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NON-INVASIVE SKIN CANCER DETECTION USING DERMOSCOPY IMAGES

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Abstract— **Now a days, Skin cancer is a deadly form of disease. Abnormal growth of melanocytic cells causes a skin cancer. So skin cancer is also known as melanoma. Exposure of skin to ultraviolet radiation and genetic factors are the main causes of the melanoma. So melanoma lesion appears as black or brown in colour. Early detection of melanoma can cure completely. Traditional method for detecting skin cancer is biopsy. This method is painful, invasive and time consuming. Therefore, in order to overcome the above stated issues computer aided diagnosis for skin cancer is needed. In this paper the proposed system is first preprocesses the skin image which is followed by image segmentation in which lesion part is segmented. Unique features are extracted from segmented lesion by using feature extraction technique. After feature extraction, classification is performed for classifying the image as normal skin and melanoma skin cancer.**

Keywords— **Melanoma Skin Cancer, Image Preprocessing, Segmentation, Feature Extraction, Classification**.

I. INTRODUCTION

Now days, cancer is one of the wide spread cause of death. Human body is made up of no of cells. DNA produces the normal cells. These cells again divided into another normal cell. If any defect occurs into the DNA then it produces abnormal cells. These abnormal cells again divided into another abnormal cell. Uncontrolled growth of abnormal cells is called cancer [1]. Research expounded that impact rate in asian nations is far higher than others. There are more than 100 different types of cancer in which skin cancer is most dangerous. Skin cancer has got a large number of patients. It happens due to rapid growth of skin cells, sometimes causing skin tumors.

Skin cancer causes due to abnormal growth of skin cells. There are melanocytic cells present on the skin. So, uncontrolled growth of abnormal melanocytic cells causes malignant melanoma. Due to malignancy feature skin cancer is also known as melanoma. Melanoma frequently develops in a mole or suddenly appears as a new dark spot on the skin. Due to exposure of ultraviolet radiation from sun and genetic defects is the main cause of skin cancer. So melanoma lesion appears as black or brown in colour. The malignant melanomas are the most dangerous form. Since it can easily affect the other parts of the body. Normally these malignant melanoma begins on the skin surface where it is easy to see and treat. Then it grows deep in to the skin and reaches at the blood vessels. Finally, it will spread to other parts of the body and affect various organs [2].

According to the World Health Organization, 132,000 melanoma skin cancer cases are diagnosed globally each year. In 2012 melanoma occurred in 232,000 people, and resulted in 55,000 deaths [3]. The world's highest rates of melanoma are found to be in Australia and New Zealand with incidence rate of 71 cases per 100,000 people, which is about four times the rate found in Canada, the United Kingdom, and the United States [4]. It is estimated that more than 8,500 people in the U.S. are diagnosed with skin cancer every day [4-5]. The American Cancer Society estimates that in 2016 about 76,380 new melanomas will be diagnosed (46,870 men, 29,510 women), and about 10,130 deaths from Melanoma (6,750 men, 3,380 women). The lifetime risk of getting melanoma is about 2.4% (1 in 40) for whites, 0.1% (1 in 1,000) for blacks, and 0.5% (1 in 200) for Hispanics [6]. So early detection of melanoma is very essential.

Traditional method for detecting skin cancer is biopsy method. In biopsy method region of skin lesion is scrapped off and sent to laboratory for the testing [7]. This method is invasive, painful and time consuming. Therefore, in order to overcome the above stated problem, computer aided diagnosis used for skin cancer detection. This system requires skin image so there is no physical contact with the body. This method will reduce the pain and makes it non-invasive. Computer aided diagnosis uses image processing tools for the detection of Melanoma Skin Cancer. First step of such diagnosis is to preprocess the skin image which is followed by image segmentation in which lesion part is segmented. Unique features are extracted from segmented lesion by using feature extraction technique. After feature extraction, classification is performed for classifying the image as normal skin and melanoma skin cancer.

Paper is organized as follows; Section II gives literature survey of the skin cancer detection. Section III provides the

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proposed methodology of the skin cancer detection. Section IV concludes the paper.

II. LITERATURE SURVEY

A lot number of research in the field of melanoma skin cancer detection have been made since last few years that covers use of the wide range of computer vision and pattern recognition techniques. Image processing techniques: image preprocessing, segmentation, feature extraction and classification of images are the most used which is found in the literature. Table 1 shows the literature survey of this paper.

The first paper is an efficient machine learning approach for the detection of melanoma using dermoscopic images. In this paper first skin image is preprocessed by using mean filter. Lesion segmentation performed using Otsu thresholding. Gray level co-occurrence matrix (GLCM) is applied for feature extraction. In feature extraction color and texture features are extracted. So support vector machine (SVM) classifier is used to classify the image as normal skin and melanoma cancer lesion [8].

The second paper is advanced earlier melanoma detection algorithm using colour correlogram. In this paper 84 directional filter is applied for preprocess the skin image. Active contour based segmentation is applied for lesion segmentation. In feature extraction unique features are extracted by using color correlogram. Bayesian classifier is used for classification [9].

The third paper is an automated computer aided diagnosis of skin lesions detection and classification for derrmoscopy images. In this paper median filter is applied for pre-processing. K-means clustering is used for segmentation which is followed by feature extraction by using GLCM. Wikis Lambda is used for feature selection. SVM classifier is used for classification [10].

The fourth paper is automatic non-invasive recognition of melanoma using support vector machines.

Table 1: Literature Survey

Sr. No	**Name of Paper**	**Contribution**
1.	An Efficient Machine Learning Approach for the Detection of Melanoma using Dermoscopic Images	• Image Pre-processing- Mean filter • Image Segmentation- Otsu Thresholding • Features- Colour, Texture • Classifier-SVM
2.	Advanced Earlier Melanoma Detection Algorithm Using Colour Correlogram.	• Image Pre-processing- 84 directional filter • Image Segmentation- Active Contour based segmentation • Features- Colour, Texture • Classifier-Bayesian classifier
3.	An Automated Computer Aided Diagnosis of Skin Lesions Detection and Classification for Dermoscopy Images	• Image Pre-processing- Median filter • Image Segmentation- K-means clustering • Features- Colour, Texture, Shape • Classifier-SVM
4.	Automatic Non-Invasive Recognition of Melanoma Using Support Vector Machines	• Image Pre-processing- Median filter • Image Segmentation- - K-means and ROI clustering • Features- Colour • Classifier-SVM
5.	Computer aided Melanoma skin cancer detection using Image Processing	• Image Pre-processing- Gamma Correction • Image Segmentation- Automatic Threshlding • Features- Texture, Size, Shape • Classifier-Predefined Thresholding

This paper uses median filter for pre-processing, K-means clustering and region of interest (ROI) segmentation is applied for lesion segmentation. GLCM is used for feature extraction. It uses SVM classifier to classify the image as normal skin and melanoma cancer lesion [11].

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The fifth paper is computer aided melanoma skin cancer detection using image processing. In this paper gamma correction method is applied for pre-processing. Image segmentation is performed by using automatic thresholding method. In feature extraction geometry based features are extracted. Finally predefined thresholding is applied for classifying melanoma [12].

Table 1 shows five different approaches for detection of skin cancer. This table gives the in short literature review of five papers. In paper [8] colour and texture feature extracted and SVM classifier is used for classification. In paper [9] colour and texture feature extracted and Bayesian classifier is used for classification. In paper [10] colour, texture and shape feature extracted and SVM classifier is used. In paper [11] only colour feature is extracted along with SVM classifier. In paper [12] shape, texture and size feature extracted and predefined thresholding is used for classification.

III. PROPOSED METHOD: NON-INVASIVE SKIN CANCER DETECTION USING DERMOSCOPY IMAGES

It is observed that most of the work found in literature is based on image processing techniques. It involves image pre-processing, image segmentation, feature extraction and classification. Proposed method contains two subsections: A] System overview, B] System flow diagram. System overview gives the pictorial overview of the system where system flow diagram gives the flow of proposed system.

A. System Overview –

Skin cancer detection pictorial overview is shown in below Fig. First image is skin cancer image. This image contains some hairs which will degrade the classification accuracy. In next step hair removal is done. After hair removal lesion part is segmented from the image. Feature extraction is performed on segmented lesion which is followed by classification. All these steps are shown in Fig. 1.

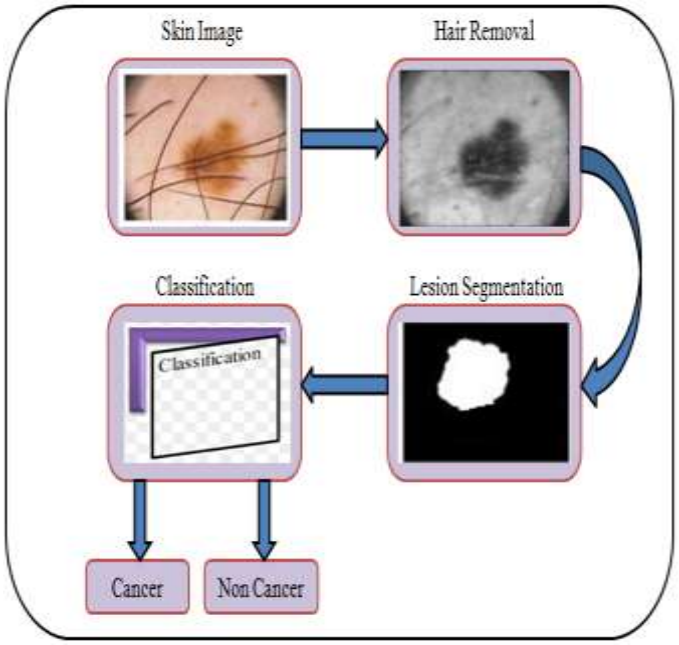

Fig. 1. Skin Cancer Detection Overview

B. System Flow Diagram –

Computer aided diagnosis of skin cancer contains four steps: image pre-processing, image segmentation, feature extraction and classification. Input to system is skin image which is affected due to melanoma. This image is preprocessed for enhancing the quality of image. After preprocessing lesion part is segmented from the skin by using image segmentation techniques. Image segmentation is followed by feature extraction which extracts the unique features. After feature extraction, classification is performed for classifying the image as normal skin and melanoma skin cancer. System flow diagram is shown in below Fig.2.

a] Image Pre-Processing

Pre-processing is the first step in image processing which is shown in Fig.2.Input to the system is skin image. This image contains some background noise and unwanted objects such as hair and air bubbles. Such objects reduce the result of segmentation and classification. In this system input image is converted into gray color. For removing hairs Gaussian filter was used [2].

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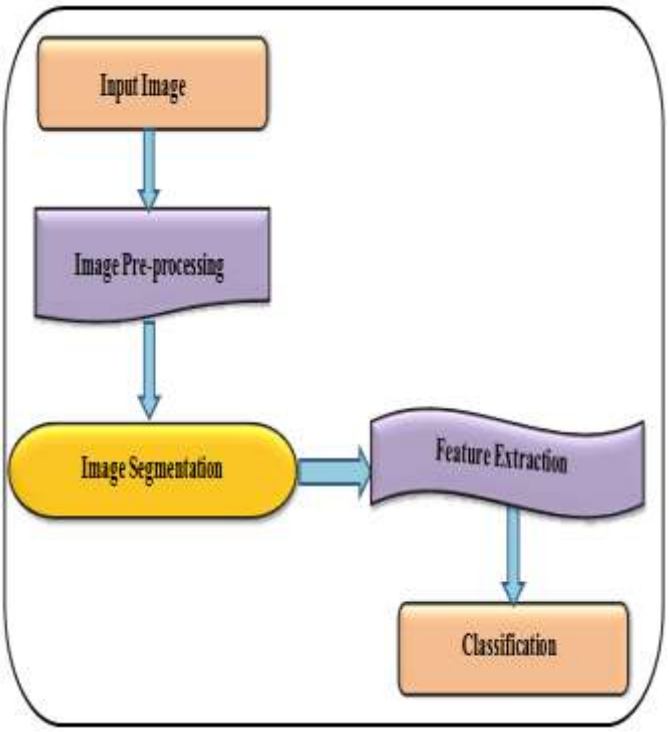

Fig. 2. System Flow Diagram

b] **Image Segmentation**

Region of interest (ROI) is separated from the image is called as image segmentation. This is the second step which is shown in Fig. 2. Skin image contain healthy part as well as lesion part. Taking both part for further processing may give less accurate classification result. Only the lesion part is needed for image analysis so that segmentation is performed. Segmentation is performed using otsu thresholding method [13] which will convert binary image. After Otsu thresholding, edges of the output image become irregular. Morphological filter is applied for smoothing the edges [2].

c] **Feature Extraction**

Feature extraction is the process of calculating the unique features from the image. These features will represent the properties of input image. This step is very important. Melanoma skin image have color variation where benign lesion have uniform color. Another difference is Benign lesion have circular shape where melanoma have irregular shape. So in this system Color and shape feature will be extracted from the skin image.

d] **Classification**

Classification is the important step in image processing. Classification classifies the melanoma lesion from benign lesion. So selection of the classifier is an important step. SVM classifier is used for classification of melanoma from benign lesion.

IV. CONCLUSION

This paper presents enhanced method for skin cancer detection. This system uses computer based diagnosis for detection of skin cancer. The manual detection of skin cancer is not only tedious but also time consuming task. Traditional method for detecting skin cancer is invasive, painful, and time consuming. Therefore, in order to overcome the above stated issues this system effectively and efficiently used. This system uses skin image for detecting cancer so there is no physical contact with any part of body. Due to image this system will make non-invasive skin cancer detection. There is no need of laboratory testing. Only camera is needed for taking image so this system is less costly.

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