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A DEVELOPMENT OF AUTOMATIC DETECTION AND CLASSIFICATION OF SKIN DISEASE IN MEDICAL IMAGING USING KNN

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ABSTRACT

Skin is the most sensitive part of the body therefore we need a special attention. This research is related to detect skin disease, such as acne, psoriasis etc. In general this type of disease can become more dangerous if it is not controlled at an earlier stage. This research will provide a facility to user for determining the skin disease based on symptoms. In this research the data processing of patients is using KNN (Neural Network) which has recently achieved very promising results in a wide range of areas such as computer vision, speech recognition and natural language processing. It aims to learn hierarchical representations of data by using KNN. In a skin disease detection system, images need to be automatically processed and analyzed. In this paper, we review the KNN algorithms applied to infected skin images of humans in terms of different research topics: skin image detection, image processing, and image recognition and image classification.

Keywords: dermatology, KNN, active contour, ROI (Region of Interest), contrast, mean value.

INTRODUCTION

In our daily life, skin diseases are common to everyone and different types of allergies symptoms are becoming more and more common. Skin is the most sensitive compared to other parts of the body and therefore need special attention. Skin problem such as acne, psoriasis in skin cause people to be insecure as well as a health issues if it is not well treated. This research is related to skin disease, such as acne, psoriasis etc. In general those diseases can become dangerous if it is not handled as early stages. Skin disease is a type of group of diseases described by the hierarchical growth and divides the different condition of cells of skin. If the spreading disease is not controlled, it can be a result of death. Skin disease is caused by the factors such as, different organism's cells, and a different diet, and internal and external factors, such as hierarchical genetic group of cells, hormones, and immune system of conditions. This type of factors may act as a together or with in sequence of skin disease. Skin disease is a type of the deadliest forms of skin disease; hence, great effort has been put into the development of diagnosis methods for this disease [1].

Acne is a type of less common skin disease other than second skin disease. However, it is so much harmful and deadly if it is not caught by in the first stage of disease. It increases the death ratio up to (75%) of deaths related to skin disease cancer. The American Cancer Society firms estimates that more than 76000 new cases of skin disease will be improved in 2014. This type of skin disease is the less common, accounting for less than 7% of all skin cancer cases. However, it is by far the most aggressive since it is more likely to metastasize than other skin tumors. This characteristic makes acne and psoriasis the deadliest form of skin cancer (it is estimated that more than 75% of deaths related with skin cancer in 2012 will be from melanoma [2]. However, this type of skin disease has been considered as one of the most hazardous types of disease in the sense that it is harmful and it's effectively has been slowly increased with time to time. Acne is another type of condition or a not formulated in order that affects the skin cells thereby, in this area a structure of High Level Intuitive Features (HLIFs) is given to numerically describe in skin disease in standard camera images. In acne disease condition it includes whiteheads, blackheads, red and inflamed patches and it occurs mainly on face and shoulders. Psoriasis is the harmful and hazardous form of skin disease, with increasing rates and subjectivity in a different type of current clinical skin detection global methods, there is a need for skin disease detection decision support systems in which feature extraction is a sharp critical and valuable step in skin disease decision support systems. If we analysis the existing feature of set of images for analysis standard type of camera images are a low-level features, which exist in high-dimensional image feature spaces and its lower and upper limit ability to disease diagnostic rationale. W. Stolz [3] gives a different type of application of the ABCD-rule of skin disease images dermatoscopy represents a new type of practical method for early detection and recognition of skin disease. Dermatologists commonly use this matrices such as the ABCD (asymmetry skin, border type irregularity, color patterns, and diameter of area) [4] or the seven-point checklist [5]. It gives an introduction of an algorithm for the skin disease detection of Acne and Psoriasis disease called 7-point checklist algorithm [6]. However, usage of the symmetric is very objective and subjective, leading to large observation variability [7]. Systematic objective decision support systems can help meet the demand of the rising rate of Acne and help reduce subjectivity. Some of the current detection methods that are used clinically consist of skin imaging techniques, dermoscopy, multispectral imaging, thermal imaging and hyper spectral imaging to name of few. The skin imaging techniques that are in place today utilize electromagnetic waves, acoustic waves and mechanical waves [8].There are some several common methods to perform lesion segmentation histogram thresholding, clustering, edge based, region-based, and active contours. Among these methods, active contours are most often globally used. In active contour method it uses image histogram to determine one or more intensity values for separating pixel into groups. The most popular method for feature extraction of image is contour method. To help people can self examinations their skin, American Academy of Dermatology promoted a simple method called "ABCDE" [9]. Corresponding to Asymmetry of lesion, Border irregularity, Color variation, Diameter and Evolving. This research will facilitate user to determine the recommended treatments for this skin disease based on the symptoms, and the recommended medicines to treat the disease.

Figure-1. Acne (black arrows) atypical pigment network; (red arrows) psoriasis disease network.

This paper includes the analysis method through surveys, including interviews with several specialists who specialize in skin treatments and diseases. The system consists of two main components: 1) Image Segmentation and 2) Feature Extraction. The system should be able to read the input image and perform the proper wise image segmentation in order to have clear and accurate skin lesion. Also it should extract the features from the segmented output image. The features are consisting asymmetry, border, diameter and color of skin lesion. In image analysis the segmentation of image is most important step as it has great effect on accuracy of system. But the main obstacle is great varieties of skin lesion sizes, shapes and colors. Also different skin types and textures feature (Energy, contrast, standard deviation etc.) have increased the complexity of system. With this skin lesions having irregular boundaries are also very difficult to image segment analysis. To classify and resolving this type of problems a numbers of algorithms are proposed. These algorithms are classified and mainly based on threshold frequency, edge-based detection and region-based detection methods.

There is some specific feature which is obtained by contour method:

- Mean and Standard Deviations of ROI of 3 color channel (R, G and B) of diseased skin.
- Mean and Standard Deviations of 3 color channel (R, G and B) of healthy skin.
- Distribution (scattering of the ROI-s).
- And texture features like Energy, Entropy, and Contrast in each color channel.

Mean and standard deviation are prevalence- independent test characteristics, as their values are intrinsic to the test and do not depend on the disease prevalence in the population of interest. In neural network architecture model there are a number of library are included. These libraries are very useful for define the method.

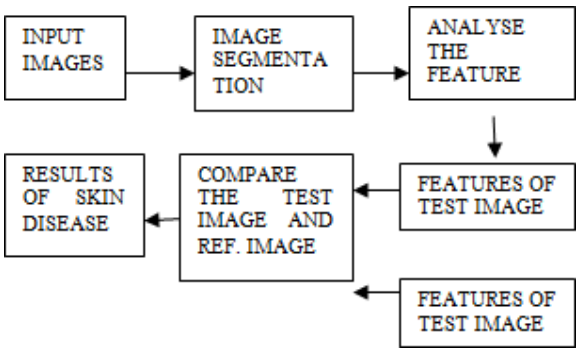


Figure-2. Comparison between infected images with referenced image.

The detailed Procedure of image processing is explained below:

Step 1: Image acquisition

Skin inspection is the first step of skin disease detection system which is helpful to find skin disease. After that the processing of digital image of infected skin is involved in computer aided diagnostic system. The creation of digital image is digital imaging or digital image acquisition of infected image. It is a type of a physical scene or the interior structure of an observed object. There are many types of standard techniques by which we define the skin lesions image by video, camera, and microscopy.

Step 2: Image pre-processing

We collected the digital snapshots of skin disease in format of Bitmap or JPEG from different sources. Generally the image which is used in image pre- processing is indexed images so that at first before indexing initially RGB skin images are converted to indexed images before further processing. In this we apply image conversion techniques like infected skin disease image in to binary image to the acquired image [12]. Such that the last image obtained are used for further processing. For further application, we make an acquired image suitable for a further application of image pre- processing steps. In the image pre-processing basically it involves the quality enhancement of images. In the process of quality enhancement, some changes has been occurred in images like noise removal of selected image, edge detection, shaping of edge, brightness, contrast of image, hair removal, cropping or resizing. In this step our main works is enhancing the image that's why we remove the unwanted parts of processed image after that, correction of the image matrix as well as remove the noise from the processed image.

Step 3: Image segmentation

In this process actually we partition a digital image into a set of multiple segments. The actual work of image segmentation and histogram is plotted through eqn.

(1) and (2) to simplify analyze and obtaining a valuable and meaningful image. This image is further used for feature extraction. In this process the thresholding method is one of the oldest and simplest methods. For image segmentation initially we define the gradient magnitude and some orientation these value are computed from these equation

$$\|g(x)\| = \sqrt{g_1^2(x) + g_2^2(x)},\ \varphi(x) = \tan^{-1}(g_2(x)/g_1(x)) \qquad (1)$$

Now we define the histogram of the gradient frequency is

$$H_a(i) = \sum_{N\ xCR}^{1} bi\ (g(x)),\ i = 1, \ldots, \qquad (2)$$

Where R denotes the set of pixels that were classified as lesion, N = ≠ R is the No. of lesion pixels, and M_a are the no. of bins used in the amplitude and histogram; b_i (.) are the characteristic functions of the i^{th} histograms been defined by

b_i ={1, if *a* belongs to the *i*th amplitude bin 0, otherwise

In this inner region R1 and border R2 is compute when lesion region R is split. Then we compute the separate histograms for each of these regions for this we use the same equation only replacing the values R by R1 and N by N1. The fig. no. shows the some histograms of amplitude and some set of dermoscopy images which is affected by skin disease like acne and psoriasis and nonacne and nonpsoriasis images. In these images we see that there is a some significant overlap of both classes in all histograms bins. That's why we mean that binary decision is not simple. The medical doctor's uses color information for finding the classification of skin disease, therefore color and texture feature have been used in the CAD systems. In dermoscopy analysis the mean color and color variance [1], [13] is most popular for color statistics. That's why these most works compute the RGB color components.

The primary colors, i.e., red (R), green (G) and

blue (B) is a color space for target color as a mixture of these colors.

Step 4: Feature extractions

Actually in this step we are reducing the amount of resources which is required to describe a large set of processed data. In the segmented image we abstract the features of image like that texture, color and shape. The important features of the texture are: Smoothness, regularity, medium rate, aspect ratio, parameter, compactness, boundary and edge detection etc. Textures are nothing but it is a very complex visual pattern which is composed of entities and sub entities that's have characteristic like brightness, color, slopes, size, etc.

Step 5: Feature analysis

In this step we extracted the image attribute by image analysis technique. If we diagnosis the skin disease then firstly we detect the skin lesions of infected skin after that localized in an image for the measurement of image features. If we analysis the skin disease before diagnosis then firstly we measure the maximum diameter of a particular infected area of skin after that we determined the skin lesion boundaries. Here texture extraction method is used. From the above discussion the conclusion is that the texture is nothing but it is a combination of some consecutive repeatedly patterns with its regular frequency. If all interpret the texture and color in many types then smoothness, fine, and coarse etc is the visual type interpretation. If defined the texture analysis of an image then it is nothing but it is a classification and segmentation of its feature like texture and color analysis through ROI extraction using Active Contour method. Although if extract the ROI feature then the some mathematical parameter is extracted through the some mathematical equation like eqn. no. 3.3, 3.4, 3.5, 3.6 these equation evaluates the ROI (rest of region) value. These value shows that which skin is healthy or not even if the input images have existence the disease then by numerical parameter find and classify the disease. The equation of these finding parameters is given by

$$\text{Mean: } \mu=\sum_{i=0} P(i) \qquad (3)$$

$$\text{Variance: } \sigma^2=\sum_{i=0}^{G-1}(i-u)^2(i) \qquad (4)$$

$$\text{Energy: } E=\sum_{i=0}^{G-1}(i)]^2 \qquad (5)$$

$$\text{Entropy: } H=-\sum_{i=0}^{G-1}(i)\log_2[p(i)] \qquad (6)$$

In feature extraction used the some mathematical term which is more useful for finding the mathematical parameters of like mean, variance, energy, entropy. For calculating the mathematical parameter of an image in this define a two space variables function *f(x, y)* of two space variables x and y, where x=0, 1…N-1 and y=0, 1…M-1. The discrete values of function *f(x,y)* can take i=0,1,…….G-1, where G is the total intensity levels of image. The intensity level histogram is a function which shows the number of pixels in the whole image.

Step 6: Skin disease detection system

Basically in this step we identify as well as detect the skin disease by its abnormal signs and symptoms. In any skin disease, if diameter of that cell area is greater than 6 mm and also whose border is irregular then we say that it is melanomas. The signs of skin disease are bleeding, itching, black and white spot etc. There are two types of measurement in image detection one is sensitivity and other is specificity. There are a number of global and local methods which is used in worldwide for skin disease diagnosis using different types of algorithm.

LITERATURE SURVEY

There are so many authors that are giving the interesting result with different set of methods and classifiers.

S.Menzis *et al*. [3] started the first installation about the visual features used for skin disease detection and skin lesion classification using state of the art techniques. W. Stolz *et al*. [4] proposed a system which is based on a SVM classifier to identify melanomas. They achieved Sensitivity 96% and Specificity 75% by used a texture and color features. G. Argenziano *et al* [5] proposed an algorithm for lesion classification that uses the Bag-of-Features (BOF) approach. They achieved SE 71% and SP 55.2% using color compensation technique and Gray method. X.Yuan *et al.* [7] used smart handheld devices like iphone Apple etc for detection of skin disease due to 7-point checklist method. In this application he also developed pattern recognition algorithms for sophisticated image processing. He obtained the sensitivity and specificity with and without 7-point checklist is 87.27%, 71.31%, and 74.78%, 70.69%.

N. Situ *et al*. [9] described an algorithm for lesion classification that uses the bag-of-features (Bof) approach. They represent each image as a set of several patches sampled from a 16 × 16 regular grid placed on the lesion. To describe each patch, they use wavelets and Gabor-like filters, leading to a total of 23 features. Two different classifiers were compared, i.e., naive Bayes and SVM classifiers; and their best performance is 82% on a data set of 100 dermoscopy images, 30 of which were melanomas. M. Celebi *et al*. [8] proposed a method using Gray level Co-occurrence Matrix (GLCM) in which they used Ada boost, Bayes net and naivy Bayes techniques which are used to identify the skin disease and to suggest medical treatments or advice for users. This expert system exhibits disease identification accuracy of 85% for eczema, 95% for Impetigo and 85% for melanoma.Kumar *et al*., [11] gave a technique which is computer based detection uses imaging techniques and Artificial Intelligence are described. The different stages of detection involves-collection of dermoscopic images in which filtering of the images for removing hairs and noises, segmentation of the images using Maximum Entropy Threshold value, feature extraction using GLCM, and classification using KNN.C.Barata *et al*. [10] proposed a method based on a CAD tool with functionalities of image acquisition, image processing, feature extraction, and diagnosis is developed.K.K Singh *et al.* [13] proposed a method for the test of image histogram equalization using Gray level Co- occurrence matrix (GLCM) on image to get wavelet decomposition of human skin tissue is described here by P. Bromiley *et al*. [14]. In this paper he proposed to localize the skin lesion by combining fast skin disease detection and fusion of two fast image segmentation results. He proposed a new feature to capture color variation image and border detection which are useful for smartphone-captured images. In this he used a SVM classifier for testing the image, if he obtained the result as 1 then it is melanoma otherwise non-melanoma. In this work he obtained the accuracy 92.09% using texture feature selection [10]. In earlier days everyone knows about the texture features for diagnosis of skin disease. K. Wang [15] uses this method with the compare of role of color with texture feature. He fined the result that color feature is not having a good result alone but when we combine it ten the methods give the good results. He fined the result for global methods i.e., Sensitivity 96% and Specificity 80%, as well as for local methods Sensitivity 100% and Specificity 75%.

PROPOSED METHODOLOGY

The method that will be used in this research, in order to identify and understand types of skin diseases as well as analyze and detecting using the ANN algorithm of Neural Network. The sequence of steps is as follows:

Step 1: Input skin disease image and read the factor of image.

Step 2: Image segmentation is through active contour method.

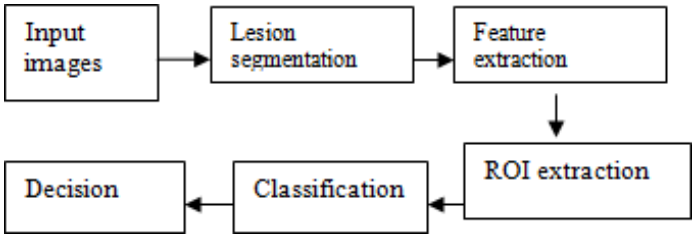
Step 3: Feature extraction through mathematical equation.

Step 4: ROI feature extracted in this step.

Step 5: Then by using classifier classification the disease.

Step 6: Decision takes place in this step that which type of disease is found in the infected skin image.

The experimental results have shown that the properties of the infected image are differing



by the properties of the referenced image. Also, the KNN [11] finds a set of abstractions in data by using model architecture.

Figure-3. Block diagram of skin disease detection system.

RESULT ANALYSIS

Thus from the above given proposed model we have extracted the color and texture features for Psoriasis and Acne disease. The results of feature extraction are as shown:

Figure-4. Segmented regions of infected skin.

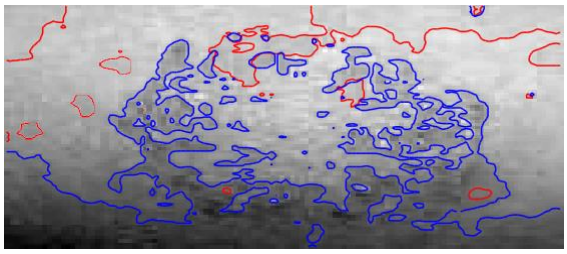


Figure-5. Contour segmentation of image after 99 iterations.

Figure-6. (a) Cropped image obtained from infected skin disease (b) Edge extraction using active contour (c) final ROI.

Table-1. Results showing color and texture feature difference between psoriasis and acne.

Feature	**Psoriasis**	**Acne**
Mean	101.2 to 161.5	141.1 to 208.4
St. deviation	26 to 49	25 to 65
Energy	107 to 176	145 to 209
Contrast	7.00 to 7.59	6.1 to 6.7

CONCLUSIONS

This paper has fined the some parameter value obtained through active contour method of infected skin disease like acne and psoriasis. The previous work uses the global and local features (texture, shape, and color) for finding the disease. There are a number of global and local methods through which we analyze and identify the skin disease after that we processed the automatic diagnosis for a particular disease of the patients. In this if we use a proper segmentation in image then the skin disease detection system is cost effective and efficiently achieves the result. Time to time in medical and automatic diagnosis of procedure there are a number of results has been recorded so that by this record we further use to development accuracy of the obtained result. By this way we provide a cost-effective, easier and faster result in skin diagnosis detection under the supervised area of skin.

REFERENCES

[1] Cancer facts and figures 2012. American Cancer Society, Atlanta, GA, USA, Tech. Rep.
[2] Dermoscopy Tutorial 2003. [Online]. Available: http://www.dermoscopy. org/atlas/base.htm.
[3] W. Stolz, A. Riemann and A. B. Cognetta. 1994. ABCD rule of dermatoscopy: A new practical

method for early recognition of malignant melanoma. Eur. J. Dermatol. 4(7): 521-527.

[4] S. Menzies, C. Ingvar, K. Crotty and W. McCarthy. 1996. Frequency and morphologic characteristics of invasive melanomas lacking specific surface microscopic features. Arch. Dermatol. 132(10): 1178- 1182.

[5] G. Argenziano, G. Fabbrocini, P. Carli, V. De Giorgi, E. Sammarco and Delfino. 1998. Epiluminescence microscopy for the diagnosis of doubtful melanocytic skin lesions. Comparison of the ABCD rule of dermatoscopy and a new 7-point checklist based on pattern analysis. Arch. Dermatol. 134(12): 1563-1570.

[6] M. Sheha, M. S. Mabrouk and A. Sharawy. 2012. Automatic detection of melanoma skin cancer using texture analysis. Int. J. Comput. Appl. 42(20): 22-26.

[7] X. Yuan, Z. Yang and G. Zouridakis. 2006. SVM- based texture classification and application to early melanoma detection. In: Proc. 28th IEEE EMBS Annu. Int. Conf. pp. 4775-4778.

[8] M. E. Celebi, G. Schaefer and H. Iyatomi. 2008. Objective evaluation of methods for border detection in dermoscopy images. In: Proc. 30th IEEE EMBS Annu. Int. Conf. pp. 3056-3059.

[9] N. Situ, X. Yuan, G. Chen and J. Zouridakis. 2008. Malignant melanoma detection by bag-of-features classification. In: Proc. 30th IEEE EMBS Annu. Int. Conf. pp. 3110-3113.

[10] C. Barata, J. Marques and J. Rozeira. 2011. Detecting the pigment network in dermoscopy images: A directional approach. In: Proc. 33rd IEEE EMBS Annu. Int. Conf. pp. 5120-5123.

[11] Kumar R. and Ravulakollu K.K. 2014. Offline handwritten devnagari digit recognition. ARPN J. Eng. Appl. Sci. 9, pp. 109-115.

[12] Singh P., Verma A. and Chaudhari N.S. 2015. On the performance improvement of devanagari handwritten character recognition. Applied Computational Intelligence and Soft Computing. p. 1.

[13] K. K. Singh and A. Singh. 2010. A study of image segmentation algorithms for different types of images. Int. J. Comput. Sci. Issues. 7: 41- 47.

[14] P. Bromiley, N. Thacker and E. Thacker. 2004. Shannon entropy, Renyi entropy, and information. Statistics and Inf. Series (2004-004).

[15] K. Wang, S. Zhang, Z. Wang, Z. Liu and F. Yang. 2013. Mobile smart device-based vegetable disease and insect pest recognition method. Intelligent Automation and Soft Computing. 19(3): 263-273.