ISSN: 2278 – 909X
International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE)
Volume 6, Issue 11, November 2017

Systematic Perspective Segmentation Method Based On Artificial Neural Network For Detecting Skin Lesion

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ABSTRACT:

Among all the types of skin cancer, Malignant melanoma is the most dangerous and deadly. Malignant melanoma, a deadly skin cancer disease needs to be detected at an early stage to be diagnosed properly. Malignant melanoma is a skin cancer that begins in cells called Melanocytes. A Melanoma starts as a collection of cancerous melanocytes Early diagnosis can be done with accurate Image Segmentation of skin lesions. However, its accuracy mainly depends on the dermatologist's experience, and it is performed using computer-aided diagnostic techniques. In the existing method thresholding algorithm is used for segmenting the skin lesions, and here the texture is separated by same color. Initially, skin images are filtered and the unwanted hairs and noise are eliminated by using the preprocessing method and then the segmentation process is carried out to extract lesion areas. The main drawback of the existing system is that the skin lesions which are less infected cannot be detected and texture comprising the same color is difficult to understand. In order to overcome this, an approach for automatic segmentation and classification of skin lesions is proposed. The main objective of this work is to propose an efficient method to segment the skin lesions with high accuracy and minimum computational cost. For segmentation, Artificial Neural Network (ANN) technique is applied by automatic initialization of seed points. An ANN is configured for a specific application, such as pattern recognition or data classification. The segmentation performance is measured with different well known measures and the results are predicted. MATLAB simulation tool has been used to validate the results.

KEYWORDS: Malignant Melanoma, Dermoscopy, Preprocessing, Thresholding, Segmentation, Artificial NeuralNetwork(ANN),

I.INTRODUCTION:

Skin cancer is the most common form of disease, globally accounting for at least 40% of cases. Malignant Melanoma is a skin cancer that begins in cells called melanocytes. Melanocytes can grow together to form benign moles. Here a melanoma starts as a collection of cancerous melanocytes. Melanomas are the most aggressive. A change in size, shape or color of a mole can be sign of melanoma. It occurs due to the development of abnormal cells that have the ability to invade or spread to other parts of the body. The incidence of melanoma has been increasing for many decades. Worldwide, in 2010, 49,100 deaths were attributed to melanoma. The most effective treatment is early surgical excision. Excision at the earliest in-situ stage of melanoma results in no change in life expectancy. Early detection could be facilitated by automatic lesion analysis. The advancement of imaging and analysis technique with non-invasive approach makes it possible to detect and classify various skin diseases with minimal human intervention.

Dermatoscopy or dermoscopy is a non-invasive micromorphological method which gives a more detailed view of skin lesions. Dermoscopy is a widely accepted diagnostic technique used by dermatologists for early diagnosis of melanoma, the most deadly form of skin cancer. Once the onset of the disease is detected at an early stage (invisible to naked eye) ,effective treatment can be initiated long before the signs andsymptoms of disease cause overt suffering. In the early diagnosis of malign ant melanoma, dermoscopic images have great potential, but their interpretation is time consuming and subjective, even for expert dermatologists. So, in many cases quantitative information in the form of measurements and counts extracted from the dermoscopic images, are needed to supplement non-image patient data. Quantification of the results of the biomedical image analysis not only increases diagnostic accuracy but also provides significant information.

Greater than 90% of cases are caused by exposure to ultraviolet radiation from the Sun. This exposure increases the risk of all three main types of skin cancer. Exposure has increased partly due to a thinner ozone layer. Tanning beds are becoming another common source of ultraviolet radiation. Between 20% and 30% of melanomas develop from moles.

II.EXISTING SYSTEM:

In the previous approaches, several computer algorithms have been developed to overcome these issues. In this method, preprocessing and segmentation are the commonly used image processing techniques for the detection of skin lesions. The term preprocessing is a common name for operations with images at the lowest level of abstraction both the input and the output are the intensity images. The main aim of preprocessing method is to suppress the unwanted distortions or enhance some image feature for further processing. Also in computer vision the image segmentation is a process of partitioning a digital image into

multiple segments (set of pixels, also known as super pixels). The goal of segmentation is to simplify or change the representation of an image into something that is more easy to analyze.These algorithms can be broadly classified as Thresholding, Region growing approach, Clustering methods, Texture and PCA.Image thresholding is simple but an effective way of partitioning an object from the background.This image analysis technique is a type of image segmentation that isolates the object by converting the gray scale images to binary images.Segmentation of image is based on thresholding of histogram features and gray level thresholding. Region growing approach is a simple region based on image segmentation method and it is classified as a pixel-based image segmentation method .

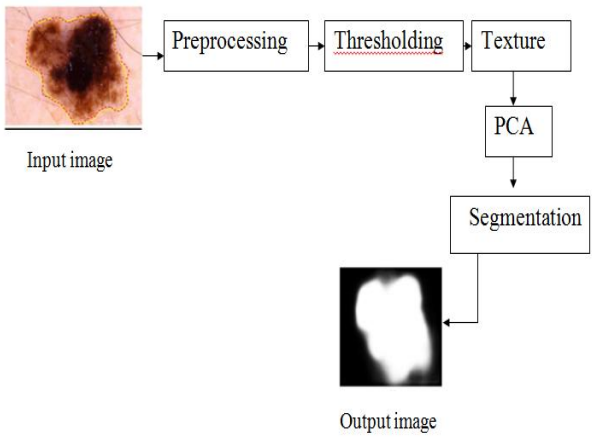

Fig.1. Segmentation based on thresholding approach

This approach to segmentation examines the neighboring pixels of initial seed points and it also determines that whether the pixel neighbors should be added to the region. The next step involves the clustering methods. In general clustering is defined as the process of organizing the objects into groups which are in a similar way. And it is also defined as a process whereby a data set (pixels) is replaced by cluster.Pixels may belong together because of the same colour, texture etc. The quality of the solution depends on the initial set of clusters. A cluster is therefore a collection of objects that is similar between them and are dissimilar to the objects belonging to other clusters. Image texture gives us information about the spatial arrangement of color or intensities of an image or the selected region of an image.It can be artificially created or found in natural scenes captured in an image. It also helps in segmentation.

One of the statistical techniques frequently used in signal processing for the data dimension reduction.It can supply the user with a lower dimensional picture. The main drawbacks identified in this approach is that the thresholding technique could not detect the skin lesion which is infected less than that particular threshold.Segmentation technique does not give accurate infection level.Texture is separated by same colors which is difficult to understand.

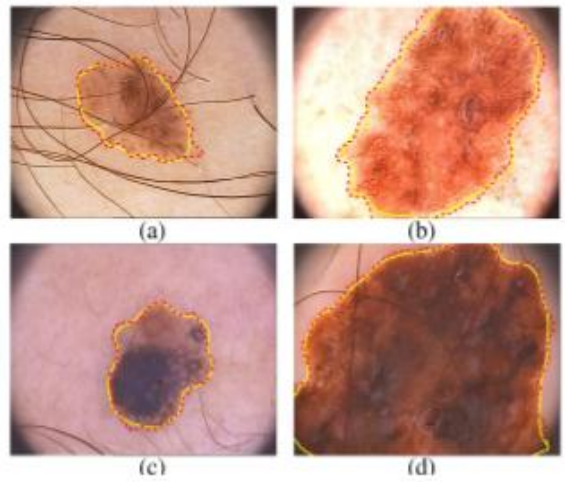

Fig.2.Segmentation results of some challenging approaches including cases affected by hair artifacts (a) and by illumination variation (b), a case with low contrast (c) and one whose boundary reaches the image edges (d).

III.PROPOSED SYSTEM:

In order to overcome the drawbacks in the existing system, a technique known as the Artificial Neural Network is being proposed with high accuracy and minimum computational cost. An ANN is based on a collection of connected units called artificial neurons. Each connection between neurons can transmit a signal to another neuron. The receiving neuron can process the signal(s) and then signal downstream neurons connected to it. Neurons may have state, generally represented by real numbers, typically between 0 and 1.

ANNs are considered as nonlinear statistical data modeling tools where the complex relationships between the input and output are modeled.Histogram is a graphical representation showing a visual impression of the distribution of data. An Image Histogram is a type of histogram that acts as a graphical representation of the lightness/color distribution in a digital image. It plots the number of pixels for each value. The histogram of a digital image with gray levels in the range [0, L-1] is a discrete function $h(r_k) = n_k$, where r_k is the kth gray level and n_k is the number of pixels in the image having gray level r_k.

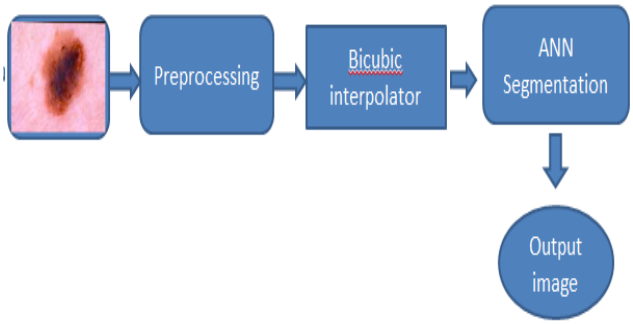

Fig.3. Segmentation based on ANN

IV.SYSTEM DESCRIPTION

A.IMAGE PROCESSING

Image processing step involves two processes. First hair removal is done and after that, filtering is done to remove any additional noises present in the image. Hair removal is done using Dull Razor software. The dermoscopic images may contain hairs. These hairs somehow will give erroneous classification. So it is desirable to do the hair removal before proceeding to further steps. A special type of filter is used, which replaces hair pixels by neighboring pixels. It improves classification results.

B.IMAGE SEGMENTATION

Image thresholding is an important technique for image processing and pattern. Bi-level thresholding classifies the pixels of an image into two classes, one including those pixels with gray-levels above a certain threshold, the other including the rest. The pixels will be either classified into one of the two classes. While classifying the pixels, there may be a chance of errors like, some of

the pixels in background class may come into object class and vice versa. A threshold level is selected in such a way that the error in classification is minimum. Using this threshold, segmentation is performed.

C.FEATURE EXTRACTION

Feature extraction is the method by which unique features of skin lesion images are extracted. This method reduces the complexity in classification problems. There certain features like geometry and color which distinguish melanoma from benign lesions. By extracting those features and training ANN classifier using known features, the classification can be made more efficient.

D.K MEANS CLUSTERING

k-means clustering is a method of vector quantisation, originally from signal processing, that is popular for cluster analysis in data mining. k-means clustering aims to partition n observations into k clusters in which each observation belongs to the cluster with the nearest mean, serving as a prototype of the cluster. This results in a partitioning of the data space into Voronoi cells.

E.TRAINING AN ARTIFICIAL NEURAL NETWORK

Once a network has been structured for a particular application, that network is ready to be trained. To start this process the initial weights are chosen randomly.There are two approaches to training - supervised and unsupervised. Supervised training involves a mechanism of providing the network with the desired output either by manually "grading" the network's performance or by providing the desired outputs with the inputs. Unsupervised training is a process where the network has to make sense of the inputs without external intervention.

F.SUPERVISED TRAINING

In supervised training, both the inputs and the outputs are provided. The network then processes the inputs and compares its resulting outputs against the desired outputs. Errors are then propagated back through the system, causing the system to adjust the weights which control the network. This process occurs over and over as the weights are continually tweaked. The set of data which enables the training is called the "training set." During the training of a network the same set of data is processed many times as the connection weights are ever refined.

G.UNSUPERVISED, OR ADAPTIVE TRAINING

The other type of training is called unsupervised training. In unsupervised training, the network is provided with inputs but not with desired outputs. The system itself must then decide what features it will use to group the input data. This is often referred to as self-organization or adaption. Traditional computers are ideal for many applications. They can process data, track inventories, network results, and protect equipment. These applications do not need the special characteristics of neural networks.

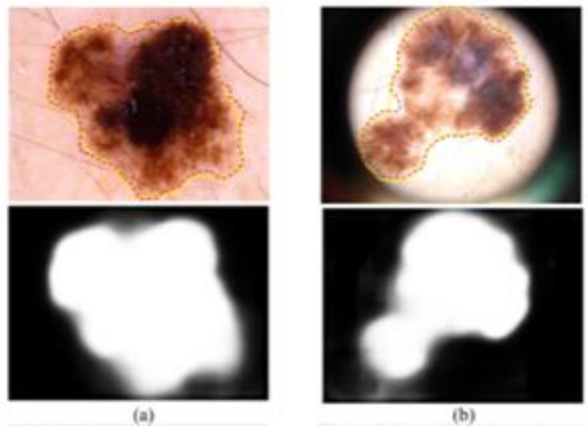

Fig.4. Melanoma lesions

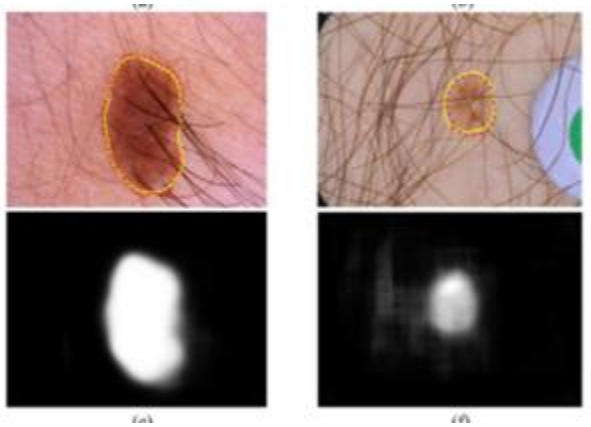

Fig.5. Non Melanoma lesions

V. RESULT

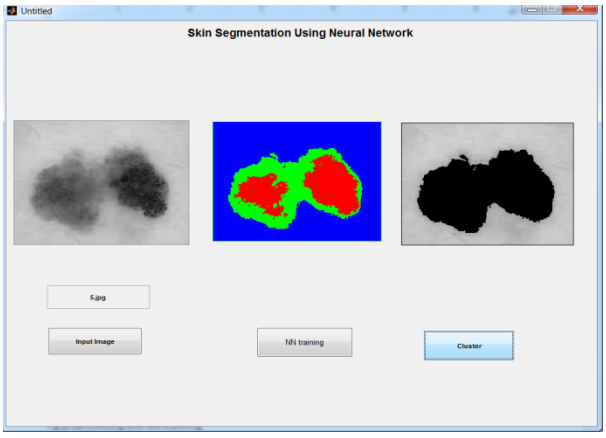

Fig.6.Segmented image

VI.CONCLUSION

The application of mathematical morphology for the segmentation of dermoscopic images, with a view to isolate the skin lesions, followed by extraction of appropriate shape, texture and color features from such segmented images is being proposed. The proposed algorithm combines the information contained in dermoscopic images, and defines the speed function based on the lightness, saturation and color information, with which the evolving curve is guided to stop at the boundary of the skin lesions. Subsequently the features have been utilized to identify patients with melanoma by distinguishing them from non-melanoma cases.

In this paper, we propose a novel method based on ANNs to meet the challenges of automated melanomarecognition in dermoscopy images, which consists of two steps: segmentation and classification. We seamlessly connect the two steps and form an automated framework without need of manual interaction.Numerical experiments illustrated the effectiveness of the algorithm, and the implementation issues were discussed based on the quantitative analysis.Further investigations include integrating probabilistic graphical models into our networks to further enhance the discrimination capability and exploring our method on more applications.

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