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A Review on Melanoma Skin Cancer Detection Using Digital Image Processing

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Abstract: ***Melanoma, basal cell carcinoma, and squamous cell carcinoma are among the different forms of skin cancers. Melanoma is the most unstable of the melanomas. One of the most serious diseases in humans is malignant melanoma. Doctors can be able to treat patients if they are diagnosed early. Computer vision plays an important role in medical image diagnosis. The identification of melanoma skin cancer is accomplished by digital image processing. Thresholding, Filtering, Feature extraction, Segmentation, and Recognition are some of the techniques used in this. The system will then detect the diseased or cancerous area. A segmentation algorithm that can effectively detect skin melanoma pixels in the information image is needed. The system's input is a dermoscopic image, which is then processed using novel image processing techniques. A series of Dermoscopic Images is used in pre-processing to detect various stages, and the images are filtered using Dull Razor filtering to eliminate hairs and air bubbles in the image. Thresholding techniques are used to identify the region's area, which is then recognized qualitatively and quantitatively.***

Keywords: Skin cancer, Segmentation, Thresholding, Melanoma Detection, Digital Image, Carcinoma, feature extraction.

1. INTRODUCTION

The skin is the body's outermost layer, and it is likely to be exposed to the atmosphere, where it may come into contact with dust, pollution, microorganisms, and UV rays. These may be the causes of any type of skin disease, and skin-related diseases are often caused by gene instability, making skin diseases more complex. The epidermis and dermis are the two main layers of the human skin. The epidermis, or top layer of the skin, is made up of three types of cells: SQUAMOUS cells, which are flat and scaly on the surface, BASAL cells, which are round, and MELANOCYTES, which provide skin color and defend against skin damage [1]. Because the diagnostic classification is correct, predicting the stage of cancer for diagnosis and providing medication to cure the disease is difficult. It is also diagnosed when cancer cells have mutated and spread to other areas of the body [2]. Therapies are unsuccessful at this time. As a result of these problems, skin cancer's percentage has been surpassed by heart-related diseases as the leading cause of death for people of all ages around the world. Skin cancer is the deadliest form of skin disease present in humans, out of all the different types of skin diseases. This is most common in people with fair skin. Malignant Melanoma and Non-Melanoma are the two forms of skin cancer found. Despite the fact that only 4% of the population is affected by malignant melanoma, it is responsible for 75% of all skin cancer deaths. Melanoma can be treated if it is detected or diagnosed in its early stages, and care is provided promptly; but, if melanoma is detected in its later stages, it is likely that it will grow deeper into the skin and affect other areas of the body, making treatment extremely difficult. Melanoma arises as a result of the presence of Melanocytes in the body. Melanoma is caused by skin exposure to UV radiation, which is one of the main causes. Dermoscopy is a procedure for examining the structure of the skin [2.1]. Melanoma can be diagnosed using Dermoscopy images using an observation-based detection technique. The system's diagnosis will assist in speeding up and enhancing the accuracy of the diagnosis. Some detail, such as asymmetry, color variation, and texture features, can be extracted by the computer; however, these minute parameters may not be visible to the naked eye. An automated dermoscopy image analysis system has three stages: (a) preprocessing, (b) proper segmentation, and (c) feature extraction and selection. The most important and critical step is segmentation, which has an effect on the subsequent steps. By taking into account parameters such as shapes, heights, and colors, as well as skin types and textures, supervised segmentation tends to be simple to enforce. This system-based research will speed up diagnosis while also enhancing accuracy [3].

2. LITERATURE REVIEW

In this section, the works carried out by various researchers are as follows:

1. Meenakshi M M [2019]: In this study, a fully automated system for recognizing dermatological diseases through lesion images was developed, using a computer rather than relying on medical personnel. They combined AI algorithms such as Convolution Neural Networks and Support Vector Machines with image processing techniques to construct a better structure, which resulted in

an 85% accuracy [1].

2. M. Chaithanya Krishna [2016]: In this study, Using Image Recognition software, a computer-aided system for detecting Melanoma Skin Cancer. The skin lesion image is fed into the device, which analyses it using novel image processing techniques to determine the existence of skin cancer. By analyzing texture, scale, and shape for image segmentation and feature stages, the Lesion Image Analysis tools search for various Melanoma parameters such as asymmetry, boundary, color, diameter, (ABCD), and so on. The image is categorized as Normal skin and Melanoma cancer lesions using the extracted function parameter [3].

3. VS. Sabeera [2016]: In this paper, the components of a portable real-time non-invasive skin lesion analysis device are proposed to help with melanoma prevention and early detection. The first part is a real-time alarm to help users avoid sunburn; a novel equation to measure the time it takes for skin to burn is thus implemented. The automated image analysis, which includes image acquisition, hair detection and exclusion, lesion segmentation, feature extraction, and classification, is the second part. And the results indicate that the proposed scheme works well, with high classification accuracy [4].

4. Uzma Bano Ansari [2017]: The proposed method of skin cancer detection can be easily implemented using a grey level co-occurrence matrix and help vector machine to classify whether the image is cancerous or non-cancerous, according to this paper. The proposed system has a 95% accuracy score. Compared to the biopsy form, it is a painless and time-consuming procedure. It is more helpful to the patients [5].

5. Preeti Shahi [2018]: To classify the extracted features of the lesions, the author used various techniques such as SVM, KNN, decision tree, and ensemble classifier in this paper. They were able to achieve a precision of 100.0 % using an SVM classifier, while they were able to achieve a lower precision using other classifiers. [10].

6. Vijayalakshmi M M [2019]: The aim of this study is to determine the most accurate skin cancer prediction as well as to identify skin cancer as malignant or non-malignant melanoma. They combined AI algorithms such as Convolutional Neural Networks and Support Vector Machines with image processing techniques to create a better structure, which resulted in an 85% accuracy [9].

7. Akhilesh Kumar [2019]: In this paper, we propose a method for extracting the requisite skin tissue features for detecting Malignant Melanoma. Histological images of skin tissues are used to feed this device. The requisite features are extracted from these images after they have been preprocessed [13].

PROPOSED SYSTEM

The method of detecting the presence of malignant and non-malignant cells in a picture is referred to as skin cancer detection using SVM. The GLCM and Help Vector Machine are used to detect skin cancer (SVM). The Gray Level Co-occurrence Matrix (GLCM) is a technique for extracting image features that can be used for classification. SVM is a type of machine learning technique that is primarily used for classification and regression analysis [4].

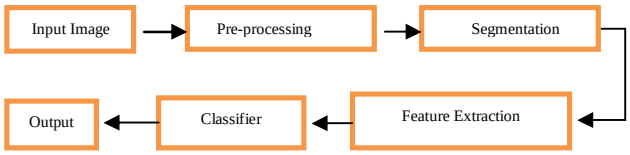

Figure 1: Block Diagram

3. METHODOLOGY

A. PRE-PROCESSING:

The pre-processing of images is an important task or activity which helps in saving time for training as well as provides the clear enhancement for the additional steps by increasing the efficiency of the model. Pre-processing includes the following:

- Collection of the data set
- Hair removal
- Shading removal
- Glare removal

Dataset: The images were gathered from the ISIC dataset, which contains a series of melanoma skin cancer images. The aim of the ISIC melanoma project was to reduce the rising number of deaths from melanoma and improve the efficiency of melanoma early detection. We have obtained 1000-1200 images from this ISIC dataset, which contains approximately 23,000 images.

Hair Removal: Hair removal method was used for the above-collected images. The Hough transform was used to perform this process. The Hough transform is used to define lines, elliptical, and circular shapes. Hair removal for images of hair inside the tumor provides us with a clear image of the tumor, enabling us to make further enhancements. Dull Razor Filtering is used to remove hairs and air bubbles from images, as well as grayscale conversion, noise filtering, and image segmentation using a threshold.

Shading removal: The images taken from the dataset have a haze around the tumor zone, which is dark in some images and bright in others. Removing the shade in the tumor area also gives us a clearer view of the tumor, which is useful for further enhancements.

Glare Removal: When images are taken from a camera, glare can appear. This glare is not visible to the naked eye, so we eliminate it with the Python . However, this minute noise can affect the accuracy in the end.

B. IMAGE SEGMENTATION

The method of segmenting a digital image into multiple segments is known as image segmentation (sets of pixels, also known as image objects). The goal of segmentation is to make an image more meaningful and easier to interpret by simplifying and/or modifying its representation. Objects and boundaries (lines, curves, etc.) in images are usually located using image segmentation. The method of assigning a label to each pixel in an image such that pixels with the same label share certain characteristics is known as image segmentation.

Table 1: Segmentation techniques in skin cancer detection

Segmentation	Techniques
Low-Level	I. Thresholding II. Region Based Approaches III. Edge Based Approaches
High-Level	I. Fusion based segmentation techniques II. Soft Computing Based Approaches III. Deformable Models IV. Other Methods

C. FEATURES EXTRACTION

Features as shape, texture, color, etc. are used to describe the content of the image. Image features can be classified into primitives.

D. CLASSIFIER

SVM: Support-Vector Machines is a supervised machine learning algorithm that is primarily used to categories data into various groups. A hyper plane is used in SVM to serve as a decision boundary between the different groups. SVM can be used to create several separating hyper planes, splitting the data into segments with only one form of data in each segment.

Features of SVM are as follows:

1. SVM is a supervised learning algorithm. This means that SVM trains on a set of labeled data. SVM studies the labeled training data and then classifies any new input data depending on what it learned in the training phase.

2. A main advantage of SVM is that it can be used for both classification and regression problems. Though SVM is mainly known for classification, the SVR (Support Vector Regressor) is used for regression problems.

3. SVM can be used for classifying non-linear data by using the kernel trick. The kernel trick means transforming data into another dimension that has a clear dividing margin between classes of data. After which you can easily draw a hyper plane between the various classes of data.

4. CONCLUSION

In this paper, different classification methods had discussed on the Classification of skin cancer detection. Various techniques in pre-processing, segmentation, feature extraction, and classification process are reviewed and properly explained. This review work is expected to be helpful for researchers, medical practitioners and scientists.

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