

Digital Dermatology - Skin Disease Detection Model Using Image Processing

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ABSTRACT: An approach to skin disease detection method based on image processing techniques. The current digital methods includes a detailed description of the transforms implemented are compared on accuracy parameter. There are many reasons that cause problems in skin it includes carelessness in maintaining the skin, restlessness, usage of some products that may not be adjusted to the skin or due to some infections. Usually changes in climatic conditions gives more impact on the skin leads to some issues. Hence correct maintenance or testing accurately what kind of issues happened in the skin is very important.

Research applies a multivariate statistical analysis to explore the Dermatology Data Set and construct a classifier, based on the clinical features. The patient provides an image of the infected area of the skin as an input to the prototype performed on this image and the detected disease is displayed at the output. it is accessible even in the remote areas and it is completely non-invasive to patient's skin through digital devices. The prevalence of skin diseases in a tertiary care center of Garhwali hills, North India was recorded in 2014 and it was found to vary from 6.3% to 11.2%. Of the total population, 16.7% were affected by acne, 3.4% by psoriasis, 3.4% by urticaria, 3.6% by melasma and 3.3% by vitiligo. the proposed is highly beneficial in rural areas where lack of dermatologist specialist. it is a prototype with a data base of six common skin diseases, using which a patient can self-diagnose and get some prior knowledge of their skin disease before consulting a dermatologist. This prototype can be used in mobile hospitals in rural areas. These days everybody is connected through mobile phones. Thus, this prototype can be accessed even in the most remote locations in the country.

KEYWORDS: Dermatology, Multivariate Statistical Analysis, Psoriasis, Acne, Melasma, Urticaria.

I.INTRODUCTION

Dermatology diseases includes common skin rashes to severe skin infections, which occurs due to range of things, such as infections, heat, allergens, system disorders and medications. Fore most common skin disorders are dermatitis. A topic dermatitis is associate current (chronic) condition that causes restless, inflamed skin. There are many reasons that causes some problems in skin, it may include carelessness in maintaining the skin, restless, usage of some products that may not be adjusted to the skin or due to some infections. Usually changes in climatic conditions gives more impact on the skin leads to some issues. Hence correct maintenance or testing accurately what kind of issues happened in the skin is very important to be maintained.

Melanoma is the most serious form of skin cancer. The major diagnostic and prognostic parameters of melanoma are the vertical thickness, three dimensional size and shape and color of the lesion. The other characteristic features of early melanoma are irregularities in the boundary of the lesion and the appearance of non uniform pigmentation with a variety of color. Melanocytic (pigmented) lesions are formed by groups of specialized cells called melanocytes. Under normal conditions melanocytes live in isolation under the epidermis, the top layer of skin, producing a brown pigment called melanin.

Melanin is passed on to keratinocytes that migrate to upper epidermal layers, playing an important role in protecting the skin by absorbing ultraviolet radiation, reducing the incidence of DNA damage. Increasing UV radiation results in an

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Vol. 7, Issue 7, July 2018

increase in melanin production, darkening the skin tone. When melanocytes group together, brown pigmented lesions may become visible on the skin. Such lesions may be benign or malignant [Fig1.1andFig1.2].



Fig 1.1 Skin Cancer



Fig 1.2 Skin Image Data set

Pigmented lesions, known as benign nevi, are typically symmetrical with clean, abrupt edges and may or may not be raised from the surrounding skin.

II. LITERATURE SURVEY

Geographical factors like season and climate also affect. In developing countries, overcrowding and poor hygiene are responsible for spreading of skin diseases. The pattern of skin diseases varies from country to country. Moreover, remote areas are severely affected^[1].

The prevalence of skin diseases in a tertiary care center of Garhwali hills, North India was recorded in 2014 and it was found to vary from 6.3% to 11.2%. Of the total population, 16.7% were affected by acne, 3.4% by psoriasis, 3.4% by urticaria, 3.6% by Melasma and 3.3% by vitiligo^[2].

WHO (World Health Organization) has emphasized the severity of skin diseases in India which accounts for 10 to 12 percent of India's population. There are only 6000 dermatologists present to cater to a population of 121 crore people^[3] and most of these dermatologists are concentrated in the cities. Due to this, rural areas are lacking dermatologists.

The current practices used by dermatologists include biopsy, scrapings, diascopy, patch testing and prick Test which are invasive methods of detection. In patch testing and prick test, the allergen is directly applied to the infected area. The skin might take a long time even several days to react to the allergen^[4].

There are also certain disadvantages of the current image processing techniques used for skin disease detection. The main problem with the median filter is its high computational cost. Also, the software implementation of median filter does not provide accurate results^[5].

III. PROPOSED METHODOLOGY AND DISCUSSIONS

The proposed solution is a prototype with a data base of six common skin diseases, using which a patient can self diagnose and get some prior knowledge of their skin disease before consulting a dermatologist. This prototype can be used in mobile hospitals in rural areas. These days everybody is connected through mobile phones. Thus, this prototype can be accessed even in the most remote locations in the country.

The proposed prototype provides a non-invasive method of skin disease detection where the patient provides a picture of the infected area as an input to the prototype and any further analysis is done on this input image. No pricking or prodding of the skin is required.

Image processing is used to detect skin diseases in humans. It describes the current methods employed for detecting skin diseases, proposes a digital method to detect skin diseases and states the benefits of this method. It also includes a detailed description of the transforms used to implement the proposed method. The transforms implemented are compared on accuracy parameter.

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Vol. 7, Issue 7, July 2018

As can be seen from the two block diagrams, the proposed system consists of two processes: Training and Testing. Training process analyses and performs image processing on the training data base where as the testing process analyses the input image provided by the patient. Before any analysis on the input image is done, image pre-processing is done so that tall images are consistent in desired characteristics. Resolution matching is done on the image so that they are all the same size (128 x 128). 128 x 128 is chosen so that the processing time is less.

1. SYSTEM REQUIREMENTS:

MAT LAB (Matrix Laboratory) is a numerical getting ready state and fourth age programming tongue. Made as a result of Math Works, its licenses compose of controls, plotting of cut off points and information, use of user interfaces, calculations and integration with programs written in different languages, comprising FORTRAN, C, C++ and Java. MAT LAB is a savvy system aimed at doing numerical counts.

A. DESKTOP AND DEVELOPMENT ENVIRONMENT:

The underneath fig exhibits the course of action of mechanical assemblies and work places which helps us to use MAT LAB records and limits. A critical quantity of such instruments are graphical user interfaces and consolidates its work territory and Command Window, records, workspace, a charge antiquity, a chief and debugger, diverse reports and code analyser and projects for audit help and chase way and it is cleared up as showed up in the Fig3.

B. GRAPHICS:

The MAT LAB devises extensive work places to show networks, vectors as diagrams, additionally clarifying and printing the charts. It integrates typical state capabilities for 2D and 3D information representation pic-

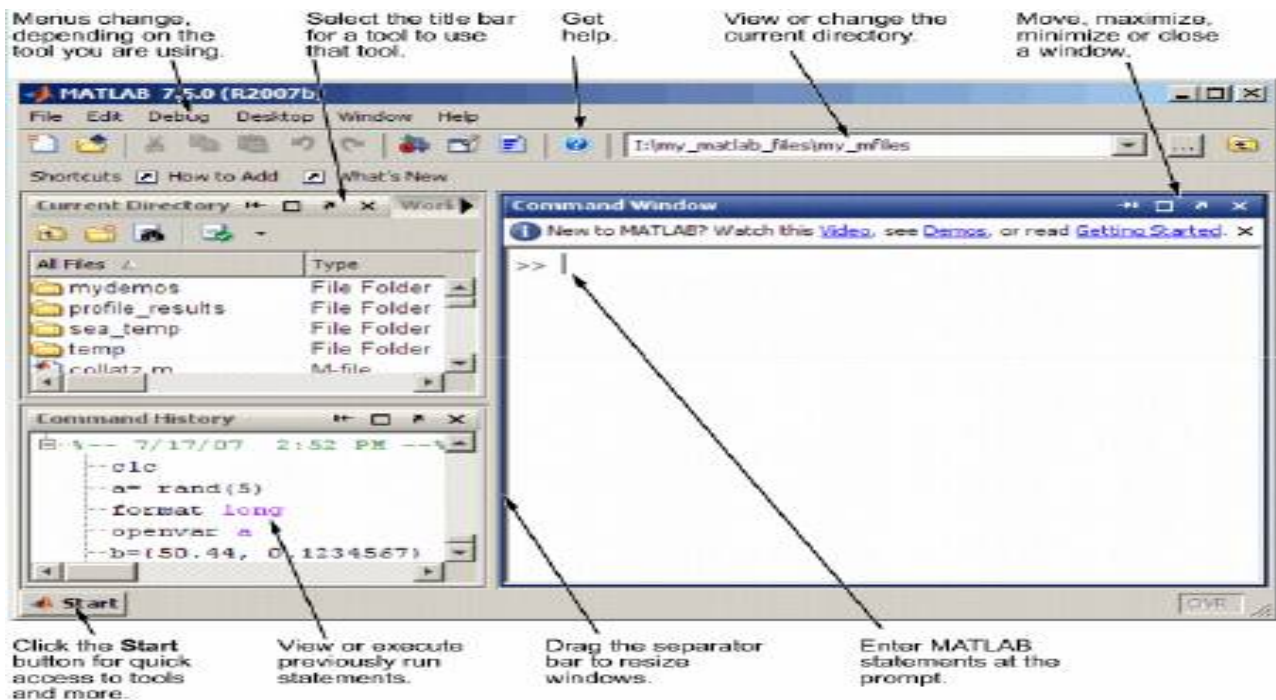


Fig3.1: Desktop Tool and Mat lab Environment.

-ture preparing, designs and activity. The MAT LAB Mathematical Function Library is illuminated as showed up in the Fig3.2.

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(A High Impact Factor, Monthly, Peer Reviewed Journal)

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Vol. 7, Issue 7, July 2018

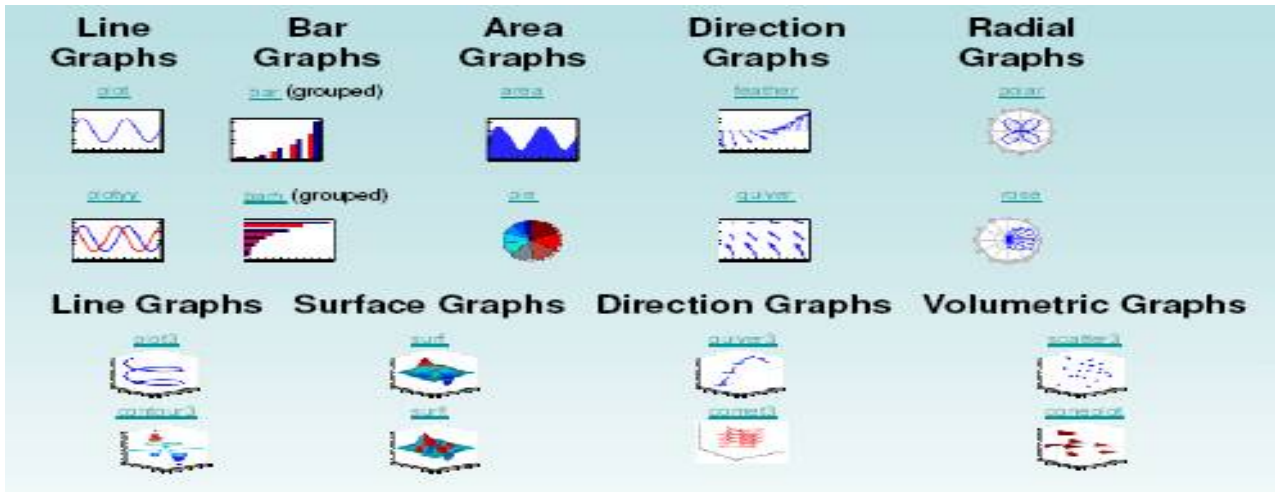


Fig3.2: The MAT LAB Mathematical Function Library.

2. SYSTEM DESIGN:

A. BLOCK DIAGRAM FOR DATA BASE CREATION:

As shown in below Fig 3.3, all required images are trained and stored all features in data base by using appropriate feature extraction techniques and classifiers.

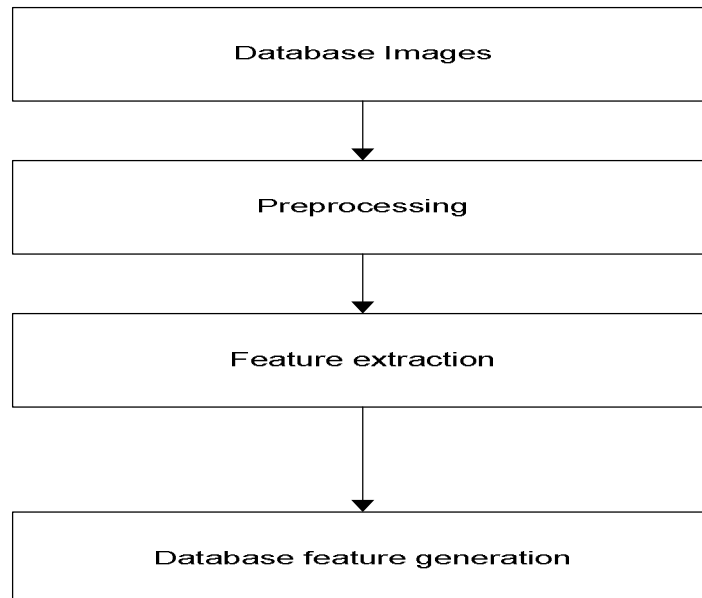


Fig 3.3 Training Phase

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(A High Impact Factor, Monthly, Peer Reviewed Journal)

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Vol. 7, Issue 7, July 2018

B. SYSTEM ARCHITECTURE:

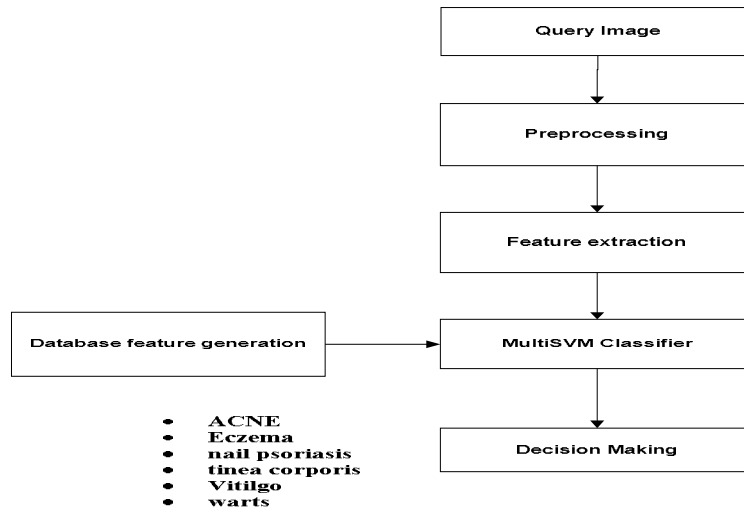


Fig 3.4 System Architecture.

C.DATA FLOW DIAGRAM:

Initially take the image from the user, its the starting of the process. Firstly the image should be enhanced and it is explained as shown in the Fig 3.5.

Enhancement is the process of removing the noise from the images that is the blurriness from the images. once the image enhancements done next feature extraction is performed.

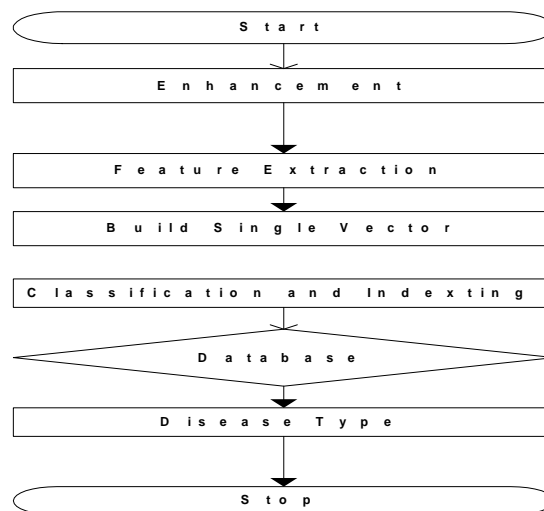


Fig 3.5: Data Flow Diagram.

Feature extraction is process of extracting the features of Color, Shape, Texture features from the images. Once the feature is extracted all the features should be collected together and build it in the single vector. Based on the collection of the features classification and indexing and performed.

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(A High Impact Factor, Monthly, Peer Reviewed Journal)

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Vol. 7, Issue 7, July 2018

Multi SVM Classification enables to classified the features separately based on their characteristics and indexing them enables to identify them easily. Next it is stored in the database. In the data base all the images will be stored whenever we need to retrieved the image query image is given. Initially first it matches the similarity among the query image and existing images in the database. Based on the disease types by referring features results can be retrieved effectively as shown in above diagram.

D. USE CASE DIAGRAM:

Use case diagram is nothing but how the user interacts with the system. In this particular use case diagram the image reading takes place and the Fig 3.6 is explained as:

For converting the image first it takes image from the user and reads the magnetic resonance imaging image. For changing grey Color, the grey scale image here it extracts RGB colours and so it highlighting a Specific change for gray levels done An picture typically is fancied. Provisions grasp upgrading choices similar to a lot for water Previously, satellite agent Also upgrading flaws in portraits.

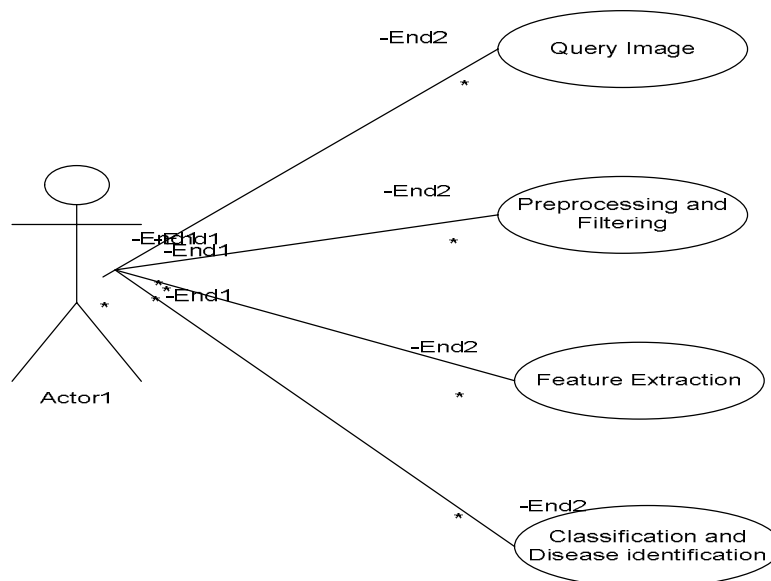


Fig3.6: Query Image.

Next perform Feature Extraction algorithm for grey scale image. In the c-means clustering algorithm it divides the image into a five clusters after dividing the image into five clusters the first cluster represents black color and in the final cluster the defected portion represents white color and the value between the clusters ranges from 0-1. Finally among the cluster we are extracting the second cluster.

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Vol. 7, Issue 7, July 2018

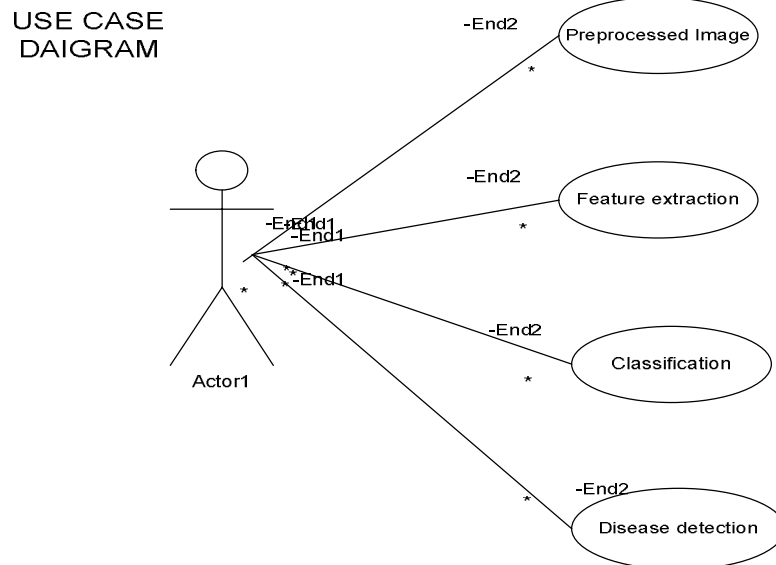


Fig3.7: Feature Extraction.

Firstly, it takes the Skin Diseased image from the user and reads the image and the above Fig 3.7 is explained here. For converting the gray scale image here it extracts RGB colours and then it highlighting a particular scope of dark levels in a picture regularly is wanted. Applications incorporate upgrading highlights, for example, water masses in satellite symbolism and improving defects in x-beam pictures.

Once the Image perusing is finished for the separating of the component, Masking of the info picture is done. Feature extraction is a strategy to locate the important highlights from pictures, which are utilized to comprehend the pictures simpler. This informational collection pictures are changed over into packed frame is called include extraction. User In highlight extraction has three level, they levels are: pixel, neighbourhood and worldwide. The least complex visual picture highlights are specifically in view of the pixel estimations of the image. After finishing of the component extraction we have to gather required highlights like shape and all the gathered highlights are composed and store it in the data base.

Next perform Feature Extraction operation on Testing Images for different diseases here six Feature extraction is a procedure to locate the important highlights from pictures, which are utilized to comprehend the pictures less demanding. This informational collection pictures are changed over in to compacted frame is called include extraction. user In highlight extraction has three level, they are: pixel, nearby and worldwide. The least difficult visual picture highlights are specifically in light of the pixel estimations of the image. After finishing of the component extraction we have to gathered required highlights like shape and all the gathered highlights are sorted out and stored in the database. Finally the testing is improved the situation the inquiry picture in light of the extricated highlights. Finally classification is done based on obtained features and types can be classified.

IV. EXPERIMENTAL RESULTS

1. TESTING

Program testing is an over whelming check and endorsement methodology. Testing incorporates rehearsing the program using data like the honest to goodness data arranged by the program. The nearness of program deserts is understood from sudden system yields. Testing may be done in the midst of the execution stage to check the item continues, as arranged by its fashioner and after the utilization is done. Testing presents a fascinating irregularity for the item outline. In the midst of earlier walks in Design and Implementation, the planner tries to gather programming from

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Vol. 7, Issue 7, July 2018

a hypothetical plan to an unmistakable use. Testing requires that the designer slight suppositions of the exactness of the item just made and overcome a "hostile circumstance" that happens when botches are uncovered.

A. TEST CASES

Test Case ID	STC_02
Description	To check the main tool box of the database
Input	To create choices
Expected Output	Choices created successfully
Actual output	Same as expected
Results And Remarks	Passed

Table4.1 To load images in databases

Test Case ID	STC_03
Description	To create databases for the Images
Input	Loading multiple images
Expected output	Images loaded in database successfully
Actual output	Same as expected
Results And Remarks	Passed

Table4.3 To create database for loaded image

Test Case ID	STC_05
Description	Check for the training dataset
Input	Click on cancel
Expected output	Displays user selected cancel
Actual output	Same as expected
Results And Remarks	Passed

Table 4.5 Test case for invalid image

Test Case ID	STC_02
Description	To check the main tool box of the database
Input	To create choices
Expected Output	Choices created successfully
Actual output	Same as expected
Results And Remarks	Passed

Table4.2 To check the main tool box of database

Test Case ID	STC_04
Description	Training of the images in database
Input	Selecting any Six of own choice
Expected output	Images trained successfully
Actual output	Same as expected
Results And Remarks	Passed

Table4.4 Training of the image

Test Case ID	STC_06
Description	To demonstrate the query image
Input	Select any query image
Expected output	Query and grayscale image is obtained if present in database
Actual output	With Disease
Results And Remarks	Passed

Table 4.6 Test case for query image

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Vol. 7, Issue 7, July 2018

Test Case ID	STC_07
Description	Check for query image if not available in database
Input	Train a query image that is not set in database
Expected output	Error image is not valid
Actual output	Same as expected
Results And Remarks	Passed

Table 4.7 Query image not available in database

Test Case ID	STC_08
Description	To verify the trained images
Input	Select features that then drag and drop to know trained values
Expected output	Feature values is obtained on the editor window
Actual output	Same as expected
Results And Remarks	Passed

Table4.8 Test case for verifying trained features

Test Case ID	STC_09
Description	To verify the test images
Input	Select test feature that then drag and drop to know test values
Expected output	Test values is obtained on the editor window
Actual output	Same as expected
Results And Remarks	Passed

Table 4.9 To verify the test features

Test Case ID	STC_10
Description	To verify the edge features within the query images
Input	Comparing the images on basis of edge feature analysis
Expected output	Edge featured value is obtained on editorwindow
Actual output	Same as expected
Results And Remarks	Passed

Table 4.10 To verify the edge features

Test Case ID	STC_11
Description	Classifier result using MSVM for disease detection
Input	Comparing the images on basis of edge feature analysis
Expected output	Edge featured value is obtained on editorwindow
Actual output	Same as expected
Results And Remarks	Passed

Table 4.11 To Apply Classifier

Test Case ID	STC_12
Description	Type of disease among all six types
Input	Comparing the images on basis of edge feature analysis
Expected output	Edge featured value is obtained on editorwindow
Actual output	Any One among Six diseases
Results And Remarks	Passed

Table4.12 Disease Type Detection

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Vol. 7, Issue 7, July 2018

B. RESULTS AND SNAPSHOTS:

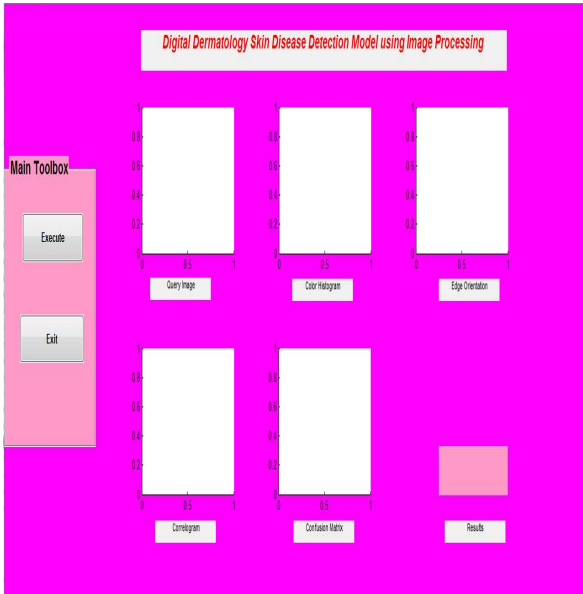


Fig 4.1 Main GUI

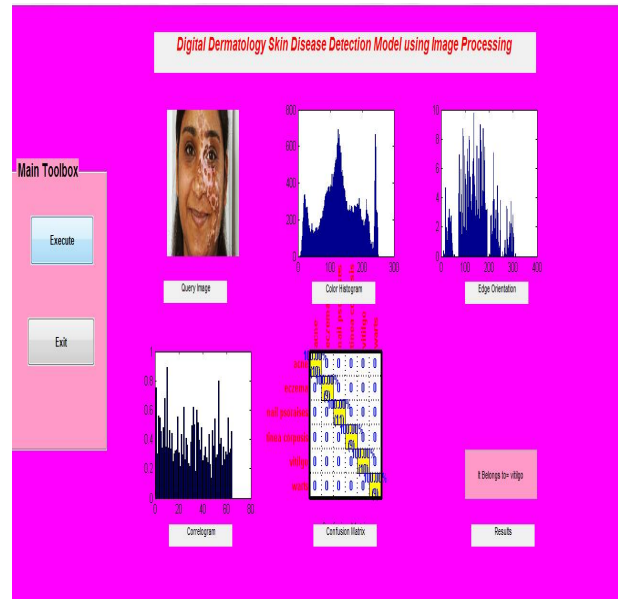


Fig 4.2 Main GUI with Results

Fig 4.2 Shows that by using color histogram and DWT features disease is analysed with accuracy for classification using Multism classifier.

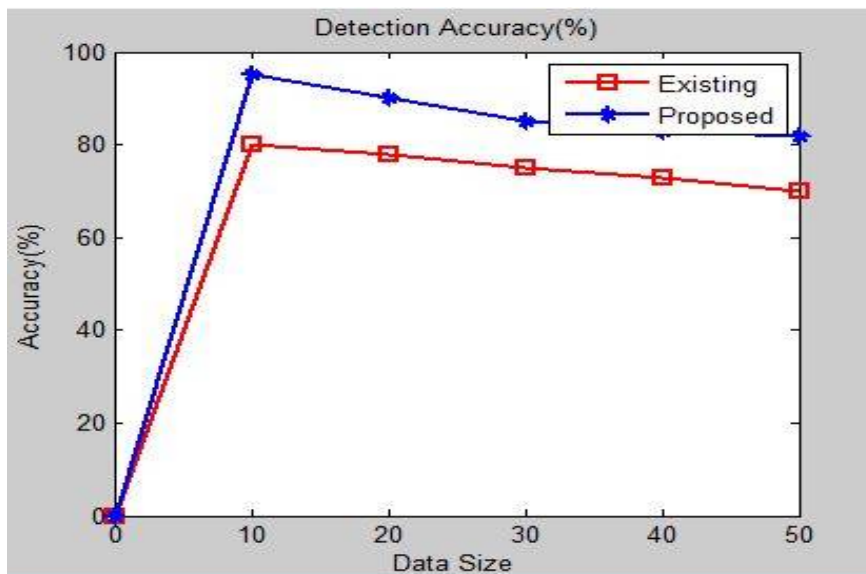


Fig 4.3: Graphical Results

V. CONCLUSION

Skin Diseases being extremely common must be detected at the earliest stage. The proposed system provides a feasible solution for skin disease detection providing up to 80% efficiency. The average training time for the three transforms

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(A High Impact Factor, Monthly, Peer Reviewed Journal)

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Vol. 7, Issue 7, July 2018

and the parallel combination was found to be 2.066 seconds and the average testing time was found to be 0.7866 seconds.

The proposed system offers high-level of classification. From the implementation of the proposed system, it can be concluded that the Laplace filter is powerful tool in edge detection and color segmentation in border stage, and when wavelet transform is used as decomposing, it gives an efficient result in features extraction stage. The statistical measurements (mean, standard deviation, and variance) are useful in texture detection and to reduce the time in process with efficient results, and Multi SVM is very fast in detections because of the topology of this Support Vector and the input values from features extraction stage.

The proposed system is able to detect many types of distributed diseases with many distributed regions closed together and unable to detect the diseases that have distributed regions separated by distance. For Future, multiple methods can be used for accurate detection with secured result analysis.

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BIOGRAPHY

One of the authors **Ms.SHASHI REKHA G**, wish to thank her Guide **Prof.H.SRINIVASA MURTHY**, Department of Computer Science and Engineering, SJCIT, CHICKBALLAPUR and **Dr.SUDARSON JENA**, Department of Computer Science and Engineering, SUIT,ORISSA for their help and Guidance during this Project Work. **Ms.SHASHI REKHA G** also acknowledges the fortunate to have blessings and affection of her parents **GANGADHARAIAM** and **SHANTHI R G**, for their full support and encouragement during this project work.