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Detecting Skin Disease by Accurate Skin Segmentation Using Various Color Spaces

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ABSTRACT
Skin diseases which may be of the bacterial, fungal, allergies, enzyme etc. are very harmful for the skin and can spread throughout if not detected accurately as early as possible. So becomes necessary to detect the type disease accurately in early stage and control it by taking proper precautions is demanding now days. So the automatic image analysis method can work really good in this way and is the heart of image processing. Especially in medical field it becomes useful for providing the quantitative information related with the skin disease. So proved as a early warning tool for future problems during the treatment. Now a day's there is a need to perform the detection of disease accurately without any penetration in the body that's why simply digital images of affected skin region are captured by the camera can be processed by using image processing tools. There are many sub techniques of image processing tools are work and played important role in the area of research. This paper presents the detection of skin disease by image processing tools like preprocessing, segmentation, feature extraction, classification and uses specific techniques for the relative steps. While doing the segmentation it uses various color spaces like RGB, Ycbcr, HSV etc. so that accurate skin segmentation will be done for proper feature extraction and classification so the disease can be detected accurately and can improve the efficiency of the system. Also gives the type and percentage of diseases.
Keywords - color spaces, feature extraction, Image preprocessing, KNN, segmentation.

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INTRODUCTION

Skin is the covering organ of human body. All the organs inside the human body are completely protected by skin. Therefore it is important to give the attention towards the complete care of skin. Because any change in its normal functioning can cause to affect the other parts of body [2]. Many of the skin diseases can be caused by the exposure to the ultraviolet rays come from sun and manmade sources [5]. There are two major layers in human skin such as epidermis and dermis. The outer layer of the skin is called as epidermis consist of three cells such as Basel cells, Squamous cells and melanoma that provide the skin its color and protected from damage. Inner layer is the dermis contains nerves, blood vessels and sweat glands. Any of the wrong functioning of these cells can cause spot on the skin which is infected and called as lesion area. Which is the first notation of skin disease if not detected in early stage can spread throughout [9]. Medical field depends more on computer aided diagnosis because early detection of skin disease is more complex for dermatologist and if detected then it is very time consuming and performed by the penetration in the body as a form of injection. So the simple way is to investigate the digital images are by means of image processing techniques which are popular now a days and becomes a interesting field for the researchers. These techniques took the less time for detection if the relevant data is available .For capturing the data doesn't requires the physical contact with skin [2]. So the proposed methodology is in the same direction, follows the steps as shown in figure.

RELATED WORK

It gives an idea about latest approaches in the various fields of interest and for finding out the new research based on the existing. Various approaches have been proposed in the direction of improving the efficiency of the system. Various methods are used in such a direction so as to increase the accuracy of the system. Some of the approaches are as follows in the field of digital image processing for detection of skin diseases.

2.1. Martin Kreutz, Malik Anschutz [1] Presents a paper which uses the combination of DIP and ANN for achieving fast and reliable diagnosis of malignant and benign skin lesions coming from DANAOS data collection.

2.2. YSumithra Ra, Mahamad Suhilb, D. S. Guruc [2] a novel approach for automatic segmentation and classification of skin lesions is proposed. Initially, skin images are filtered to remove unwanted hairs and noise and then the segmentation process is carried out to extract lesion areas. For segmentation, a region growing method is applied by automatic initialization of seed points. The segmentation performance is measured with different well known measures and the results are appreciable. Subsequently, the extracted lesion areas are represented by colour and texture features. SVM and k-NN classifiers are used along with their fusion for the classification using the extracted features. The performance of the system is tested on our own dataset of 726 samples from 141 images consisting of 5 different classes of diseases. The results are very promising with 46.71% and 34% of F-measure using SVM and k-NN classifier respectively and with 61% of F-measure for fusion of SVM and KNN.

2.3. Sneha Kugunavar [3] Dermoscopy needs sophisticated and robust systems for successful treatment which would also help reduce the number of biopsies. Computer aided diagnosis of melanoma support clinical decision making which would provide relevant supporting evidence from the prior known cases to the dermatologists and practitioners and also ease the management of clinical data. These systems play an important role of an expert consultant by presenting cases that are not only similar in diagnosis but also similar in appearance and help in early detection and diagnosis of skin diseases. With the advances in technology, new algorithms have also been proposed to develop more efficient CAD systems. This article reviews various techniques that have been proposed for detection and classification of skin lesions.

2.4. Revati Kadu [4] In this paper, system is proposed which detects the skin diseases using Wavelet Techniques and Artificial Neural Network. This paper presents a wavelet-based texture analysis method for classification of five types of skin diseases. The method applies tree-structured wavelet transform on different color channels of red, green and blue Dermoscopy images, and employs various statistical measures and ratios on wavelet coefficients. In all 99 unique features are extracted from the image. By using Artificial Neural Network, the system successfully detects different types of dermatological skin diseases. It consists of mainly three phases image processing, training phase, detection and classification phase.

2.5. Ekta singhal [5] Skin Cancer is most prevalent cancer in the light-Skinned population and it is generally caused by exposure to ultraviolet light. In this paper, an automatically skin cancer classification system is developed and the relationship of skin cancer image across the neural network are studied with different type of pre-processing. The collected image is feed into the system and image pre-processing is used for noise removal. Images are segment using Thresholding. There is certain feature unique in skin cancer region these feature are extract using feature extraction technique. Multilevel 2-D wavelet decomposition is used for feature extraction technique. These features are given to the input nodes of neural network. Back propagation neural network and radial basic neural network are used for classification purpose, which categories the given images into cancerous or non-cancerous.

2.6.Nisha Yadav, Virender Kumar Narang,
Utpal Shrivastava [6] This paper presents a survey of various skin disease diagnosis systems using image processing techniques in recent times. A comprehensive study of a number of skin disease diagnosis systems are done in this paper, with different methodologies and their performances.

2.7. Damilola **A.**Okuboyejo**,** Oludayo O. Olugbara, and Solomon A. Odunaik [7]

This study would focus on designing and modelling a system that will collate past Pigmented Skin Lesion (PSL) image results, their analysis, corresponding observations and conclusions by medical experts using prototyping methodology. This wealth of information would be used as a library. A part of the system would use computational intelligence technique to analyze, process, and classify the image library data based on texture and possibly morphological features of the images. Trained medical personnel in a remote location can use mobile data acquisition devices (such as cell phone) to generate images of PSL, supply such images as input to the proposed system, which in turns should intelligently be able to specify the malignancy (life-threatening) or benign (non-threatening) status of the image PSL.

2.8. M. Chaithanya Krishna 1,S. Ranganayakulu 2,

DR. P. Venkatesan 3 [8] This paper present a computer aided method for the detection of Melanoma Skin Cancer using Image Processing tools. The input to the system is the skin lesion image and then by applying novel image processing techniques, it analyses it to conclude about the presence of skin cancer. The Lesion Image analysis tools checks for the various Melanoma parameters Like Asymmetry, Border, Color, Diameter,(ABCD) etc. by texture, size and shape analysis for image segmentation and feature stages. The extracted feature parameters are used to classify the image as Normal skin and Melanoma cancer lesion.

2.9. Neenu paliwal [9] this paper gives an idea to deal with the segmentation, detection and classification of the skin cancer and the affected area using hybrid image processing techniques.

2.10.Uzma Bano Ansari [10] this paper presents skin cancer detection system using SVM for early detection of skin cancer disease. It is more advantageous to patients. The diagnosing methodology uses Image processing methods and Support Vector Machine (SVM) algorithm. The Dermoscopy image of skin cancer is taken and it goes under various pre-processing technique for noise removal and image enhancement. Then the image is undergone to segmentation using Thresholding method. Some features of image have to be extracted using GLCM methodology. These features are given as the input to classifier. Support vector Machine (SVM) is used for classification purpose. It classifies the given image into cancerous or non-cancerous.

2.11.Manish Kumar and Rajiv Kumar [11] 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 analysed. In this paper, 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.

SKIN DISEASE DETECTION

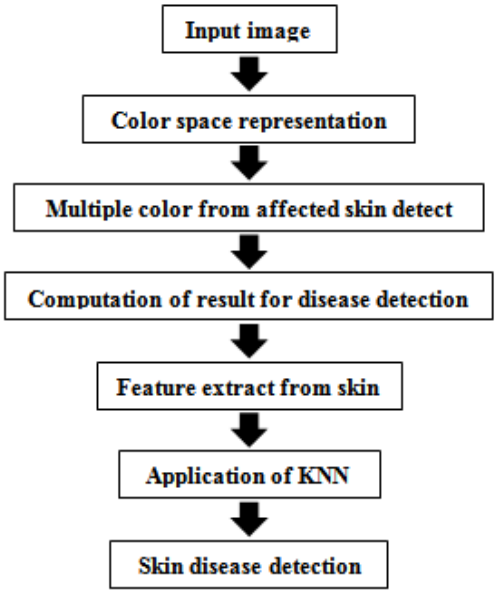

Fig.1

It first take out the image which is to be processed for disease detection by means of camera. Then image undergoes for pre processing which is the first step

3.1. preprocessing an input image -The images of the skin captured by the standard cameras usually contain artefacts such as light scattering caused by secular reflection of light from skin surface and skin parts such as hairs that could affect the segmentation performance so for dealing with these factors the system uses median filtering technique[5]. Generally filtering techniques can be either linear or non linear. Linear filtering technique applies the algorithm linearly to all the pixels in the image without defining the image as corrupted or uncorrupted pixel hence causes the uncorrupted pixels to be filtered out. Which is not so effective in removing impulsive noise on the other hand median filtering technique is a non linear filtering technique which goes through to the two phases, in first phase it identifies the pixels as corrupted or uncorrupted, in second phase it filter out the corrupted pixels and retains the uncorrupted pixel value.

3.2. Color space representation- This is the second step through which system uses the color spaces such as RGB,Ycbcr,HSV for representation of image.RGB is the most widely used colour space for storing and processing digital image. It can represent luminance with colour which may vary within and across the person.

Ycbcr is the another colour space in which Y is the one component of this colour space and luminance, cb,cr are the others stands for blue and red difference.

HSV colour spaces uses two cylinder to represent the pixels in an RGB color space. It gives the hue, saturation value of image. Since RGB singly is not reliable for identifying so system uses it with Ycbcr and HSV color spaces.

3.3. Segmentation-This is the second step where system uses Adaptive k means clustering technique. It refers to partitioning of an image into region so as to simplify and change the representation of an image into more meaningful easier way to analysis. It's a fully automatic way to cluster an input color or gray image. There is no need to specify no. of clusters or any initial seed value to start iteration. It provides the fast implementation of clustering an image without knowing the no. of clusters.

3.4. Feature extraction- This is the fourth step where for feature extraction colour histogram technique is used. It is very important to analyse and explore the image properly, so the system uses colour histogram which gives the representation of the distribution of colours in an image and suitable for any kind of colour. Due to which the early

detection of disease by investigating the digital image is possible.

3.5. Classifier-This is the last step which provides type of the disease. System uses KNN classifier technique which is a non parametric method for classification and regression. It uses input consist of K closest training samples in feature space. The training examples are vectors in a multidimensional feature space each with class label. It can work in two phases as in training phase it stores the feature vectors and class labels of training samples. In classification phase, K is a user defined constant and an unlabeled vector is classified by assigning the label which is most frequent among the K training samples nearest to that query point. The commonly used distance metric for continuous variables is Euclidean distance. For discrete variables another metric can be used such as Hamming distance. The best choice of K depends on data. Generally larger values of K reduce the effect of noise.

CONCLUSION

Early, detection of skin diseases was either skin segmentation from human body images, or detection of skin diseases from already segmented images. This posses a restriction on detection of diseases from images captured by the camera or already raw captured images.

This method first segment the image to find the skin regions. Finding skin region has to be done accurately, so by using a variety of color spaces for doing the same. The color spaces can include RGB, Ycbcr, and HSV.Once the skin regions are extracted, Feature extraction on the skin region, to extract features relevant to disease detection. Then application to a classifier likes KNN in order to get the classified result of the disease. So a method to detect and classify skin region into disease section has been proposed in order to get a more user friendly and practical system for skin based image processing.

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