TEST Engineering & Management

January - February 2020
ISSN: 0193 - 4120 Page No. 3042 - 3049

Prediction Of Skin Cancer On Skin Lesion Images

R. Meenakshi

Article Info
Volume 82
Page Number: 3042 - 3049
Publication Issue:
January-February 2020

Article History
Article Received: *14 March 2019*
Revised: *27 May 2019*
Accepted: *16 October 2019*
Publication: *19 January 2020*

Abstract
A disease very dangerous caused mainly due to genetics is cancer in humans. It has alterations in molecules that too multiple alterations which causes instability in genes in a way leading to cancer. One of the reason for skin cancer in human is the above said one. There is a need to identify of any type at an early stage. Many techniques are many techniques available for this. Some of them are segmentation of the tumor area using feature extraction.A type of skin cancer called Malignant melanoma is mainly because of heavy amount of Melanoma-Hier deposits in the skin especially in the dermis layer. This is detected using ABCD rule (Asymmetry Border Color Detection).In this proposed system an alteredmethodisused for identifying melanoma skin lesion.The steps in the proposed method are Image acquisition Pre-processing,Segmentation, Feature characterization, Classification.The classification techniques used are ABCD and Local Binary Pattern (LBP). Back Propagation Neural Network is used to classify the benign or malignant stage.

Keywords: ABCB features, Co-occurrence matrix, GLCM Features,Local Binary Patterns, Skin Cancer.

I. INTRODUCTION

The prevalence of skin cancer is in increase all through the decades. A report says that there was almost 49,100 deaths till 2010 due to cancer. Therefore the need for early detection of cancer is increasing day by day. One of the best treatment is surgery for this disease. This in a way may increase life expectancy. Early detection of cancer including skin cancer must be automated. There are many approaches that have been implemented for this automation.

II. RELATED WORKS

Nachbar et al. developed the ABCD (Asymmetry, Border irregularity, Color and Dermoscopic structure). This is the rule for dermoscopy developed by the authors. The structural properties and the geometrical properties are characterized using ABCD rule. The characteristics that are considered here are colours, architecture, asymmetry and also homogeneity of lesion.

Menzie et al has a different approach which counts positive features which is for cancer cells and negative featureswhich is for non cancer cells [2].

Pehamberger et al. use analysis of patterns for identifying skin cancer. The author here considers structures which are 11 in number and also considers 7 colours. These are applied to the those parts which are localized and have lesion distributed over it. The technology in recent days in the field of skin imaging has developed to get an image using computer aided diagnosis which is non-invasive. This development has made the detection of skin cancer more easy. [3]

Garnaviet al. made use of CAD for diagnosing melanoma. This was based on texture methods like wavelet and border. [4]

Patwardhan et al. made use of tree structures for finding the melanoma cells with the help of mena energy ratios.[5]

January - February 2020
ISSN: 0193 - 4120 Page No. 3042 - 3049

Ramezani et al. proposed a recognition system having support vector machine(SVM) for classification and used

Melanoma.Texture of the lesion,asymmetry, colourvariation,border irregularity are the basis on which the features selection was done.

Celebi et al. combined the lesions geometrical properties with blue-white veil structure. The geometrical properties considered were circularity, fractal dimension, ellipticity and asymmetry index.

Di Leo et al. considered the seven point algorithm and detected five features out of the seven. An algorithm based on microscopy data was developed on epiluminescence to detect the above said features. The five features were regression structures, irregular pigmentation, irregular streaks, pigment network and blue-white veil.

Burronietalm combined linear discriminant classifiers and K-nearest neighbourhood. The input for this was a combination of texture properties, color and geometrical features.

Based on the same above input Ferris etal.developed a classifier called the decision forest.

III. EXISTING SYSTEM

The ABCD rule is widely used bydermatologists. The acronyms for this method are:

Asymmetry A:

It evaluates asymmetry; lesion is bisected by both orthogonal axes.

Dermoscopic structures, shape and colours are used assess the asymmetry of both axes.

If there is no asymmetry in both the axis then zero is the score. If there is asymmetry in any one axis then one is the score. If both the axis have asymmetry then the score is two.

Border B:

Eight slices or octants is the number into which a division of lesion is done. Every slice has a regular, irregular or combination of both the shapes. A regular shape is assigned a value of zero whereas irregular border shape gets a value of one. This accounts to a maximum value of eight for a border.

Color C:

Colours white, gray, black, red, blue, both light and drak brown increase the score by one for each colour.

Dermoscopic structures D:

There are structures five in number whose presence is evaluated. They are

- Globules
- Dots
- Branched streaks
- Network
- Structure less areas

The value of one is assigned to D if the structure is present. The maximum value that D can get is 5 starting from 0. The lesion can be classified through total dermoscopic score.

Table showing TDS values

Slno	TDS	Classification
1	<4.75	Benign
2	4.75 to 5.45	suspicious case
3	>5.45	Malignant

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

A recent implementation of ABCD is the digital ABCD rule. Piccolo et al. developed a digital one where shape was considered instead of colour. Here the number of octants and a sharp border was the basis of B. Digital filters are used not only for finding out various structures but also are used for analyzing morphology of the input image.

Attribute D is leisons' diameter according to the authors Smaoui et al. The score of the attribute D will be 5 if the diameter of the lesion is greater

January - February 2020
ISSN: 0193 - 4120 Page No. 3042 - 3049

than 6. ABCD rule is the basis for image analysis for dermoscopic images where a CAD system is reported.

The approach taken here is different from Piccolo's approach.

Table showing properties and the values

Sl No	Properties on which the values are based	Values
1.	Luminance asymmetry, colour and Shape	A
2.	blue-white veil structures, network, lesion geometrical properties	D

Using the above table lesions of benign and lesions of melanoma can be easily be distinguished.

There are mainly four steps which are main here. (i)pre processing- artefacts removed.

(ii) detection oflesion contour; (iii)feature extraction and (iv) lesion classification.

IV. PROPOSED SYSTEM MATERIALS&CONDITIONS

ImageDatabase

A database containing 30 infraredskin lesion images and 10 input images, each of 512X512 resolution or roughly 280,000 pixels.Pre processing is already done on the images. RGB that is Red, Green and Blue is the input format for the image. The images are obtained using

- Proper contrast and lighting
- Proper distance being maintained from the camera
- Less distortion

V. IMAGE SEGMENTATION& RESULTS

The image segmentation [1]8phase has been divided into several sub- phases such as: a) image acquisition, b) pre- processing, c) Feature extraction and d) Neural Network

Step 1:

A 512X512 resolution vein image, is selected from the database we are using.

Step 2:

Color is the most used features in pattern recognition. Humans identify and perceive color images which is reflected in the color space. Hue, Saturation and Value in short is HSV.

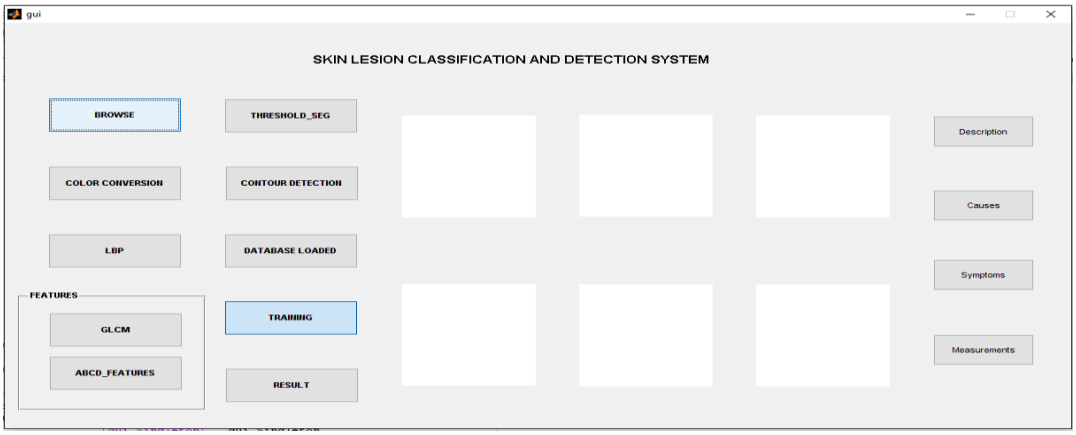

Fig 1:- Displays the screen for skin lesion classification and detection system

Hue :

The identity of a color as it relates specifically to the spectrum.

Saturation :

It is the purity of a color.

Value :

The lightness or darkness of a color.

January - February 2020
ISSN: 0193 - 4120 Page No. 3042 - 3049

The statistical features such as mean and covariance will be extracted from hue and saturation plane as a one part of feature vectors.

Step 3:

Local Binary Patterns (LBP) is used in face recognition usually for getting better results. It increases acceptance rate and strength, many methods exploitation LBP, are planned

Local binary pattern (LBP) operator is outlined as a gray level invariant texture live during a local neighborhood. The first LBP operator labels the pixel of a picture by threshold the 3X3 neighborhood of every pixel and concatenating the results binomially to make variety.

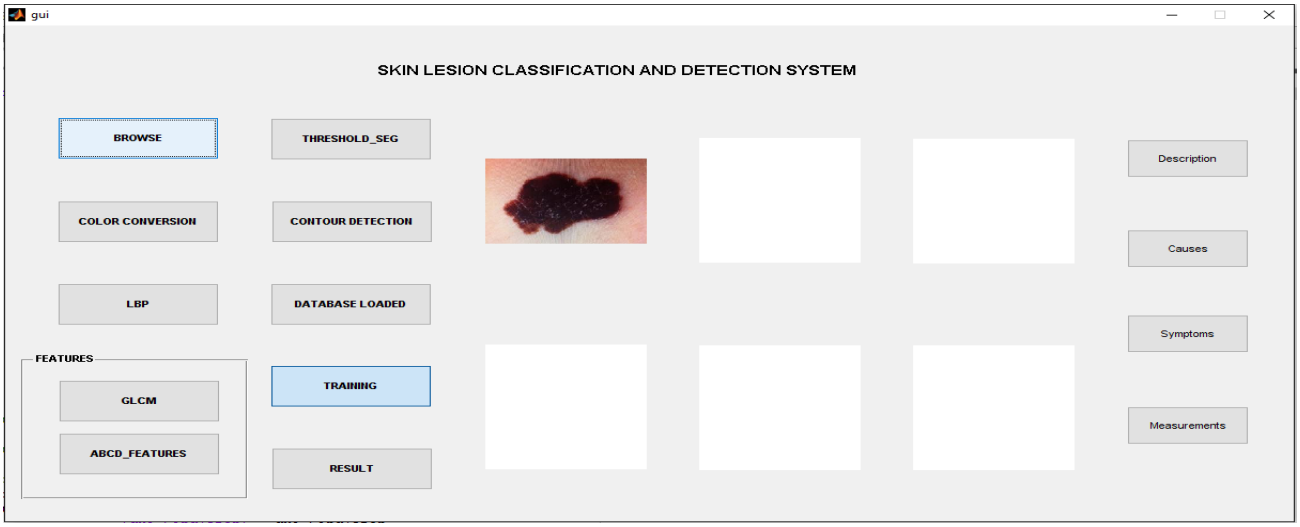

Fig 2:-By clicking the browsing button displays the set of input images, one should be selected from that

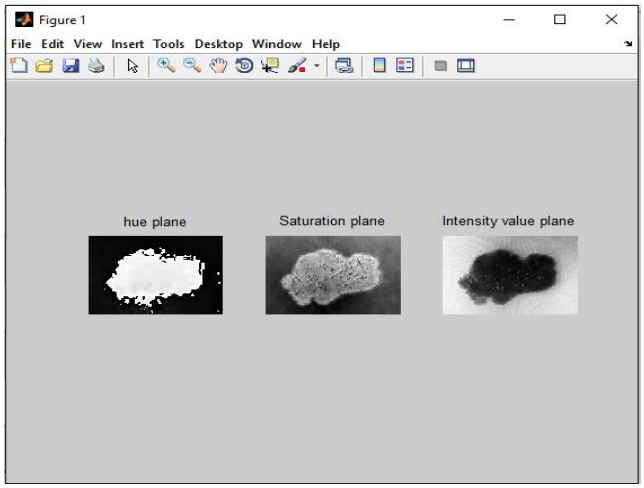

Fig 3:- Displays each image for Hue Saturation and Value

There may be pixels which may vary in intensity with regard to the central pixel. Only Black or white pixels are considered. The region is considered as flat when the pixels are all either white or all black. Flat region means the region selected has no feature. There is another point that has to be taken into account here which is pattern. The pattern is uniform when all the pixels are black or when all the pixels are white. Also when the pixels are alternate each other i.e. black-white-black-white then the pattern is non-uniform.

Step 4:

Calculation of Co-occurrence matrix (CCM) is done using intensity. This intensity is got from pixel. It is nothing but the frequency of occurrences of valuei of one pixel with regard to value j of anotherpixel. Also i and j must have a precise resultant matrix of CCM whichbelongs tobelongs to the region of interest from theelements. Each element of CCM is sum of frequency of occurrences of i in j. The number of gray levels in the image determines the size of the CCM. The Texture Features considered are Energy,Entropy, Contrast,Correlation Coefficient Homogeneity

Step 5: Contour edge detection:

TEST Engineering & Management

January - February 2020
ISSN: 0193 - 4120 Page No. 3042 - 3049

While considering binarized images there maybe intensity changes occurring all of a sudden in the pixels. This sudden change is marked as edge. White colour is assigned for skin pixels and black colour is assigned for lesion pixels. The image was scanned pixel by pixel to detect the sudden change and there by finding the edge. Chan-vese model was considered for threshold and image smoothing. Anisotropic diffusion is the method used for image smoothing. Morphological filters were used to get the edge of the image.

Step 6: ABCD Parameters

Here A represents Asymmetry, B represents Border, C represents Colour and finally D represents Diameter. The skin lesion Melanoma is detected using these geometric features since these are main for the detection. Therefore these features are extracted to find the defective pixels. Along with these features some additional features are also extracted. The extraction is done only from segmented images.

The Different Features extracted are as follows:

- Area (A): Number of pixels of the lesion.
- Perimeter (P):
- Number of edge pixels. Major Axis Length or Greatest Diameter (GD): The length of the line passing through lesion centroid and connecting the two farthest boundary points

Major Axis Length or Greatest Diameter (GD): The length of the line passing through lesion centroid and connecting the two farthest boundary points.

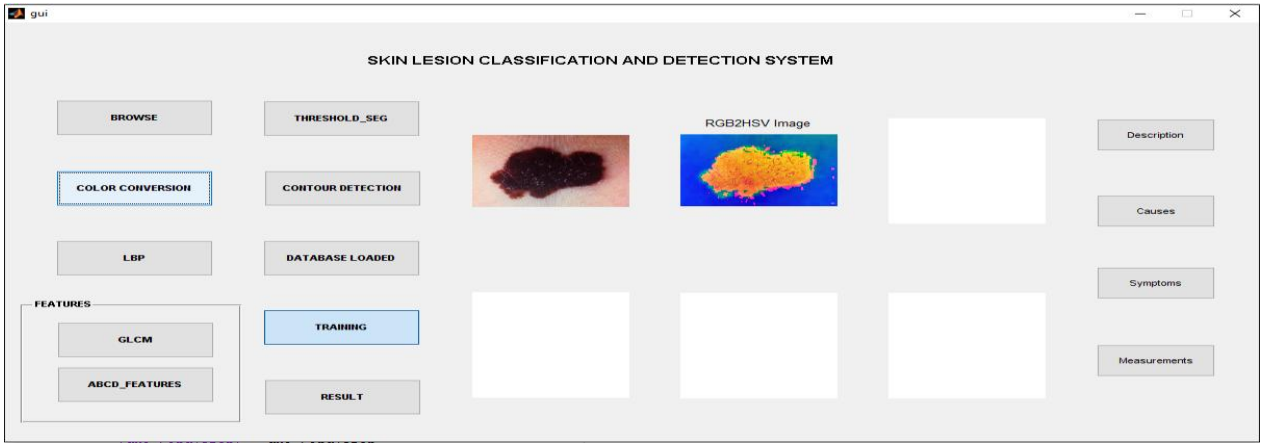

Fig 4:- By clicking the LBP button changes the HSV image into Black and white image

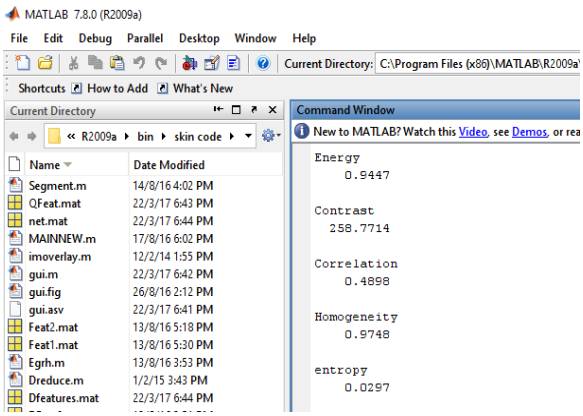

Fig 5: Extraction of GLCM Features

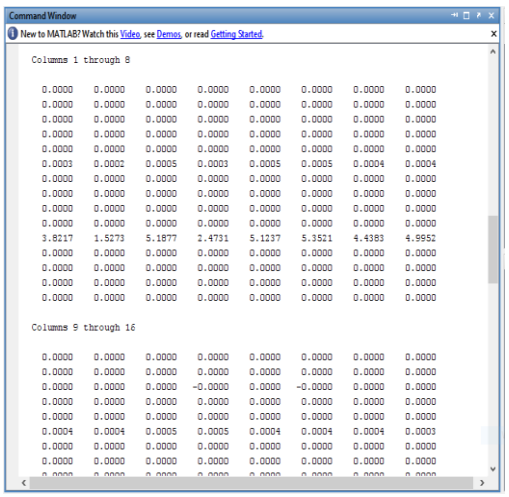

Fig 6:- Co-occurrence Matrix

January - February 2020
ISSN: 0193 - 4120 Page No. 3042 - 3049

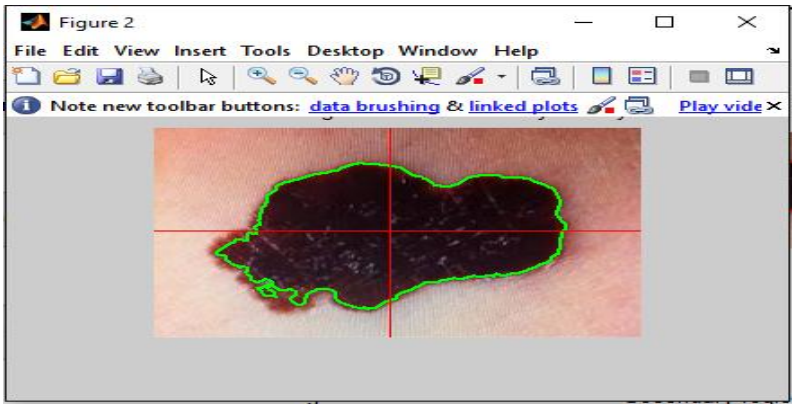

Fig 7:- The Contour Detection is done for the input image

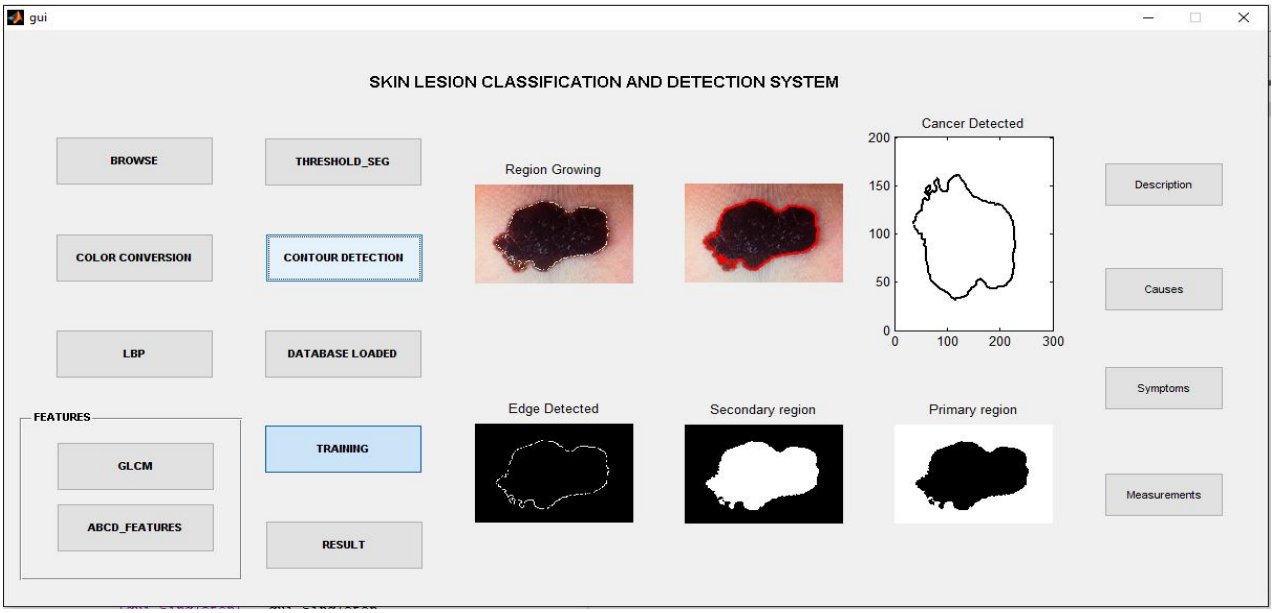

Fig 8:- The Edge Detection is done and the cancer part is detected

- Minor Axis Length or Shortest Diameter (SD): The two points near the boundary are connected through a line which is passing from side to side of the lesion blob, the length of which is called Minor Axis Length.
- Circularity Index (CRC):It gives the shape uniformity. CRC = 4A*pi/P^2
- Irregularity Index A (IrA):IrA = P/A
- Irregularity IndexB(IrB):IrB = P/GD
- Irregularity Index C(IrC): IrC = P*(1/SD-1/GD)
- Irregularity Index D(IrD):IrD = GD-SD

Step 7: Neural Network Classifier

Here, classifier based on knowledge is used for image classification with Supervised learning.

The neural network model BPN is used here to act as a classifier with radial basis function for network activation function.

Vector targets are given as features of sample for training. This is the input for BPN which has a supervised training and the output is weight factors and node biases.

Finally, test image features are simulating with trained network to make decision of skin lesion stages like normal or abnormality.

The network classifies input vector into a specific class because that class has the maximum probability to be correct.

The BPN has three layers:

- Input Layer
- Radial Basis Layer

January - February 2020
ISSN: 0193 - 4120 Page No. 3042 - 3049

- Competitive layer.

Radial Basis Layer evaluates distance of vectors in a weight matrix. The vectors are

- Input Vector
- Weight Matrix

A non linear functional scaling is done for Radial Basis distances.

Competitive Layer finds the shortest distance among them, along with the pattern of training which would be very near to input pattern.

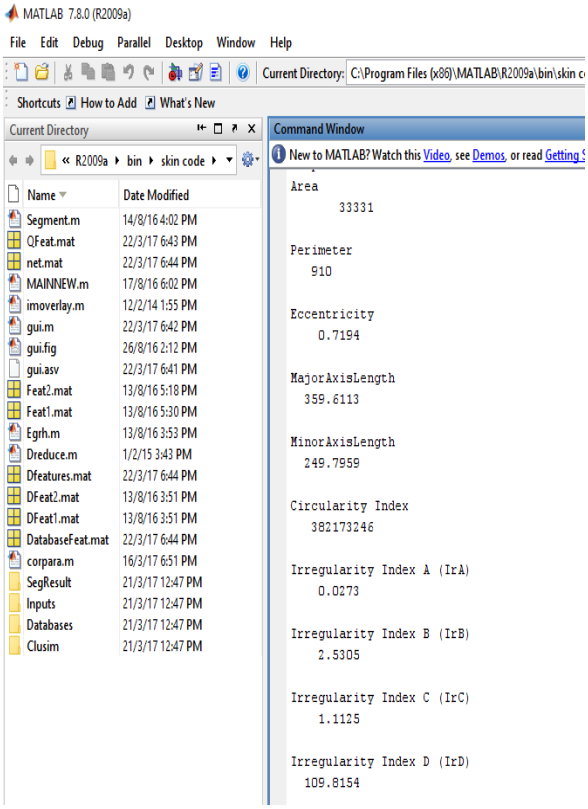

Fig 9:- The Asymmetry Border Color Diameter value is Extracted

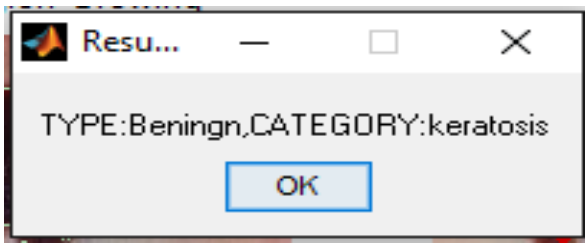

Fig 10:- Displays the type and category

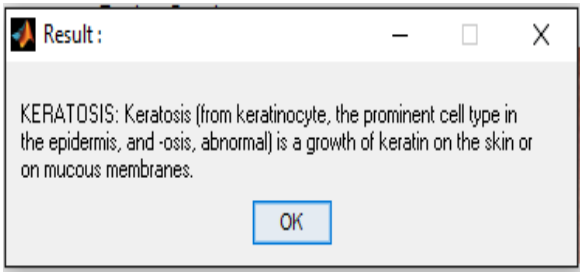

Fig 11:- Description about the disease

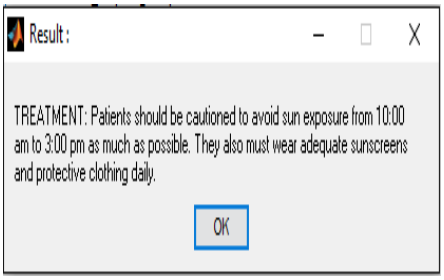

Fig 12 Displays the Treatment about the disease

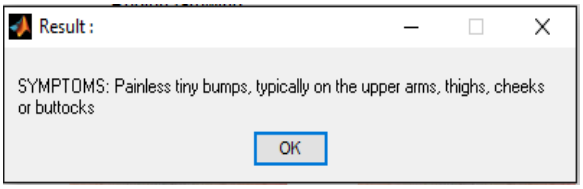

Fig 13:- Displays the symptoms of the disease

Fig 14:- Displays the causes of the disease

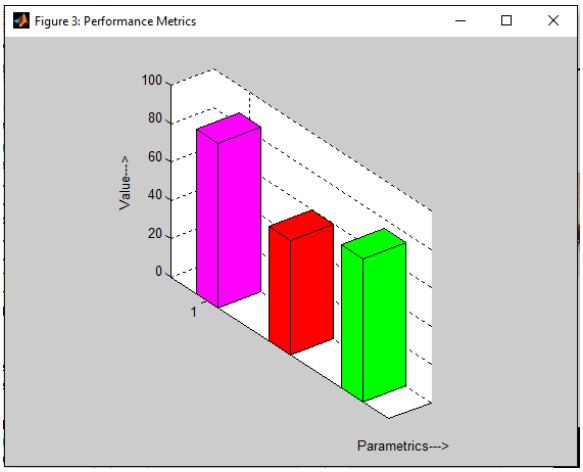

Fig 15 Showing the performance metrics

January - February 2020
ISSN: 0193 - 4120 Page No. 3042 - 3049

VI. RESULTS AND DISCUSSION

In this paper we have combined ABCD and GLCM features to improve the recognition of skin lesion tissues. The performance improved by 1%.

VII. CONCLUSION

In this paper, ABCD rule and some other geometric features are extracted to recognize the malignant melanoma pixels and also to distinguish them from benign lesions. Methods used for selection of skin features are segmentation, Image Acquisition Technique and pre-processing. The same is used for lesion characterization.

With using NN classifier detect the disease name and suggest the measurement the patient have to take.

REFERENCES

Nachbar F, Stolz W, Merkle T, Cognetta AB, Vogt T, Landthaler M, Bilek P, Braun-Falco O, Plewig G.," The ABCD rule of dermatoscopy. High prospective value in the diagnosis of doubtful melanocytic skin lesions" (1994), Journal of the American Academy of Dermatology, Vol 30,issue 4, pp 551-9.

[1] Menzies S.W., K.A. Crotty, C. Ingvar et al., "An atlas of surface microscopy of pigmented skin lesions: dermoscopy", McGraw-Hill Roseville, 2003.

[2] Pehamberger H., A. Steiner, K. Wolff, "In vivo epiluminescence microscopy of pigmented skin lesions. i. pattern analysis of pigmented skin lesions", Journal of the American Academy of Dermatology., vol. 17, no. 4, pp. 571-583, 1987.

[3] Garnavi R., M. Aldeen, J. Bailey, "Computer-aided diagnosis of melanoma using border- and wavelet-based texture analysis", IEEE Transactions on Information Technology in Biomedicine, vol. 16, no. 6, pp. 1239-1252, 2012.[4]

[4] Patwardhan S.V., A.P. Dhawan, P.A. Relue, "Classification of melanoma using tree structured wavelet transforms", Computer Methods and Programs in Biomedicine, vol. 72, no. 3, pp. 223-239, 2003.[5]

[5] Ramezani M., A. Karimian, P. Moallem, "Automatic detection of malignant melanoma using macroscopic images", Journal of Medical Signals and Sensors, vol. 4, no. 4, pp. 281, 2014

[6] Ina Singh ; Monika Arora," Image Processing Based Detection of Abnormal Tissue in Magnetic Resonance Images", Proceedings of the 2018 2nd International Conference on Trends in Electronics and Informatics (ICOEI), 11-12 May 2018.

[7] Krishna ChaitanyaTatikonda ; Chandra Mohan Bhuma ; Srinivas Kumar Samayamantula," The Analysis of Digital Mammograms Using HOG andGLCM Features, Proceedings of the 2018 9th InternationalConference on Computing, Communication and Networking Technologies (ICCCNT), 10-12 July 2018

AUTHORS PROFILE

Dr. R. Meenakshi B.SC., P.G.D.C.A., A.D.C.A., MCA., MS., M PHIL., M.TECH., PH.D.,

Has got 15 years of teaching experience and has published over 10 International Journals.