An improved Skin cancer Classification using Back Propagation Neural Networks

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Abstract:-Human Cancer is one of the most dangerous disease which is mainly caused by genetic instability of multiple molecular alterations. Among many forms of human cancer, skin cancer is the most common one. Skin cancer can be analyzed and identified at an early stage through different techniques named as segmentation and feature extraction. In this work, it demonstrates that the malignant melanoma skin cancer occurs, due to the high concentration of melanocytic cells present beneath the skin. In this work, the ABCD rule dermoscopy technology for malignant melanoma skin cancer detection is used. In this system several techniques are done for finding melanoma skin lesioncharacterization first the Image Acquisition Technique followed by pre-processing, segmentation, skin Feature Selection that determines lesion characterization and classification methods. The Feature extraction by digital image processing method includes symmetry detection, border detection, color, and diameter detection and also Local Binary Patterns (LBP) is used for the extraction of texture based features. In this work Artificial Neural Network (ANN) is used as a classifier. Finally, the Back Propagation Neural Network is used to classify the benign or malignant stage.

Keywords:- Malignant melanoma, LBP, BPN, ANN, CAD.

I. Introduction

A problem in an object can appear very different when viewed from different angles or under different lighting. Another problem is deciding what features belong to what object and which are background or shadows etc. A computer requires skillful programming and lots of processing power to approach human performance whereas the human visual system performs these tasks mostly unconsciously. Manipulating data in the form of an image through several possible techniques. The generic nature of line segments and ellipses affords them an innate ability to represent complex shapes and structures. While individually less distinctive, by combining a number of these primitives, empower a combination to be sufficiently discriminative. Consequently, discriminative combinations of varying complexity can be exploited to represent an object class. It is the combination by exploiting distinguishing shape, geometric, and structural constraints of an object class. Shape constraints describe the visual aspect of shape tokens, while geometric constraints describe its spatial layout (configurations). Structural constraints enforce possible poses/structures of an object by the relationships (e.g., XOR relationship) between shape-tokens.

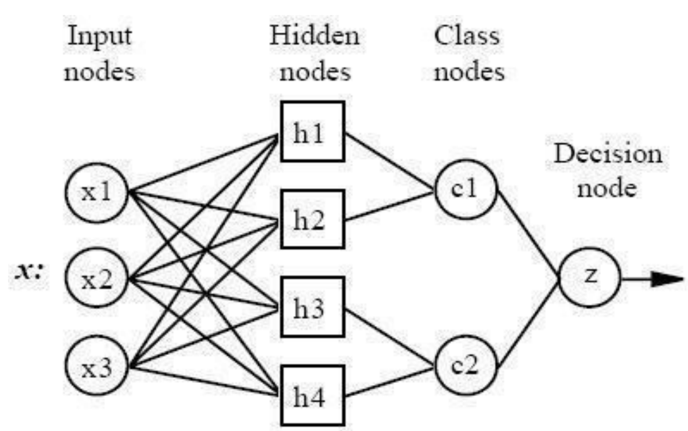
In the proposed procedure, new methods to weaken the effect of non-uniform illumination, correction of the effect of thick hairs and large glows on the lesion and also, a new threshold-based segmentation algorithm are presented.

For the classification of skin lesion images into melanoma [8] and dysplastic nevus, a wavelet transform based tree structure model developed and executed. The tree structure model utilizes a semantic representation of the spatial-frequency information contained in the skin lesion images including textural information.The presented method is effective in discriminating melanoma from dysplastic nevus is shown by the results. The results are also compared with those obtained using another method of developing tree structures utilizing the maximum channel energy criteria with a fixed energy ratio threshold.

II. System design

The existing system used was K-meansis one of the simplest unsupervised learning algorithms that solve the well-known clustering problem.Skin lesion classification for Computer Aided Diagnosis (CAD) system based on, Local binary pattern and gray level co-occurrence matrix, Hybrid features involves color features and texture [1] descriptors, ANN-Back Propagation Neural Network classifier.

There is one neuron for each predictor variable. They also provided a reasonably effective training algorithm for neural networks. Consider a network [5] with a single real input x and network function F. Models for object classes must be flexible enough to accommodate class variability, yet discriminative enough to sieve out true object instances in cluttered images. These seemingly paradoxical requirements of an object model make recognition difficult. This paper addresses two goals of recognition are image classification and object detection. The task of image classification is to determine if an object class is present in an Image, while



objectdetection localizes all instances of that class from an image.

Neural networks are predictive models loosely based on the action of biological neurons. This network has an input layer (on the left) with three neurons, one hidden layer (in the middle) with three neurons and an output layer (on the right) with three neurons. The Proposed block diagram is shown in Fig. 2. The derivative F'(x) is computed in two phases: Feed-forward: the input x is fed into the network. When the value of the error function has become sufficiently small, the algorithm is stopped. For attempting to minimize the square-error criterion, it will divide the Objects in one cluster into two or more clusters. So, random selecting initial cluster centre is easy to get in the local optimum not the entire optimal. For overcoming that square-error criterion is hard to distinguish the big difference among the clusters, one technique has been developed which is based on representative point-based technique. Besides, there are various approaches to solving the problem that the performance of algorithm heavily depends on the initial starting conditions: the simplest one is repetition with different random selections.Some algorithms also employ simulation anneal technique to avoid getting into local optimal.

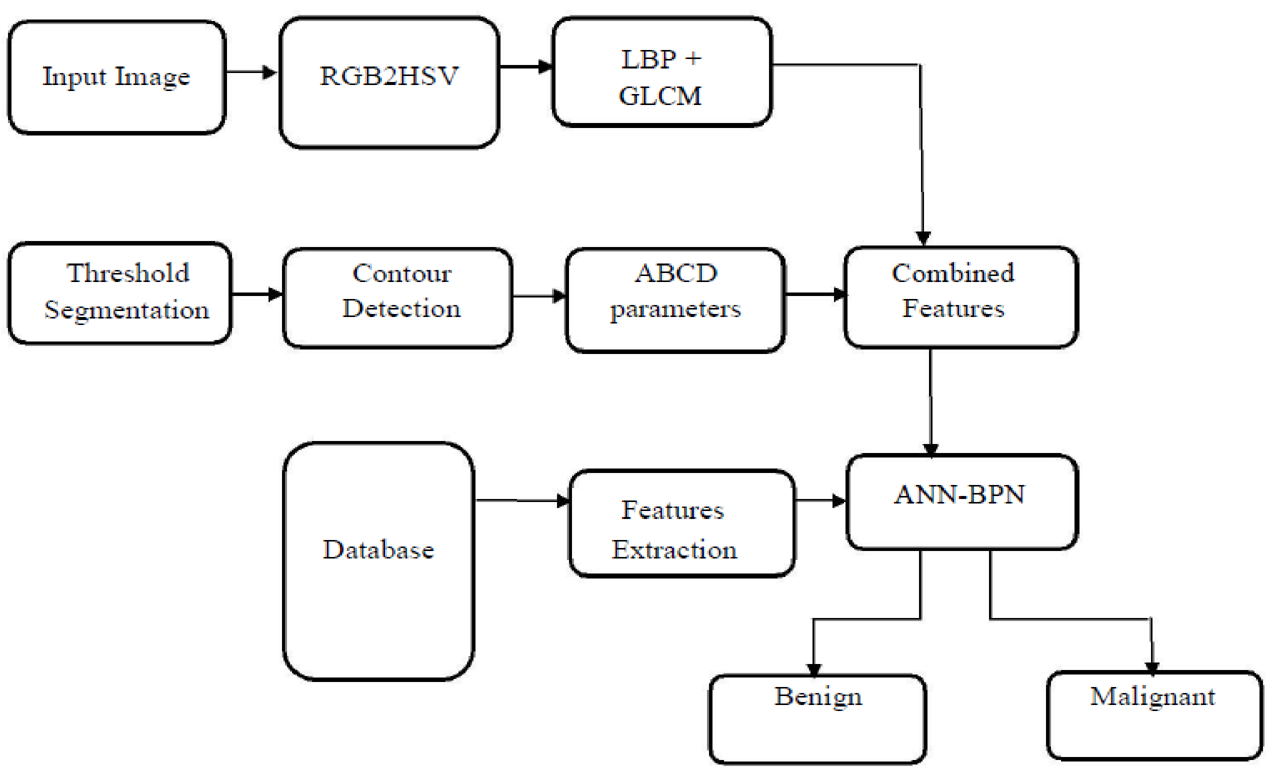


Fig. 2 Proposed block diagram

The back propagation algorithm is used to compute the necessary corrections, after choosing the weights of the network randomly. The algorithm is stopped when the value of the error function has become sufficiently small.

Local binary patterns (LBP) is used to extract features of both input image and database images [10]. LBP does not threshold the pixels into 0 and 1, rather it uses a threshold constant to threshold pixels into three values. This paper proposes a novel method for extraction of features using Local Binary Pattern (LBP) and signed bit multiplication, which uses central pixel for feature computation [13]. The extracted features are main component of the initial set of learning images (training set).Once the features of test images are extracted, the image is classified by comparing its feature vector with other train vectors in database using ANN classifier.

Cluster analysis, an important technology in data mining, is an effective method of analyzing and discovering useful information from numerous data. Cluster algorithm groups the data into classes or clusters so that objects within a cluster have high similarity in comparison to one another, but are very dissimilar to objects in other clusters

III. Results and Discussion

Skin cancer detection is simulated in MATLAB 2012 a version with 30 images as database. From the results that shows neural network which classifies the skin cancer stage and GLCM feature extraction techniques are used. Fig. 3 shows the sample input images used for screening and Fig. 4 depicts the selected images from the database .The following images shows the skin cancer detection process.

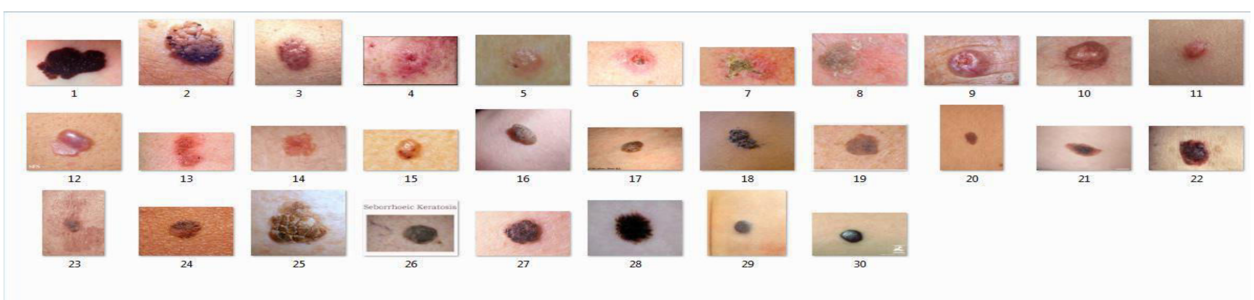


Fig. 3Sample input images

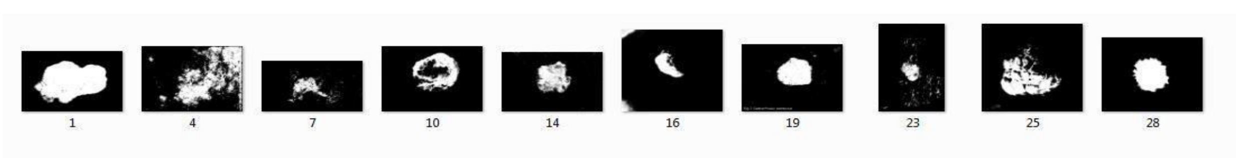


Fig. 4Selected images

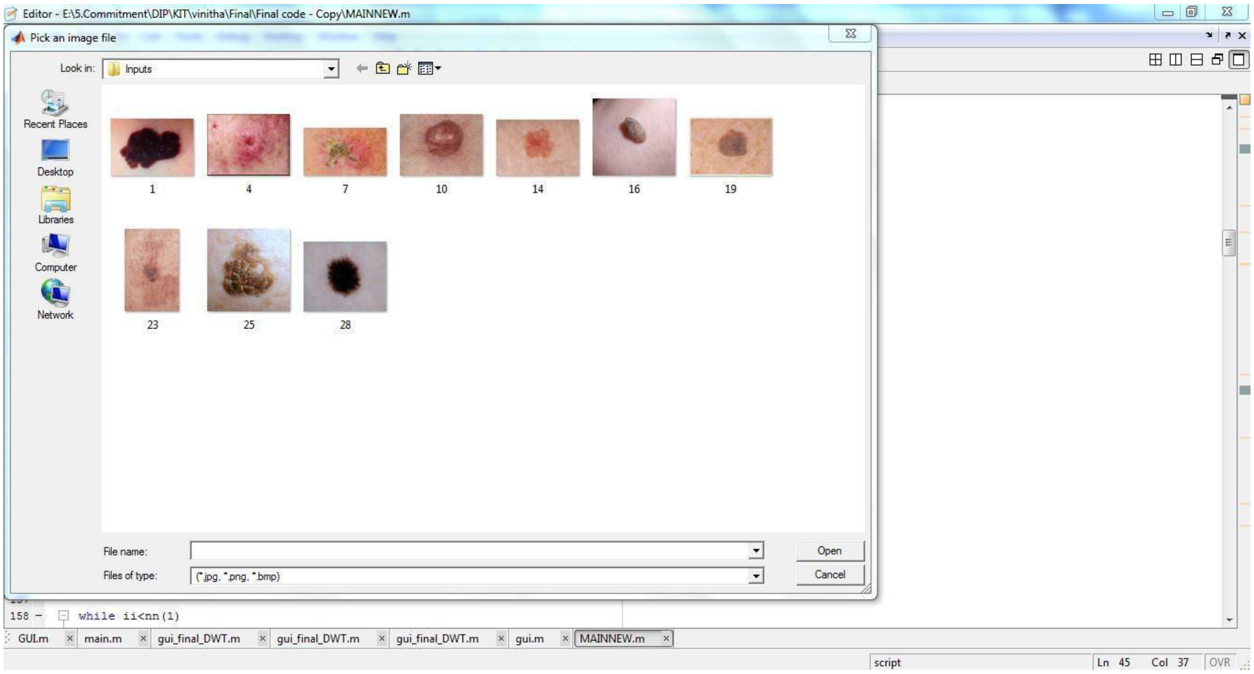
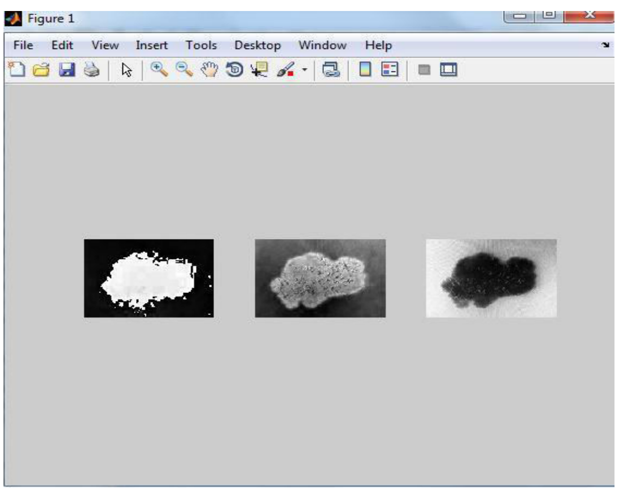


Fig. 5Database

In this work images used are taken from the database Physiodoc.net Fig. 5 shows the selected images and Fig.6 shows the complexity of images in subplot.



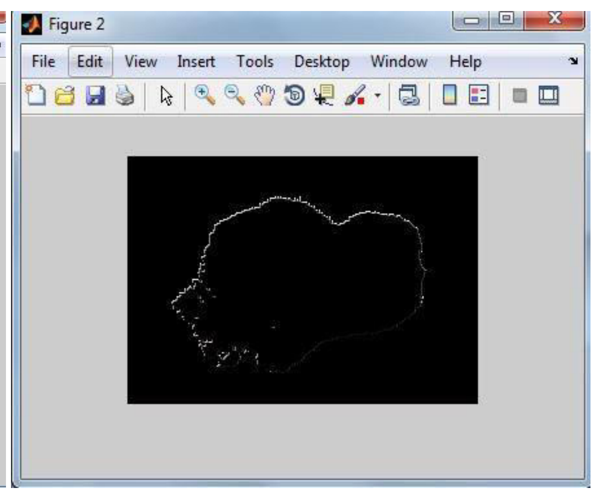


Fig. 6Complexity of the images

Fig. 7 Edge detection

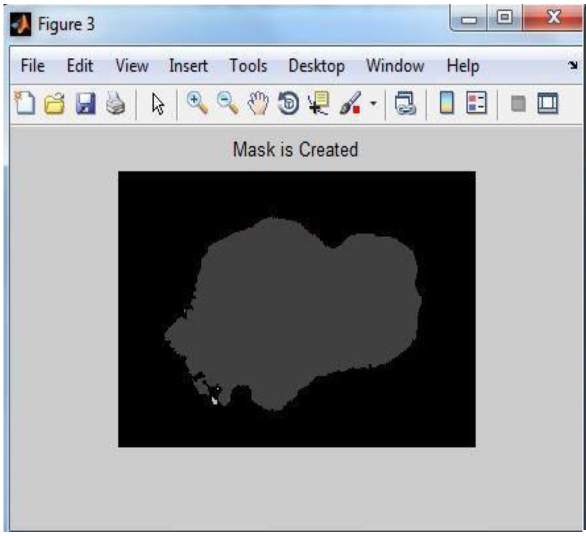


Fig. 8Mask Detection

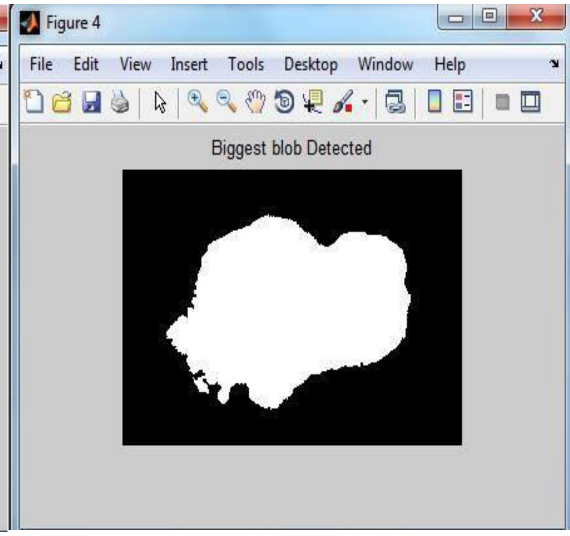


Fig. 9Binary image of grown region

Fig. 7 and Fig. 8 shows the Edge and mask detection of the affected region and the binary image of the blob detected is shown in Fig. 9.

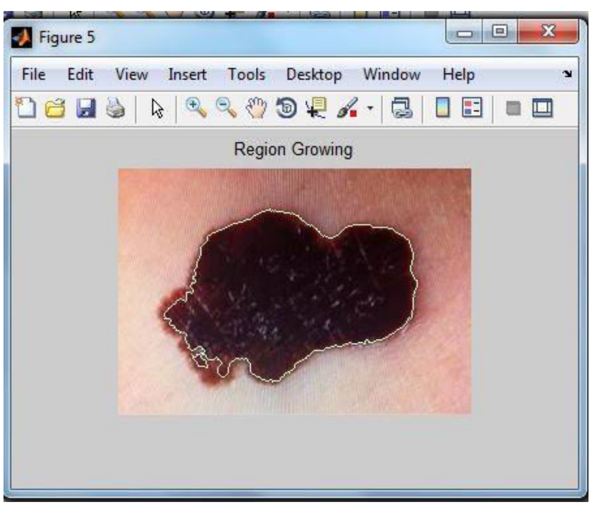


Fig. 10Detection of exact border of grown region

Fig. 11Disease localization

Detection of exact border of the tumour affected region is shown in Fig. 10 and localization of the disease is shown in Fig. 11.

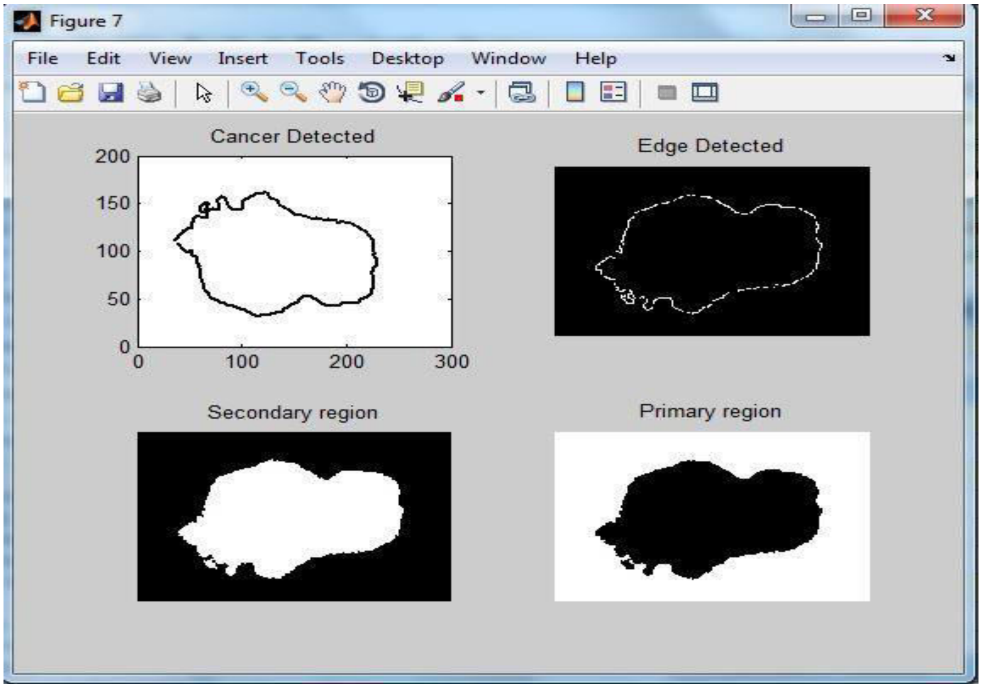


Fig. 12Mask detection of primary and secondary region

Detection of mask in primary and secondary region is shown in Fig. 12 and symmetry calculation is shown in Fig. 13.

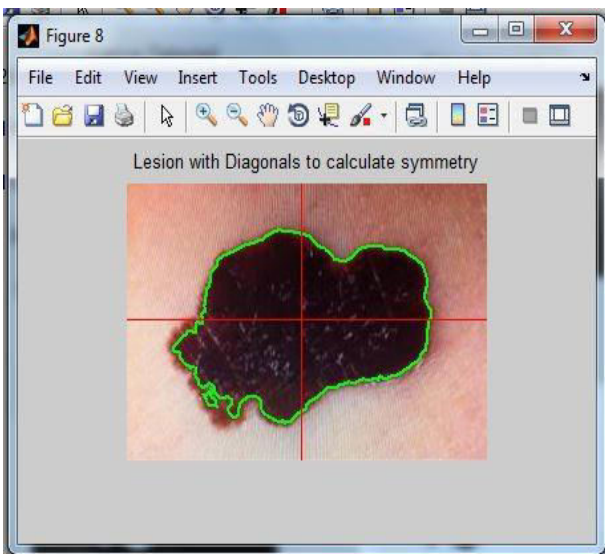


Fig. 13Calculation of symmetry in lesion

Fig. 14 Completion of loading images in Database

Fig. 15Completion of screening process

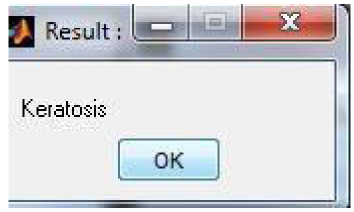


Fig. 16Final output

Successful completion of screening process and decision of stages of growth is shown in Fig. 14, Fig. 15 and Fig. 16.

IV. Conclusion

In this work, image processing techniques were used for automatic diagnosis of ABCD rule parameters and implementation of back propagation network to discriminate malignant melanoma from benign lesions. The experimental results show that the selected features are good candidates for an automatic melanoma detection algorithm. Future work could allow further improvement, primarily in the artifact removal steps and in structures detection.

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