A SURVEY BASED ON MEDICAL IMAGE SKIN DISEASE DIAGNOSIS

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Abstract:
The majority of skin diseases nowadays are found in humans, animals, and plants. Infections associated with skin illnesses can happen to people of almost any age. Many illnesses, such as alopecia, ringworm, yeast infections, brown spots, allergies, eczema, etc., have very detrimental effects on the skin and continue to spread over time. So, to prevent these diseases from spreading, it is essential to recognize them at the very earliest stages. This research provided a thorough analysis of the various picture diagnosis methods. The study outlined typical picture diagnosis steps. In the publication, the scholars also listed the features they employed for image segmentation.

Index Terms: Image Processing, Medical Image Diagnosis, Feature Extraction, Segmentation.

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1. Introduction

The largest organ in the body is the skin. An adult's skin has a surface area of about 16,000 cm2, which is about 8% of their body weight. Sunscreen, UV rays, heat rash, itching, sores, dark spots, and other infections can all affect the skin. Skin diseases are just as serious as other serious diseases in general (Roy, 2019; Trabelsi, 2013). WHO says that more than 2 million people have non-melanoma cancer and around 132,000 people have melanoma.

Melanoma is a type of cancer that affects the skin.

Each year, people all over the world get it. So, not all skin diseases are cancerous (melanomas) (Chowdhury, 2016; George, 2016), but some skin diseases are developing as side effects of other chronic diseases. Most of the time, the skin has two layers. The outer layer is called the epidermis and is made up of three types of cells: squamous, basal, and melanocytes. The middle layer is called the dermis. [Hasija, 2017; Manoorkar, 2016] Most skin cancers start in the epidermis.

Fig. 1. The first image is eczema, the second is Melanoma; the third is psoriasis, and finally healthy skin.

There are many different kinds of skin diseases, such as impetigo, pityriasis rosea, erisipelas, nekrolisistoksika epidermal, eczema, psoriasis, acne, warts, vitiligo, tinea corporis, scabies, hives, rosacea, shingles, boiling, cellulitis, cold sores, corns, and shingles.

Most people don't know what kind of skin disease they have or how far along it is. Some skin diseases don't show symptoms for a few months, which lets the disease get worse and spread. This is because most people don't know enough about medicine.

Dermatologists are doctors who specialize in skin problems. Sometimes it's hard for them to figure out what's wrong, and they may need to do expensive lab tests to figure out the type and stage of the skin disease.

With the help of lasers and photonics, medical technology has improved so that skin diseases can be diagnosed much faster and more accurately. But the cost of these tests is still very high and limited.

Dermoscopy images, or pictures of the skin, are used by systems that can find skin diseases automatically. Benchmark skin disease image databases include DermNet [DermNet, 2020], Dermweb [Dermweb, 2010], the International Skin Imaging Collaboration [ISIC, 1979], the HAM10000 [HAM10000, 2020], etc.

1. Steps of Image Diagnosis

Pre-processing: The main goal of this pre-processing is to improve the quality of the skin image by getting rid of parts in the background that don't belong there and aren't needed for the next step. The goal of pre-processing is to do three things: improve the image, fix the image, and get rid of the hair.

Feature Extraction: A feature is a piece of information that is needed to solve the computational task that goes with a certain application. The process of getting this information out of an image is called "feature extraction." From skin lesions, you can get the following features: GLCM features, first-order histogram features, dermoscopic features, etc**.**

Segmentation and Analysis: Grouping and Breaking Down Image segmentation is a way to figure out how big and what shape the border is.

Using different features taken from the image, we can separate the object from the background. After the hair and dirt are removed from the lesion area, the lesion needs to be separated from the skin.

The diagnosis is then done using only the necessary areas.

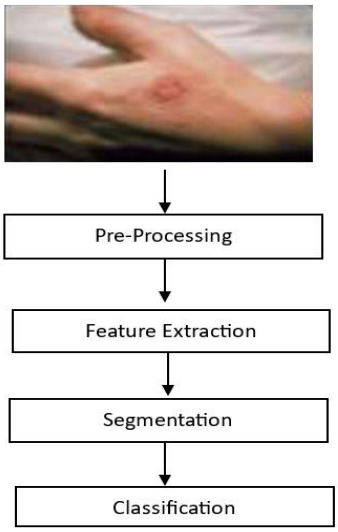

Fig. 2 Steps of image diagnosis.

Feature Classification Classification of Features Certain features are used to identify benign and malignant lesions and put them into groups. This can be done with many different kinds of classifiers. For this, classifiers like SVM and C4.5 can be used.

II. Related Work

Zhong et al. [6] used computed tomography (CT) imaging of the skin in three dimensions to find out if someone had psoriasis vulgaris. The end of the experiment showed that it was very easy to diagnose a Munro's micro abscess in psoriasis vulgaris.
Sumithra et al. [7] used SVM and the k-nearest neighbor (k-NN) classifier to come up with a new way to automatically segment and classify skin lesions.
Yasir et al. [8] came up with an idea for a detection system that could be used on computers or cell phones by using computer vision techniques.

Arivazhagan et al. [9] came up with a plan for an automated system that would use independent component analysis of skin colour images to find diseases on human skin. This system would be based on texture analysis. The different kinds of skin diseases were put into groups using the minimum distance classifier.
Niu et al. [10] did an experiment with a colour image of erythema on the skin. They used the HSV colour space and the fuzzy C-means clustering algorithm. The end of the experiment showed that this method of reducing the number of dimensions could speed up and improve the final segmentation process.

Liu and Guo [11] used computed tomography (CT) to find skin tumours, vascular dermatosis, and psoriasis and figure out what was wrong with the patients. The optical confocal principle, which has been used a lot, is what this method is based on.

Luo et al. [12] diagnosed and named vitiligo using a skin digital image analysis system that they made themselves. It was a good idea to look into the quantitative evaluation method because it was both scientific and fair.

Lu et al. [13] sorted smooth pixels by using two-dimensional digital image segmentation, resizing, and Markov random field (MRF). This showed that the grouping was correct. The final results showed that psoriasis can be found and diagnosed well.

Back propagation neural (BPN) network classifier was used by Jaleel et al. [14] to study how to find skin cancer. Salimi et al. [15] showed how to use pattern recognition to put skin diseases into groups. Ganeshkumar and Vasanthi, both 16 years old, looked into how to find melanoma disease by using preprocessing and edge detection.

Kolkur et al. [17] made a new algorithm for recognising human skin that makes it easier to recognise pixels like RGB (red, green, and blue), HSV (hue, saturation, and value), and YCbCr (luminance and chrominance).

Gindhi et al. [18] and Kotian and Deepa [19] looked at the problem of an automated skin disease diagnosis system using image border identification and feature data mining with Matlab software.
Kumar and Singh [20] looked at how images of skin cancer relate to different kinds of neural networks. This skin cancer classification system, which is based on the Matlab Image Processing Toolbox, was then given medical images so that it could be used for training and testing.
EL SALEH et al. [3] say that a deep CNN that has already been trained could be used to diagnose diseases of the skin on the face. First, the images are redone using some pre-processing image methods to make their databank bigger. These pictures come from different places, and their sizes have been changed to fit the system. Once, these pictures were thrown away because they were no longer needed for getting ready or checking. They show that the average person can correctly identify nine skin diseases with an accuracy of 89%, both in the normal skin class and in the non-face class.

Hameed et al. [8] said that an intellectual diagnosis system could help a multi-level skin injury organisation. The projected arrangement is made with a mix of CNN and error-correcting output cyphers SVM. The planned system is set up, run, and checked to put pictures of skin into 5 groups: acne, healthy, benign, eczema, or malignant melanoma. Over 9,000 images from different places were tested. The structures were described by a CNN model that had already been trained. With SVM, the arrangement was correct 87% of the time.

Sawant, et al. [9] focuses on how Tensor flow can be used with MRI to find melanoma in the brain. Melanoma is one of the most dangerous kinds of cancer. MRI is the only way to find out if someone has cancer. ML with an image classifier will be able to quickly find cancer cells in the brain using MRI. This will save valuable time for radiologists and doctors.

1. A Feature of Image Diagnosis

Color Feature The image could be a grid of values for how bright the light is, and each of these values would be a different color [7]. This could be said about the color: Because of this, being able to tell what color an object is is a very important feature, and a low computation cost is an important part of this feature. There are a lot of different kinds of image files, and each one has its own color format. For example, images can have any number of color formats, such as RGB, which stands for red, green, and blue.

Edge Feature: As an image can be thought of as a collection of intensity values that change quickly, the edge, shown in Figure 4, stands out as an important feature. Edge Function: An image can be thought of as a set of values for how bright it is. This feature can be used to find many different kinds of image objects, like roads, buildings, and other similar things [5, 7]. There are several rules, such as Sobel, Prewitt, and Canny, that have been made to effectively show all of the pictures in an image or frame. Canny edge detection is one of the best algorithms for finding all of a picture's edges.
Texture: Texture is a property that lists qualities like smoothness and regularity. Texture can be thought of as how different a surface looks and how strong that difference is. Compared to the paint house model, the texture model takes one more step to complete. The color-based feel options are less affected by changes in lighting than the same on-edge options.

Corner Feature: If the camera is moving, you need to be able to tell the difference between the two frames that are being shown in the image or frame, and the corner feature lets you do that. This keeps the video from shaking. So, in the original text, you can change the size of the window by finding the corner of the two frames and using that information. This function can also be used to find the angles as well as the distance between the object in the two different frames. because they have a purpose in the picture and can be used to find the things that are the main focus.

DWT Feature: It is a frequency domain feature that is used to change the values of pixels in the frequency domain. It has four regions: a flat region; a region with horizontal edges; a region with vertical edges; and a region with diagonal edges [8, 9]. [DWT Feature] Each image was made with a combination of low-pass and high-pass filters.

DCT Feature: This is another thing that can be explained by the frequency domain. Low-frequency values were found in the top left corner of the image matrix. The cosine transformation operation was used to get these coefficients for the feature set. The Discrete Cosine Transmit, or DCT, is an image processing method that is a standard in the industry and one of the most commonly used today. The DCT makes it possible to divide an image into several different frequency bands. This makes it much easier to hide data in the middle-frequency bands of an image. The middle-frequency range is used to hide data because noise and compression don't affect it. Another thing to think about is that the visual frequency region can be found in the low-frequency part of the image. So, embedding is done by putting the least significant bit (LSB) of the pixel in the right place.

Techniques of Image Classification

Region-based segmentation: This segmentation is simple compared to other methods and is also strong against noise [24]. Using criteria that have already been set, it divides an image into different parts based on things like color, power, or entity. Region-based image segmentation is grouped into three principle classifications: region developing, region parting, and region combining.

Edge-based: Based on information about the edges in the images, this type of segmentation refers to a wide range of techniques. This segmentation is based on the edges that edge-recognition administrators find in an image. These edges look for places in the image where the dark level, color, surface, etc. change.

Segmentation is done so that changes in the pixel value don't happen all at once. You may also hear these strategies called edge-based or limit-based strategies. Edge recognition is most often used to find breaks in images with low levels of light. There are many different ways to find an edge, but most of them can be put into two groups: specific search-based and zero-intersection-based [25].

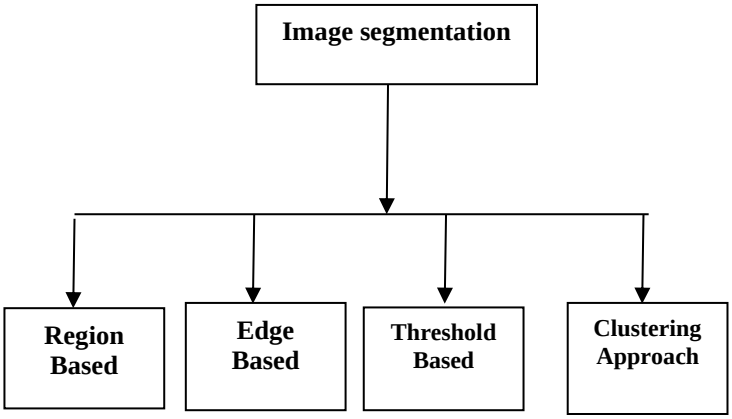

Figure 3: Segmentation Techniques.[24].

Threshold-based segmentation*:* Most of the time, thresholding is used to divide an image [24]. Depending on the choice of edge value, there are two different kinds of limit strategies. Thresholding is an old, simple, and well-known way to divide an image into groups. Limit-based systems divide the image into two groups and try to disprove the idea that pixels with a certain range of pixel values belong to one group and the rest of the pixels in the image belong to the other group. Any pixel (x, y) is a piece of protest if its power is greater than or equal to the limit value, i.e., f(x, y)T. Otherwise, it is a pixel with a place for foundation thresholding, which can be done globally or locally.

Global Threshold*:* Just on gray level values, the nature of the pixel affects both the global limit value and the edge value. The limit segmentation strategy involves techniques. Worldwide thres holding uses a two-segment method to break up the image and choose the limit value. It can also tell the difference between foundation and entity pixels by comparing and Pixels that pass the edge test are called protest pixels and are given the value "1" as a pair. Other pixels are used as foundation pixels and are given the value "0" as a pair. The edge-based segmentation methods are fast to run on a computer, cheap, and can be used in continuous applications with the help of certain tools [24].

Local Threshold: The local edge is based on the info image's normal dark value and power estimation. This method divides the information image into a few sub-areas and picks a different threshold value for each sub-area.

Clustering Approach

Two prevalent techniques for clustering are:

i) K-means clustering: The K-means calculation is a type of unsupervised classification calculation that divides the given data point into multiple classes based on how far apart they are. In k-means calculation, information vectors are put into a set number of groups, and the centers of those groups are introduced randomly at the beginning. The cancroids' sizes are the same as the sizes of the information vectors. The pixels are put into groups based on how close they are to each other. Then, the mean of each group is recalculated. This process is repeated until there are no major changes in the mean of each group or for a set number of cycles [26].

ii) Fuzzy clustering: Fuzzy c-means (FCM) is a way to group data in which an information index is split into n groups and each data point in the dataset has a certain place in each group. Some people think fuzzy classification strategies are better than their hard counterparts because they can talk more naturally about the relationship between the information design and the group. Fuzzy c-means is one of the most effective fuzzy grouping methods. It is more flexible than the hard-grouping calculation most of the time.

2 Conclusion

Given the growing ability to track down and collect copious amounts of sensitive data from many sources of medical equipment, after the completion of various systematic surveys of research papers, experts were found to be required for each type of image's diagnosis. In this work, numerous common methods for image diagnosis are briefly reviewed. Here, several characteristics and their combina tions are discussed in detail. Future research can create a single model that overcomes the dangers and problems discussed in this field.

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