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MELANOMA SKIN CANCER DETECTION USING IMAGE PROCESSING TECHNIQUES

Ambika M[1], Mallikarjun Mudda[2], Mogali Swathvika[3], Gajula. Venkat Sai[4], Moguram Himaja[5]

[1]Aassistant Professor, Department of Electronics and Communication Engineering, Nalla Malla Reddy Engineering College, Hyderabad, India

[2] Associate Professor, Department of Electronics and Communication Engineering, Sreenidhi Institute of Science and Technology, India,

[3,4,5]Students, Department of Electronics and Communication Engineering, Sreenidhi Institute of Science and Technology, India,

Abstract: In Image Processing, the input image is processed in order to enhance its quality so that is suitable extracted features. Image Processing Techniques can be used for detection of Melanoma Skin cancer which is highly hazardous type of skin cancer in humans. Here we are using OTSU'S method for segmentation and Asymmetry, Border irregularity, Color variegation, and Diameter (ABCD) rule for feature extraction. Melanoma skin cancer is observed in melanocytes which contains melanin. Melanin is responsible for skin color. It is important to detect it in very early stage because it could spread to other parts easily. For this purpose to detect in a very early stage we use image of the affected area of the skin which is preprocessed and then segmented using OTSU's method and particular features are extracted and based on this features we conclude whether it is Melanoma or Benign.

Index Terms: OTSU, ABCD, TDV, FEATURE EXTRACTION, PIXEL INFORMATION, PIXEL CLASSIFICATION.

1. Introduction

In recent days, many people are suffering from cancer. Abnormal growth of cells in an uncontrollable manner leads to cancer. It can be benign (non-cancerous) or malignant (cancerous). There are many parts which could be affected by cancer like lungs, skin, breast; blood skin cancer is one of the dangerous types of cancer in humans. The major cause of skin cancer is UV radiation from Sun. In skin cancer, there are many types like Basal cell cancer, squamous cell cancer, Melanoma cell cancer. Melanoma is highly hazardous for humans. It is caused or starts in melanocytes. Melanocytes are responsible for melanin. People with high melanin are more resistant to skin cancer. it is very important to detect it in very early stage to get it treated and to stop its growth. Because it could spread other parts easily. Image processing techniques can be used to detect Melanoma Skin Cancer. Here we used OTSU's method for Image Segmentation and ABCD rule Feature Extraction. MATLAB software is used for Implementation.

2. Literature survey

Many researchers have been working on melanoma skin cancer detection. As Melanoma skin cancer is highly dangerous it has to be detected in early stage. For this purpose, many researchers have used preprocessing techniques like filtering, edge detection and watershed method, wavelet method, thresholding technique for

Segmentation and ABCD rule for feature extraction. Though ABCD rule have some exceptions and not very accurate, it is commonly used. As it is of low cost and faster. And based on total dermoscopic valve it is classified.

Melanoma Skin Cancer Detection by Segmentation and Feature Extraction using combination of OTSU and STOLZ Algorithm Technique by Nayana Banjan, Prajkta Dalvi, Neha Athavale[2] in this paper first the input image is converted to Gray scale and filtered. The second stage is the filtered is segmented using OTSU'S algorithm. Then for feature extraction STOLZ algorithm is used. Then TDS value is calculated using which classification is done.

ABCD rule based automatic computer-aided skin cancer detection using MATLAB by Nilkamal S. Ramteke, Shweta V. Jain[3]. In this paper, the total system is divided into three modules. They are Image Segmentation, Wavelet Analysis and Fuzzy Inference. asymmetry, border is calculated from segmentation step which includes edge detection, watershed segmentation. Color factor from Fuzzy inference and diameter from wavelet analysis.

Computer Aided Melanoma Skin Cancer Detection Using Image Processing byShivangi Jain, Vandana jagtap, Nitin Pise[1]. In this paper,the input is enhanced by techniques like gamma-correction. Edge detection and automatic thresholding is used for segmentation, ABCD rule for feature extraction.

Feature Extraction for Skin Cancer Lesion Detection by Omkar Shridhar Murumkar, Prof. Gumaste P. P[5].In this paper Otsu's method is used for segmentation and ABCD rule is used for feature extraction.

3. Proposed system and Block

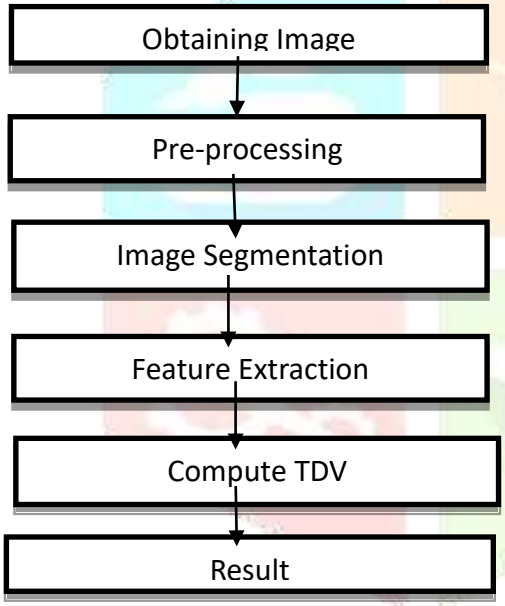


Figure 1:Proposed System Blocks

1. Pre-processing

In this step, the input RGB image is converted to gray scale for easy processing. Then the image is filtered to reduce noise.

2. Segmentation

Segmentation is the technique in which the image is divided into parts. The pixels are grouped based on their characteristics. In this paper, we have used Otsu's method for segmentation. In Otsu's method, the threshold value is chosen such that the image is divided into two parts. One is foreground and the other is background. In other words, the given gray scale image is converted to binary image such that the background is white and the foreground is black. This way the image is segmented and can be further processed.

3. Feature Extraction

For this, we have used ABCD rule in which parameters of lesion like asymmetry, border, color and diameter are obtained using which further classification can be made.

a. Asymmetry

If it symmetrical along both the axes then asymmetry is 0. If is symmetrical along one axis then 1 and if it is asymmetrical along both the axes then 2.

AI=(T-L)/L*10

WhereT is Total Number Of pixels of image and

L is Number of pixels in the lesion

Based on this AI, Asymmetry (A) is obtained

b. Border

Generally, cancerous lesion is abnormal in shape compared to the normal moles. The lesion is divided into eight regions to check it's abnormality.

B=(p*p)/(4*pi*a)

Where p= perimeter

a=area and pi=3.14

c. Color

Usually this lesion contains about six colors.so we need to count the number of colors present. The normal moles could be black or brown. Butthese lesions could be black, light brown, dark brown,blue-gray, white, red or combination of them. Each color corresponds to melanin distribution. Color score range from 1 to 6.

d. Diameter

The diameter of normal moles is less than or equal to 5mm generally. If it is more than that it could be dangerous or suspicious.

4. TDS value calculation

TDS value (total dermoscopic value) is calculated as

TDV=1.3*A+0.1*B+0.5*C+0.5*D

Based on this TDV, melanoma skin cancer can be detected

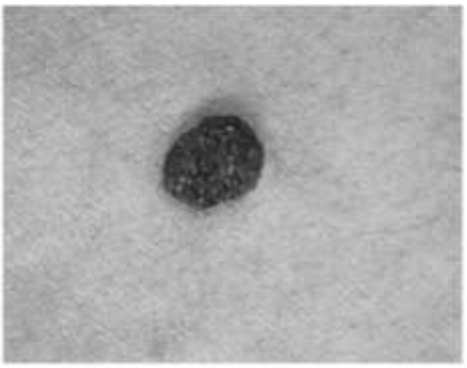
Total dermoscopic value	
1-4.75	Non- cancerous
4.75- 5.45	It could be cancerous
>5.45	Melanoma

4. Results and Discussion

The case study gives the exact classification of the input image, the input image is preprocessed for removing noise and convert into gray level image, the processed image is segmented and features are extracted. The following 3 cases are experimented for detection of melanoma.

Case -I:

a. Input Image



b. Preprocessed Gray Scale Image

c. **Segmented Image for features extraction**

For this input

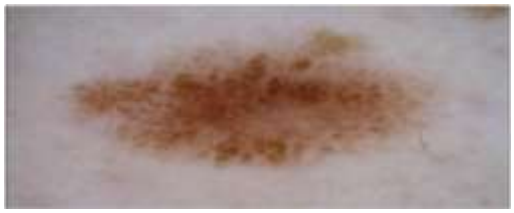
parameter	value
Asymmetry	0
Border	2
Color	3
Diameter	5

TDS value is 4.2

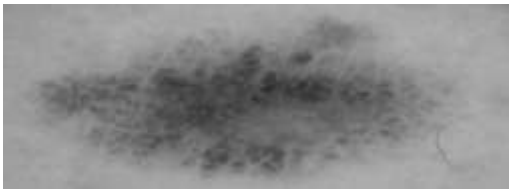
Therefore it is just a mole.

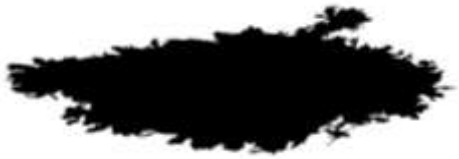
Case-II:

a. Input Image



b. Preprocessed Gray Scale Image





c. Segmented Image for features extraction

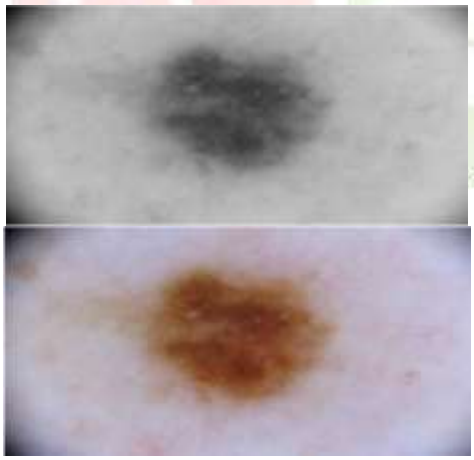
For this input

parameter	value
Asymmetry	0
Border	8
Color	6
Diameter	5

TDV = 6.3000

MELANOMA DETECTED

Case III:



Figures shows the Stepwise processing of image for Segmentation and then Clasification, all the three cases results proviedes the clear information about Malenoma.

For this input

parameter	value
Asymmetry	0
Border	2
Color	4
Diameter	5

TDV =4.7000

MELANOMA NOT DETECTED

Conclusion: In this project, we have detected melanoma skin cancer from a skin image. In this process, we used OTSU's method for segmentation by separating foreground and background we extracted the lesion. ABCD rule is used for feature extraction in which parameters from the lesion are obtained. Based on the features like asymmetry, border, color and diameter we have calculated total dermoscopic valve. From the calculated total dermoscopic valve we have detected the melanoma skin cancer.

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