

SKIN DISEASE DETECTION BASED ON IMAGE PROCESSING TECHNIQUES

Submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering Degree in
biomedical Engineering

by

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SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

Accredited with Grade "A" by NAAC
JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI – 600119

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **SANTHIP SHANMUGAM.A(39240035)** and **SABARI.K(39240033)** who carried out the Interdisciplinary project entitled **"SKIN DISEASE DETECTION BASED ON IMAGE PROCESSING TECHNIQUES"** under my supervision from December 2021 to May 2022.

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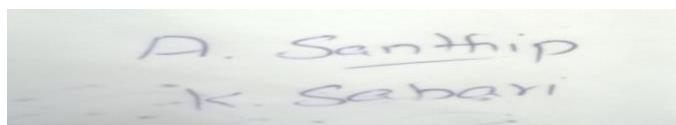
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DECLARATION

We, **SANTHIP SHANMUGAM.A (39240035)** and **SABARI.K (39240033)** hereby declare that the Interdisciplinary Project Report entitled “**SKIN DISEASE DETECTION BASED ON IMAGE PROCESSING TECHNIQUES**” done by under guidance of the **Dr.S.Krishnakumar M.Sc., Ph.D.**, is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in biomedical Engineering.

1)

A photograph of a handwritten signature in blue ink on a white background. The signature reads "A. Santhip" on the first line and "K. Sabari" on the second line.

2)

DATE:
PLACE: CHENNAI

SIGNATURE OF THE CANDIDATE

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ABSTRACT

Skin is the human body's exterior integument. Human skin pigmentation varies from person to person, and skin types include dry, oily, and mixed. The human skin's diversity offers bacteria and other microbes with a diverse home. Melanocytes in the human skin create melanin, which can absorb harmful UV radiation from the sun, causing skin damage and cancer. In most third-world societies, the requisite technologies for early identification of many diseases are still unavailable. If acne, dermatomyositis, candidiasis, cellulitis, Scleroderma, chicken pox, ringworm, eczema, psoriasis, and other skin illnesses are left untreated in their early stages, they can lead to a variety of health issues, including death. The technique of image segmentation aids in the diagnosis of various skin disorders. The goal of this research is to use image processing techniques to diagnose the skin illness from a given image set. Deblurring and noise reduction were performed on the captured image set before it was processed. The disease is detected at the output for a corresponding input image based on the definite pattern (pertaining to a distinct disease) present in the processed image. If acne, dermatomyositis, candidiasis, cellulitis, Scleroderma, chicken pox, ringworm, eczema, psoriasis, Melonama, and other skin illnesses are left untreated in their early stages, they can lead to a variety of health consequences and even death. The technique of image segmentation aids in the diagnosis of various skin disorders. They have taken two classes here. To classify the condition, there are two types of skin: normal and abnormal. Melonama and Acne photos will be processed in the system in the abnormal section.

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CHAPTER-1

INTRODUCTION

In India, skin problems affect roughly 10% to 12% of the population. The skin protects the body while also receiving sensory input from the surrounding environment. It is the largest organ in the human body, with seven layers of ectodermic tissue protecting bones, muscles, and internal organs. Poor hygiene, higher levels of pollution, global warming, and dangerous UV radiation are all factors that contribute to skin problems. A one percent ozone depletion can result in a two to three percent increase in cancers. In India, photosensitive and infectious skin disorders are rather widespread. It is critical to treat them as soon as possible, or else complications may arise that impact not only the skin, but also the mental health and life of the individual in the system. For the following reasons, people require effective solutions: Because India's population is rapidly growing, it is critical to provide effective care to each individual at a faster rate. Skin disorders are analogous to diseases such as tuberculosis, AIDS, and others that are fatal if not treated promptly. The cost of treating even a minor skin illness limits an individual's treatment options. As a result, cost-effective yet efficient methods of skin disease identification are critical. Dermatology is the branch of medicine that deals with the diagnosis and treatment of skin, hair, and nail illnesses, and a dermatologist is a qualified medical expert in this subject. In today's world, computerized systems are used in practically all sectors, including medical and other fields, to replace manual traditional equipment with automated technology. With so many different forms of skin disorders, all modern researchers, particularly in medical science, are looking for a solution that may successfully assist doctors in recognizing a disease at its early stage of diagnosis without wasting a lot of time utilizing modern technology. Digital image processing comes in handy in this situation. Digital image processing is the process of enhancing a digital image by extracting relevant information with the use of computer algorithms. The three main phases of image processing are: importing the image using image acquisition tools; analyzing and manipulating the image; and producing a report or output based on the image analysis. The splitting of an image into discrete parts containing pixels with similar properties is known as image segmentation. It facilitates the examination and interpretation of images in a more straightforward manner. Using several

segmentation techniques, the researchers hope to successfully detect skin illnesses such as ringworm, eczema, chicken pox, and psoriasis. The accuracy of feature measurement aids in determining the picture segmentation outcome. This paper will assist us in determining the most appropriate image processing strategy for detecting the aforementioned skin diseases: (1) Data collection (2) Pre-processing (3) Segmentation (4) Feature extraction and classification The methods described above are applied to photographs of each of the skin disorders using Mat lab Software and Toolbox, and the differences in the outcomes of each dataset are observed.

1.1 Image Processing

Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image. Nowadays, image processing is among rapidly growing technologies. It forms core research area within engineering and computer science disciplines too.

Image processing basically includes the following three steps:

- Importing the image via image acquisition tools;
- Analysing and manipulating the image;
- Output in which result can be altered image or report that is based on image analysis.

There are two types of methods used for image processing namely, analogue and digital image processing. Analogue image processing can be used for the hard copies like printouts and photographs. Image analysts use various fundamentals of interpretation while using these visual techniques. Digital image processing techniques help in manipulation of the digital images by using computers. The three general phases that all types of data have to undergo while using digital technique are pre-processing, enhancement, and display, information extraction.

Digital image processing is the use of a digital computer to process digital images through an algorithm. As a subcategory or field of digital signal processing, digital image processing has many advantages over analog image processing. It allows a much wider range of algorithms to be applied to the input data and can avoid problems such as the build-up of noise and distortion during processing. Since images

are defined over two dimensions (perhaps more) digital image processing may be modeled in the form of multidimensional systems. The generation and development of digital image processing are mainly affected by three factors: first, the development of computers; second, the development of mathematics (especially the creation and improvement of discrete mathematics theory); third, the demand for a wide range of applications in environment, agriculture, military, industry and medical science has increased. Digital Image Processing means processing digital image by means of a digital computer. We can also say that it is a use of computer algorithms, in order to get enhanced image either to extract some useful information. A image is defined as a two-dimensional function, $F(x,y)$, where x and y are spatial coordinates, and the amplitude of F at any pair of coordinates (x,y) is called the **intensity** of that image at that point. When x , y , and amplitude values of F are finite, we call it a **digital image**. In other words, an image can be defined by a two-dimensional array specifically arranged in rows and columns. Digital Image is composed of a finite number of elements, each of which elements have a particular value at a particular location. These elements are referred to as picture elements, image elements, and pixels. A Pixel is most widely used to denote the elements of a Digital Image.

1.1.1Types of an image

- **BINARY IMAGE**– The binary image as its name suggests, contain only two pixel elements i.e. 0 & 1, where 0 refers to black and 1 refers to white. This image is also known as Monochrome.
- **BLACK AND WHITE IMAGE**– The image which consist of only black and white colour is called BLACK AND WHITE IMAGE.
- **8 bit COLOR FORMAT**– It is the most famous image format. It has 256 different shades of colours in it and commonly known as Grayscale Image. In this format, 0 stands for Black, and 255 stands for white, and 127 stands for gray.
- **16 bit COLOR FORMAT**– It is a color image format. It has 65,536 different colors in it. It is also known as High Color Format. In this format the distribution of color is not as same as Gray scale image.

1.2 Machine Learning

Machine learning (ML) is a type of artificial intelligence (AI) that allows software

applications to become more accurate at predicting outcomes without being explicitly programmed to do so. Machine learning algorithms use historical data as input to predict new output values. Recommendation engines are a common use case for machine learning. Other popular uses include fraud detection, spam filtering, malware threat detection, business process automation (BPA) and predictive maintenance. Machine learning is important because it gives enterprises a view of trends in customer behavior and business operational patterns, as well as supports the development of new products. Many of today's leading companies, such as Facebook, Google and Uber, make machine learning a central part of their operations. Machine learning has become a significant competitive differentiator for many companies. Machine learning (ML) is the study of computer algorithms that can improve automatically through experience and by the use of data. It is seen as a part of artificial intelligence. Machine learning algorithms build a model based on sample data, known as "training data", in order to make predictions or decisions without being explicitly programmed to do so. Machine learning algorithms are used in a wide variety of applications, such as in medicine, email filtering, speech recognition, and computer vision, where it is difficult or unfeasible to develop conventional algorithms to perform the needed tasks. A subset of machine learning is closely related to computational statistics, which focuses on making predictions using computers; but not all machine learning is statistical learning. The study of mathematical optimization delivers methods, theory and application domains to the field of machine learning. Data mining is a related field of study, focusing on exploratory data analysis through unsupervised learning. Some implementations of machine learning use data and neural networks in a way that mimics the working of a biological brain. In its application across business problems, machine learning is also referred to as predictive analytics.

1.3 *Types of Machine Learning*

- **Supervised learning:** In this type of machine learning, data scientists supply algorithms with labelled training data and define the variables they want the algorithm to assess for correlations. Both the input and the output of the algorithm is specified.

- **Unsupervised learning:** This type of machine learning involves algorithms that train on unlabelled data. The algorithm scans through data sets looking for any meaningful connection. The data that algorithms train on as well as the predictions or recommendations they output are predetermined.
- **Semi-supervised learning:** This approach to machine learning involves a mix of the two preceding types. Data scientists may feed an algorithm mostly labelled training data, but the model is free to explore the data on its own and develop its own understanding of the data set.
- **Reinforcement learning:** Data scientists typically use reinforcement learning to teach a machine to complete a multi-step process for which there are clearly defined rules. Data scientists program an algorithm to complete a task and give it positive or negative cues as it works out how to complete a task. But for the most part, the algorithm decides on its own what steps to take along the way.

1.3.1 Main Parts of Machine Learning

- **A Decision Process:** In general, machine learning algorithms are used to make a prediction or classification. Based on some input data, which can be labelled or unlabelled, your algorithm will produce an estimate about a pattern in the data.
- **An Error Function:** An error function serves to evaluate the prediction of the model. If there are known examples, an error function can make a comparison to assess the accuracy of the model.
- **A Model Optimization Process:** If the model can fit better to the data points in the training set, then weights are adjusted to reduce the discrepancy between the known example and the model estimate. The algorithm will repeat this evaluate and optimize process, updating weights autonomously until a threshold of accuracy has been met.

1.4 Skin Disease

- Skin disorders are illnesses that affect the surface of your skin. Rashes, inflammation, itching, and other skin abnormalities may be caused by several disorders. Some skin disorders are caused by genetics, while others are caused by lifestyle factors. Medications, lotions, and ointments, as well as lifestyle changes, may be used to treat skin diseases. The big organ that covers and protects your body is your skin. Your skin serves a variety of purposes. It accomplishes the following:
- Prevent dehydration by retaining fluid.
- Assist you in sensing feelings such as temperature and discomfort.
- Prevent the spread of germs, viruses, and other infectious agents.
- Maintain a constant body temperature.
- In reaction to sun exposure, synthesise (produce) vitamin D.
- All problems that clog, irritate, or inflame your skin are considered skin illnesses. Rashes or other changes in your skin's appearance are common symptoms of skin illnesses.

1.4.1 Common Types of Skin Disease

Some skin diseases are minor. Others cause severe symptoms. Some of the most common skin diseases include:

- Acne, which causes oil, germs, and dead skin to build up in your pores due to blocked skin follicles.
- Alopecia areata (hair loss in tiny spots).
- Eczema (atopic dermatitis), a dry, itchy skin condition that causes swelling, cracking, and scaliness.
- Psoriasis is a scaly skin condition that can enlarge and feel hot.
- Raynaud's phenomenon, which causes numbness or skin colour changes by reducing blood flow to your fingers, toes, or other body parts on a regular basis.
- Rosacea, which causes flushed, thick skin and pimples on the face.

- Skin cancer is characterised by the uncontrolled proliferation of abnormal skin cells.
- Vitiligo is a condition in which regions of skin lose their colour.

1.4.2 Causes of Skin Disease

A skin illness can be caused by a variety of lifestyle factors. Your skin may be affected by underlying health issues as well. Bacteria trapped in your pores or hair follicles are common causes of skin problems.

- Thyroid, kidney, or immune system disorders.
- Exposure to environmental stimuli, such as allergens or the skin of another person.
- Genetics
- The presence of fungus or parasites on your skin.
- Anti-inflammatory drugs, such as those used to treat inflammatory bowel disease (IBD).
- Viruses.
- Diabetes and Sun.

1.4.3 Symptoms of Skin Diseases:

Depending on the type of skin illness you have, the symptoms can be rather different. Changes in the skin aren't usually caused by skin illnesses. Wearing ill-fitting shoes, for example, can cause a blister. Skin changes that appear without a known cause, on the other hand, may be linked to an underlying ailment.

Skin illnesses can result in the following symptoms:

- Discoloured skin patches (abnormal pigmentation).
- Skin that is dry.
- Sores, lesions, or ulcers that are open.
- Skin that is peeling.
- Rashes, possibly accompanied by itching or pain.
- Bumps that are red, white, or pus-filled.
- Skin that is scaly or rough

CHAPTER-2

LITERATURE REVIEW

Wei, et al (2018) Skin Disease Recognition Method Based on Image Color and Texture Features. In this paper, three type skin diseases such as herpes, dermatitis, and psoriasis skin disease could be identified by a new recognition method. Initially, skin images were preprocessed to remove noise and irrelevant background by filtering and transformation. Then the method of grey-level co-occurrence matrix (GLCM) was introduced to segment images of skin disease. The texture and color features of different skin disease images could be obtained accurately. Finally, by using the support vector machine (SVM) classification method, three types of skin diseases were identified. The experimental results demonstrate the effectiveness and feasibility of the proposed method.

Sumithra, et al Segmentation and Classification of Skin Lesions for Disease Diagnosis," In this paper, 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 color 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 k-NN.

Kolkur, et al Human skin detection using RGB, HSV and YCbCr Color models. Skin color is often used in human skin detection because it is invariant to orientation and size and is fast to process. A new human skin detection algorithm is proposed in this paper. The three main parameters for recognizing a skin pixel are RGB (Red, Green, Blue), HSV (Hue, Saturation, Value) and YCbCr (Luminance, Chrominance) color

models. The objective of proposed algorithm is to improve the recognition of skin pixels in given images. The algorithm not only considers individual ranges of the three color parameters but also takes into account combinational ranges which provide greater accuracy in recognizing the skin area in a given image.

Kalaifarasi, et al Dermatological Disease Detection using Image Processing and Neural Networks. In this research paper, we provide an approach to detect various kinds of these diseases. We use a dual stage approach which effectively combines Computer Vision and Machine Learning on clinically evaluated histopathological attributes to accurately identify the disease. In the first stage, the image of the skin disease is subject to various kinds of pre-processing techniques followed by feature extraction. The second stage involves the use of Machine learning algorithms to identify diseases based on the histopathological attributes observed on analyzing of the skin. Upon training and testing for the six diseases, the system produced an accuracy of up to 95 percent.

Parikh and Shah, A Survey on Computer Vision Based Diagnosis for Skin Lesion Detection. We propose an automated image based system for recognition of skin diseases using machine learning classification. This system will utilize computational technique to analyze, process, and relegate the image data predicated on various features of the images. Skin images are filtered to remove unwanted noise and also process it for enhancement of the image. Feature extraction using complex techniques such as Convolutional Neural Network (CNN), classify the image based on the algorithm of softmax classifier and obtain the diagnosis report as an output. This system will give more accuracy and will generate results faster than the traditional method, making this application an efficient and dependable system for dermatological disease detection. Furthermore, this can also be used as a reliable real time teaching tool for medical students in the dermatology stream.

CHAPTER-3

AIM AND SCOPE

3.1 OBJECTIVE

- ⦿ To predict skin disease based on the Image Processing.
- ⦿ To increase the accuracy compared to other techniques.

3.2 EXISTING SYSTEM

- ⦿ Rule based approach is used for classification which gives static range value for different classes. Therefore we will not able dynamic images or outlier behavior images.
- ⦿ Features set is not normalize. Therefore different features show different outputs and show different representation during training phase of classifiers.
- ⦿ Classifiers are not able to distinguish feature overlapping. Therefore at learning phase pattern of image is not identified.
- ⦿ Multi classification problem is not optimized and ignore the class imbalance problem. Therefore in learning all classes is not input in learning phase so it became a biased learning.
- ⦿ In the existing method Ada-boost classifier is being used for classification and PCA is used for image segmentation.

3.3 PROPOSED SYSTEM

- ⦿ In our proposed system, to classify the skin disease based on the image processing techniques.
- ⦿ Here, the five steps will be implemented to show the results. They Steps are Datasets collection, Preprocessing, Segmentation, Feature Extraction and Classification.
- ⦿ Datasets collection can be obtained in the normal and abnormal image format of the system.
- ⦿ In Preprocessing, the Gaussian filter method is used to show the results.
- ⦿ In Segmentation, the FCM and Edge detection method is used. In the Feature Extraction part, the DWT and GLCM method is used to show the results.
- ⦿ In the Classification part, the SVM techniques is used to classify the skin disease based on the Image Processing techniques.
- ⦿ Finally, the performance metrics have been obtained to show the results.

3.4 ADVANTAGES

- More Accuracy
- Reduced time consumption
- Classification can be done with much higher accuracy.

CHAPTER-4

SYSTEM REQUIREMENTS

4.1 *HARDWARE REQUIREMENTS:*

- ⦿ Processor Type : Above i3
- ⦿ Speed : 2.4 GHZ
- ⦿ Ram : 4 GBRAM
- ⦿ Hard disk : 20 GB HD

4.2 *SOFTWARE REQUIREMENTS*

- ⦿ Operating System : Windows 10
- ⦿ Software Programming Package : MATLAB R2021.

4.2.1 *BLOCK DIAGRAM*

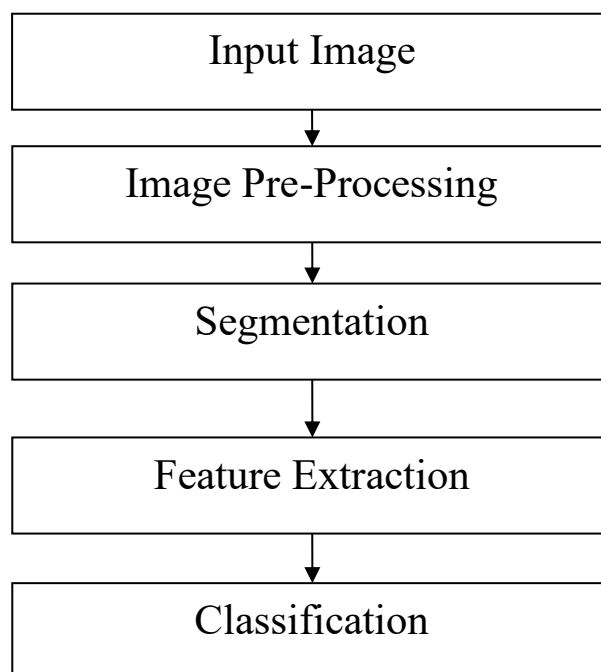


Fig 4.2.1 Block diagram

4.3 MODULES

- ⦿ Input Image
- ⦿ Pre-Processing
- ⦿ Segmentation
- ⦿ Classification
- ⦿ Performance metrics

4.4.1MODULES DESCRIPTION

- ⦿ **Input Image:** A Collection of data is called datasets. Let us consider, Skin disease databases namely, normal and abnormal prediction of the patient. Here, an input data can be obtained in the image format to predict the disease based on the Skin Disease Detection. 2 Classes of data's will be taken based on the Normal and abnormal condition.
- ⦿ **Preprocessing:** Data cleaning, smoothing, grouping or filtering the image. Data can require preprocessing techniques to ensure accurate, efficient, or meaningful analysis. Data cleaning refers to methods for finding, removing, and replacing bad or missing data. Here, the Gaussian method is used in the Preprocessing techniques. A Gaussian filter is used to reduce the noise in the input image of the system.
- ⦿ **Segmentation:** Image segmentation is the process of partitioning a image into multiple segments (sets of pixels, also known as image objects). The goal of segmentation is to simplify or change the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain characteristics. Here, segmentation can be used in the FCM of the system. A FCM is a one type of technique is used to segment the image from the input

data.

- ◎ **Feature Extraction:** Feature extraction involves reducing the number of resources required to describe a large set of data. When performing analysis of complex data one of the major problems stems from the number of variables involved. Analysis with a large number of variables generally requires a large amount of memory and computation power, also it may cause a classification algorithm to overfit to training samples and generalize poorly to new samples. Feature extraction is a general term for methods of constructing combinations of the variables to get around these problems while still describing the data with sufficient accuracy. Here, Feature Extraction method can be obtained in the DWT and GLCM.
- ◎ **Classification:** Classification is a term used both about the process to classify disease based on the normal and abnormal of the patient. A classification process can be obtained to training the network of the system. Here, a classification techniques can be obtained from using SVM model to classify the result of the model. Finally, the performance of the system can be analysed.

4.4 METHODOLOGY

The flow diagram of the present work is shown in Fig1. The methodology filtered with the de-noising filters begins with acquisition of the images followed by image processing and segmentation. In pre-processing, noise reduction is done by using average filter and the segmentation techniques used are -adaptive thresholding, edge detection, k-means clustering and morphology-based image segmentation.

4.4.1 PRE-PROCESSING

Contrast- Contrast enhancement has been applied on the images considered to increase the brightness or sharpness as and when required so that proper information can be obtained from the images. Noise reduction- The images taken into consideration has been filtered with the denoising filter. In most of the cases Salt and pepper noise is present and has been removed with the help of average filter.

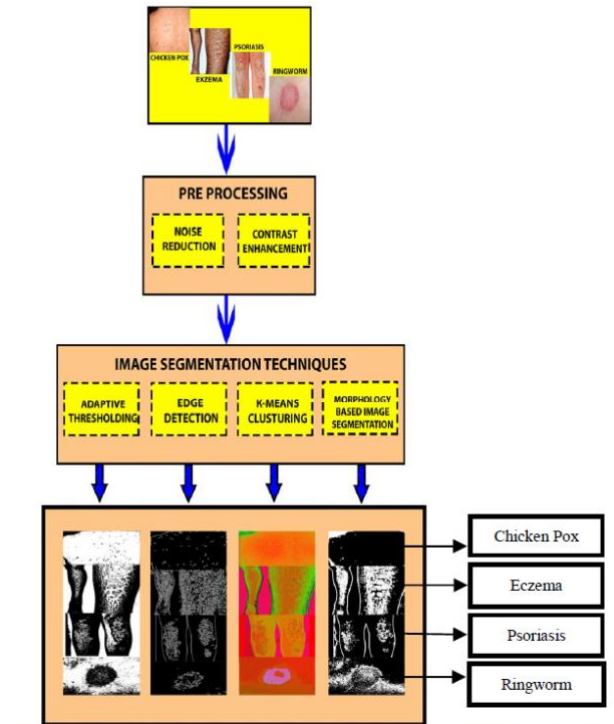


Fig 4.4.1 Pre - Processing

4.4.2 IMAGE SEGMENTATION

A) EDGE DETECTION: -

The filtered image is convolved with the selected operator's gradient with a referential axis. A threshold value is considered and Gaussian filter is used to blur the image and to remove noise and detail. For each pixel co-ordinate the gradient magnitude is computed and then the pixel co-ordinate is shifted to the adjacent co-ordinate. If the gradient magnitude is greater than the threshold value then the respective co-ordinate of the gradient magnitude is denoted as the 'edge'. Primarily the image is converted to the greyscale and then smoothened. Lastly edge detection is done. From our experimental result, ringworm is best detected using edge detection technique. Biologically ringworm is a type of skin infection caused by mould like fungi which lives on the dead skin tissues. The infected region of the skin due to the presence of Moisture and the skin texture is not detected by other segmentation process efficiently. But converting the diseased image to the greyscale and applying

B) Adaptive Thresholding: -

The input image histogram is considered along with its expected background proportion. The intensity and image pixels are noted with the help of which quantile is calculated using where, N is the total number of pixels.....(i)

Two adaptive functions adaptive thresh mean and adaptive thresh Gaussian functions are used to calculate the thresholding value from the image which makes it easier to decide the neighborhood area. If the foreground is found nonempty, then the process is repeated. If the foreground is empty then the pixels at the background are denoted. Chicken pox is best detected by Adaptive thresholding. Separating the desired foreground image from the rest of the background primarily helps us in detecting the entire infected region of this disease while other segmentation methods cannot. In case of K means clustering, the detailing of the affected image is lost due to the presence of clusters while in case Morphology based segmentation and Edge detection the whole infected area is not detected.

C) K-means Clustering: -

A set of data points and a set of centers are considered in the image. Using the elbow method 4 cluster points are considered randomly from the image. The distances between each data point and cluster centers are recorded. Each time different set of data points are considered and the distances are measured. The set of records are compared and the respective set of data points resulting in the minimum distance has been selected. It is seen that Eczema is well distinguished by K means method of segmentation. The patches on the skin due to inflammation and itchiness are generally Referred as Eczema. While comparing the different segmentation process, the swollen region is not efficiently detected using other segmentation processes like in adaptive thresholding the output image becomes too dark and for morphological method the output is found to be losing information from the image.

D) Morphological Segmentation: -

The input image is considered to be a set of data. The resultant set is complemented and structured. Initial points inside the boundary of each structure are recorded. Then union of the complemented and original set of data is determined. From our experimental result Psoriasis was best detected using Morphological based technique.

Psoriasis is a type of chronic skin condition which is caused by an overactive immune system. While using the edge detection process only the edges around the infection skin is detected but the infected region is not efficiently detected. Besides, in K means clustering and adaptive thresholding methods, certain Information is being discarded due to the presence of noise and the resultant output image is blurred

CHAPTER-5

RESULTS AND DISCUSSION

The experimental results are shown below for the input images of the diseases- Chicken Pox, Eczema, Psoriasis, Ringworm and the corresponding obtained output images obtained for the different segmentation techniques used namely Adaptive thresholding, Edge detection K means clustering and Morphological segmentation.

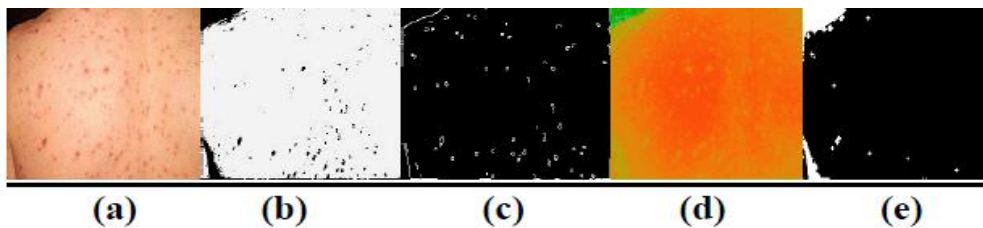


Fig 5.1: (a) Input image (Chicken Pox); (b) Image after Adaptive thresholding; (c) Image after Edge detection; (d) Image after K- means clustering; (e) Image after Morphology based image segmentation

In Fig. 5.1: Chicken Pox affected image is considered and the segmentation techniques are applied. Fig.2 (b) is showing the result of the output segmented image using adaptive Thresholding. 2(b), 2(c), 2(d) and 2(e) are showing the results of edge detection, K-means and lastly the morphological segmentation.

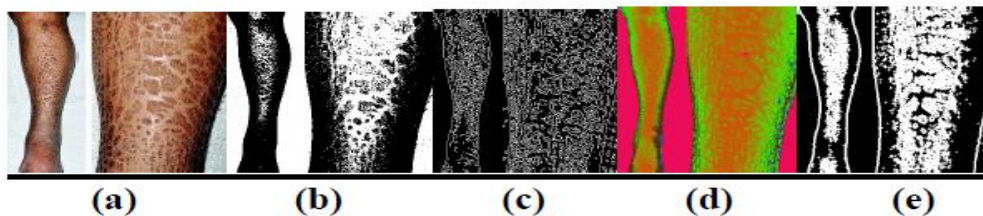


Fig. 5.2: (a) Input image (Eczema); (b) Image after Adaptive thresholding; (c) Image after Edge detection; (d) Image after K- means clustering; (e) Image after Morphology based image segmentation

In Fig 5.2: Eczema affected image is considered and 3(b),3(c), 3(d), 3(e)are the segmented images after Adaptive thresholding, Edge detection, K-means clustering respectively.

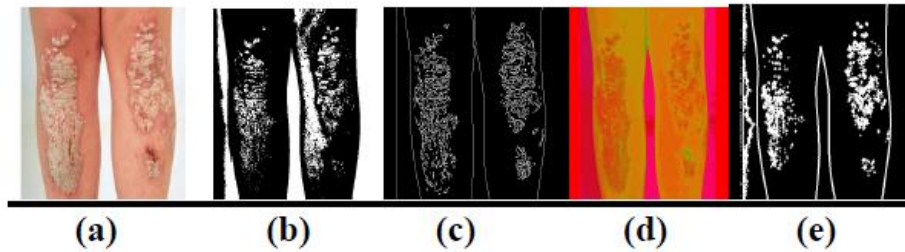


Fig. 5.3: (a) Input image (Psoriasis); (b) Image after Adaptive thresholding; (c) Image after Edge detection; (d) Image after K- means clustering; (e) Image after Morphology based image segmentation

The input image and corresponding output images with respect to the disease Psoriasis is given in Fig. 5.3. The output image after Adaptive thresholding is shown in 4(b), the output image after Edge detection is shown in 4(c); the output image after K-means clustering and Morphology based image segmentation are shown in 4(d) and 4(e) respectively.

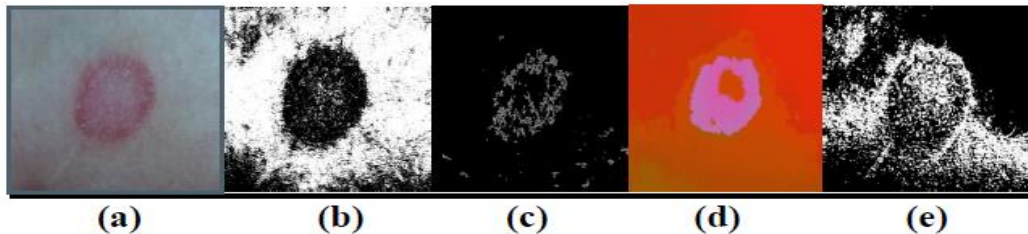


Fig. 5.4: (a) Input image (Ringworm); (b) Image after Adaptive thresholding; (c) Image after Edge detection; (d) Image after K means clustering; (e) Image after Morphology based image segmentation

The input image and corresponding output images with respect to the disease *Tinea corporis* (ringworm) is given in Fig. 5. 5(b), 5(c), 5(d) and 5(e) are showing the corresponding outputs after Adaptive thresholding, Edge detection, K-means clustering and Morphology based image segmentation respectively.

Conventionally, the ratio between the average signal value and the standard deviation of the background is denoted as the SNR ratio. In other words, a Signal to Noise ratio

is Determined as the ratio of the net signal to the RMS Noise .A Root Mean Square Noise is represented as the square root of the mean of variances from the background region. The following table is determined with the help of SNR values of the outputs of the disease infected images using segmentation techniques namely Adaptive thresholding, Edge detection, K-means clustering and Morphology based segmentation to find the results in terms of visibility.

<i>Diseases</i>	<i>Segmentation Techniques</i>			
	Adaptive	Edge	K-means	Morphology
Chicken Pox	19.9684	14.9575	9.9684	14.7455
Eczema	9.1405	7.0314	12.246	7.2193
Psoriasis	7.2082	10.2513	10.7983	13.7961
Ringworm	7.5957	19.2816	10.5685	8.2054

Fig 5.5 Signal to Noise ratio using different segmentation techniques

Hence, from the segmented results obtained from the SNR parameters considered, it can be accounted that Chicken Pox can be best detected by Adaptive Thresholding, Eczema can be best detected by K means clustering, Psoriasis can be best detected by Morphology based image segmentation and Ringworm can be best detected by Edge detection.

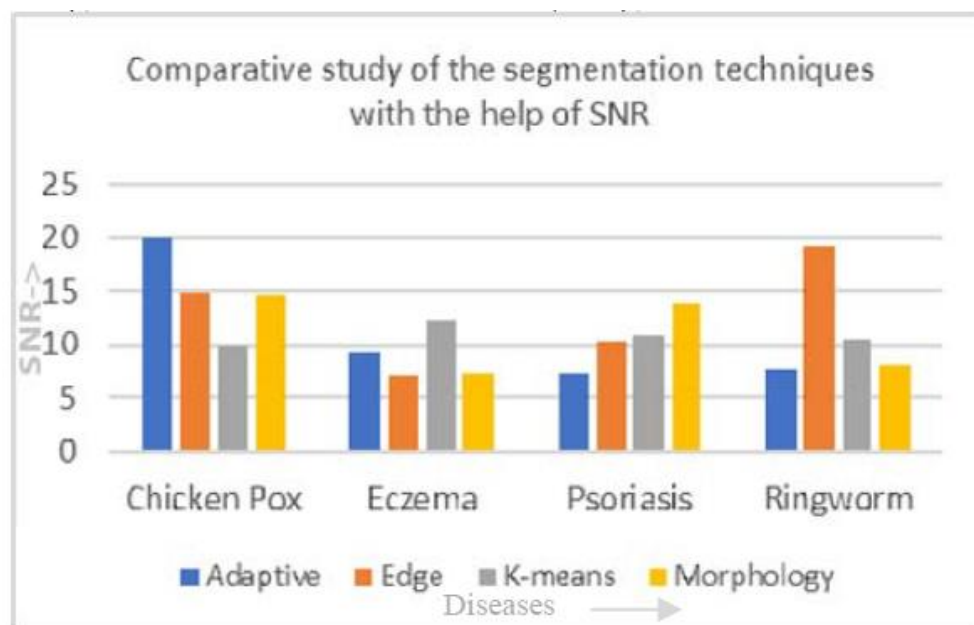


Fig 5.6 Skin disease infected images with respect to signal to noise ratio

CHAPTER-6

SUMMARY AND CONCLUSION

6.1 SUMMARY

We proposed an image processing-based method to detect skin diseases. This method takes the digital image of disease effect skin area, then use image analysis to identify the type of disease. Our proposed approach is simple, fast and does not require expensive equipment other than a camera and a computer.

6.2 CONCLUSION

In this paper, we performed the image processing four segmentation techniques to classify the skin disease to be informative regarding the detailed information relative to the images. The proposed method implemented the Machine learning to show the results. Here, the abnormal condition based on the different disease images, they are Acne and Melonama and Normal skin image. The input image is considered to be a set of data. The resultant set is implemented and structured By using Mat lab Software. It will help us to find the most suitable classification technique of the following to detect the skin diseases. From our experimental result, SVM model is best algorithm to classify the skin infection in the body. Experimental results can be obtained in the performance metrics of our system.

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APPENDIXES

```
clc;
clear all;
close all;
warning off;

%% -----Input Image-----%%
[filename, pathname]=uigetfile('D:\Image Processing Backup\Ushasree-----Skin
disease detection Using Machine learning\Source code\Source code\Datas','.*');
A=imread([pathname, filename]);
figure;
imshow(A);
title('Original Image');
figure;
imhist(A);
title('Histogram-Original Image');
B=imresize(A,[256 256]);
figure;
imshow(B);
title('Resized Image');
figure;
imhist(B);
title('Histogram-Resized Image');
C=rgb2gray(B);
figure;
imshow(C);
title('Conversion Image');
figure;
imhist(C);
title('Histogram-Conversion Image');

%% -----PreProcessing Stage-----
%%
F = fspecial('gaussian');
I1 = imfilter(C,F);
figure;
imshow(I1);
title('Filtered Image');
figure;
imhist(I1)
title('Histogram-Filtered Image');

%% -----Segmentation Stage-----
%%
fim=mat2gray(I1);
level=graythresh(fim);
```

```

bwfim=im2bw(fim,level);
[bwfim0,level0]=fcmthresh(fim,0);
[seg_img,level1]=fcmthresh(fim,1);
subplot(2,2,1);
imshow(fim);title('Original');
subplot(2,2,2);
imshow(seg_img);title(sprintf('FCM1,level=%f',level1));

%% -----Feature Extraction Stage-----
----%%
%DWT (Haar features)
[cA,cH,cV,cD] = dwt2(seg_img,'haar');
cA = mean2(cA);
cH = mean2(cH);
cV = mean2(cV);
cD = mean2(cD);

%% Create the Gray Level Cooccurrence Matrices (GLCMs)
glcms = graycomatrix(seg_img);

% Derive Statistics from GLCM

stats = graycoprops(glcms,'Contrast Correlation Energy Homogeneity');

Contrast = stats.Contrast;

Correlation = stats.Correlation;

Energy = stats.Energy;

Homogeneity = stats.Homogeneity;

Mean = mean2(seg_img);

Standard_Deviation = std2(seg_img);

Entropy = entropy(seg_img);

Variance = mean2(var(double(seg_img)));

a = sum(double(seg_img(:)));

Smoothness = 1-(1/(1+a));

Kurtosis = kurtosis(double(seg_img(:)));

Skewness = skewness(double(seg_img(:)));

% Inverse Difference Movement
m = size(seg_img,1);
n = size(seg_img,2);
in_diff = 0;
for i = 1:m
    for j = 1:n
        temp = seg_img(i,j)./(1+(i-j).^2);
        in_diff = in_diff+temp;
        IDM = double(in_diff);
    end
end
end

```

```

feat_ext2 = [ cA, cH,cV,cD, Contrast,Correlation,Energy,Homogeneity, Mean,
Standard_Deviation, Entropy, Variance, Smoothness, Kurtosis, Skewness, IDM];
save feat_ext2 feat_ext2

```

```

%% -----Prediction Model ----- %%
load feat_ext2.mat
load SVMModel.mat
labels = predict(SVMModel,feat_ext2);
if labels==1
    disp('Normal Skin')
    msgbox('Normal Skin')
elseif labels==2
    disp('Abnormal-Acne Disease')
    msgbox('Abnormal-Acne Disease')
else
    disp('Abnormal-Melanoma Disease')
    msgbox('Abnormal-Melanoma Disease')
end

%% ----- Performance Analysis----- %%
disp('Performance Analysis');
load label.mat
load Result.mat
cp = classperf(label,Result)
accuracy = cp.CorrectRate
sensitivity = cp.Sensitivity
specificity = cp.Specificity

```