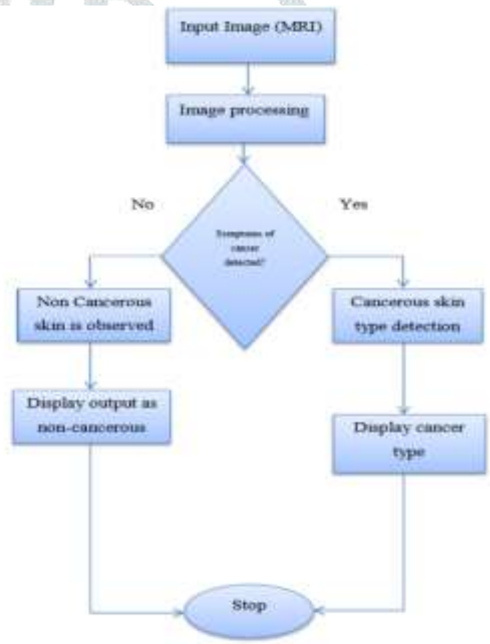


Fig .3 Flow Chart of project description

The above flow chart (Fig.3) depicts the flow of proposed project which helps us in yielding accurate results.

III. RESULTS

After collecting the required database that is MRI images, the image is taken for further process in diagnosing. The image provided as the input (Fig .4) to the system will undergo noise removal process using the filters. This enhanced image (Fig.6) will then be grayscale through RGB grey scale conversion. Fig.5 depicts the grey conversion. The image undergoes various conversions from grey conversion, binarization followed by segmentation and classification which are all depicted in the Fig.5, Fig.7, Fig.8, Fig.9 respectively. Segmentation shown in Fig.8 will map the image to binarized image, hence will calculate the energy and contrast values. Based on the parameters energy and contrast values of the given input image the classifier will detect the disease.

Obtained Results

- Input Image

Fig.4 Input Image
(a)basal(b)Melanoma(c)Noncancerous(d)Squamous

- Gray Scale Image

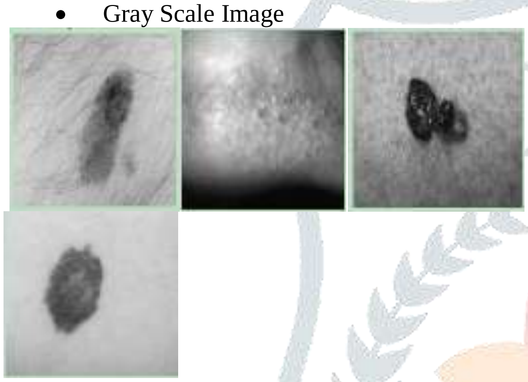


Fig.5 Gray Scale Image
(a)basal(b)Melanoma(c)Noncancerous(d)Squamous

- Image Enhancement

Fig.6 Enhancement

(a)basal(b)Melanoma(c)Noncancerous(d)Squamous

- Binarization

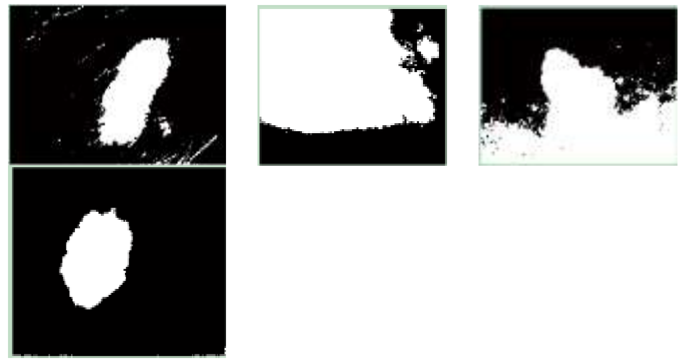


Fig.7 Binarization

(a)basal(b)Melanoma(c)Noncancerous(d)Squamous

- Segmentation

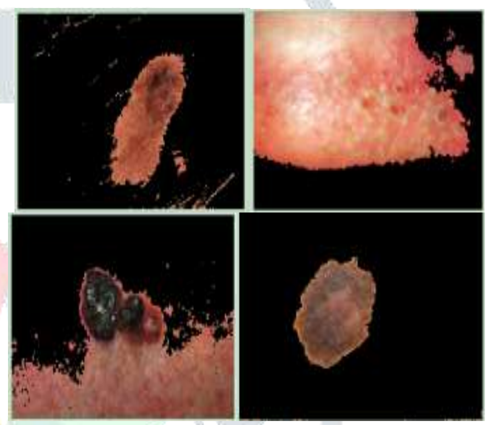


Fig.8 Segmentation

(a)basal(b)Melanoma(c)Noncancerous(d)Squamous

- Classification

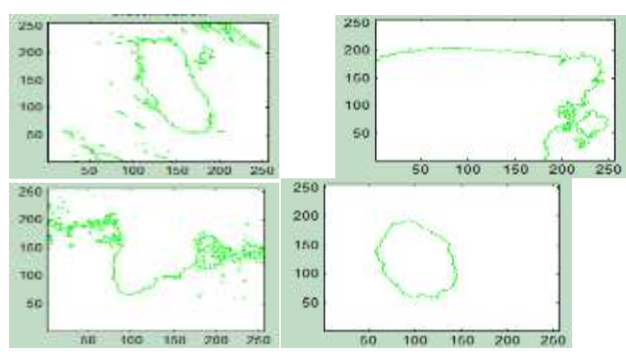


Fig.9 Classification

(a)basal(b)Melanoma(c)Noncancerous(d)Squamous

IV. CONCLUSIONS

It can be concluded that the proposed system of skin cancer detection can be implemented using gray level co-occurrence matrix and support vector machine to classify easily whether image is cancerous or non-cancerous. It is painless and timeless process than biopsy method. It is more advantageous to patients. It saves the money on the stupendous amount that patients shell out during the conventional checkup and diagnosis.

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