IOSR Journal of VLSI and Signal Processing (IOSR-JVSP)
Volume 12, Issue 5 (Sep. - Oct. 2022), pp.08-16
e-ISSN: 2319-4200, p-ISSN: 2319-4197
www.iosrjournals.org

A Image analysis System to Detect Skin Diseases

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Abstract: *Skin diseases rate has been increasing for past few decades. Psoriasis is chronic inflammatory skin disease which affects more thgan 3% of population. One of the risk factor in skin cancer is unprotected exposer to UV radiation, which causes various skin diseases. For early diagnosis of skin cancer, psoriasis and dermatophytosis and increases chance for cure significantly. Therefore proposed system used for early prevention and detection named a Image analysis system to detects skin diseases. The image analysis technique where user will able to take skin images of different mole type or rashes type. System will process and analyse the images, which provide notification to user you need medical help. This system provides automatic skin diseases prevention and detection.)*

Keywords: *Enhancement, Segmentation, statistical analysis, Adaboost classifier*.

I. Introduction

1.1 Background and Motivation

Now a day's people are suffering from skin diseases, More than 125 million people suffering from Psoriasis also skin cancer rate is rapidly increasing over last few decades specially Melanoma is most diversifying skin cancer. Dermatophytosis rate is high specially at rural areas.

If skin diseases are not treated at earlier stage, then it may lead to complications in the body including spreading of the infection from one individual to the other. The skin diseases can be prevented by investigating the infected region at an early stage. The characteristic of the skin images are diversified, so that it is challenging job to devise an efficient and robust algorithm for automatic detection of the skin disease and its severity. Skin tone and skin color plays an important role in skin disease detection. Colour and coarseness of skin are visually different. Automatic processing of such images for skin analysis requires quantitative discriminator to differentiate the diseases.

Proposed system is combo model which is used for the prevention and early detection of skin cancer, psoriasis and Dermatophytosis. Basically skin disease diagnosis depends on the different characteristics like color, shape , texture etc. there are no accepted treatment for skin diseases Different physicians will treat differently for same symptoms. Key factor in skin diseases treatment is early detection further treatment reliable on the early detection.

In this paper, Proposed system is used for the diagnosis multiple skin disease using statistical parameter analysis. Statistical analysis is anxious with analysis of random data. Random data is pattern of skin diseases. Standard database is used this data does not have any mathematical expression, it has some statistical properties. To analyses random data we must analyze statistical properties of it.

1.*2 Contribution*

In this paper, we present Image analysis system to diagnosis multiple skin disease using statistical parameter analysis. Statistical analysis is concerned with analysis of random data. This system is combo-model which is to be used to diagnosis multiple skin diseases at a time. The target skin diseases are skin cancer, psoriasis and dermatophytosis. The disease diagnosis and classification is built on statistical parameter analysis. Statistical parameters includes: Entropy, Texture index, Standard deviation, Correlation fact Depending on standard range of parameters skin disease is going to be diagnosis and classified.

1.3 Paper Organization

Paper is ordered as follows: Section II related work. Section III proposed system named image analysis system to detection of skin diseases. Section IV describes the technique for skin disease images classification. In Section V It shows the results of the classification framework. In Section VI It conclude the paper with future work

II. Relegated Work

Skin image identification has become one of the most demanding and attractive research areas in the past few years. Colour histogram based characteristics are used to analyse and classify the psoriasis infected skin images in sequence to take the diagnostic measures [3]. On one hand, this would be useful for dermatologists to decrease diagnostic faults, while on the other hand it can help as the early test bed for patients in rural areas where there is a dearth of good medical professionals. A support Vector Machine with RBF kernel is used for the classification of images. The experimental results gave the encouraging results in an initial attempt for identification of psoriasis infected skin images. Classification of psoriasis skin diseases and their severity will be carried out.

Image processing method is implemented in MATLAB, for skin cancer detection. In this paper, online database of skin cancer images is used for testing the method [4]. Skin images for cancers of different types are obtained from, of these images for BCC (Basal cell carcinoma), SCC (squamous cell carcinoma) and normal or harmless skin lesions are collected and database is created for testing purpose Next step in image processing is de-noising using wavelet tool. To remove low frequency or background noise from image, filtering is used. After de-noising the image, median filtering is applied to remove some hair like material from skin image, if present Thresholding is the simplest and most commonly used method of segmentation. This paper considers use of high-level feature extraction technique by implementing the 2D-DWT as the processing method neural network tool is used for classification of skin images in different skin diseases. Using the features extracted from image, it is classified either in harmful diseased i.e., BCC (Basel cell carcinoma), SCC (Squamous cell carcinoma), or harmless.

Buket D. have worked on real time system for the malignant melanoma prevention and early detection [5]. In this system user is able to analyse captured image. System process the image and shows the notification for medical help. This system shows convincing results and accuracy.

Ho Tak Lau. Have worked on an automatic skin cancer classification [6]. Available image is given to the system and it goes through different image processing procedure. Use full information is extracted from the image and then with the help of training and testing system classifies the image. Recognition accuracy of the neural network classifier is 90%

Fig 1. Sample images from database including melanom, psoriasis and dermatophytosis.

III. Proposed System

In this paper we propose the Image analysis system to detect skin diseases. Our system capture image from standard database and put in to the system to inform the user for preventing the threats linked to skin diseases. More briefly, we present the Image analysis system to detect different skin diseases, where user will able to take images of different moles or skin patches. Our system will analyze and process the image and classifies the image to normal, melanoma, psoriasis or dermo case based extracting the image features. An alert

will be provided to the user to seek medical help if the mole belongs to the atypical or melanoma category. Major components in proposed system flow chart shown in fig2 and Architecture of system is shown in fig 3.
This database includes images of multiple skin diseases. These images are occupied from standard database shown in fig 1. The image database contains a total of 130 images of lesions, including melanoma, psoriasis and dermatophytosis cases.

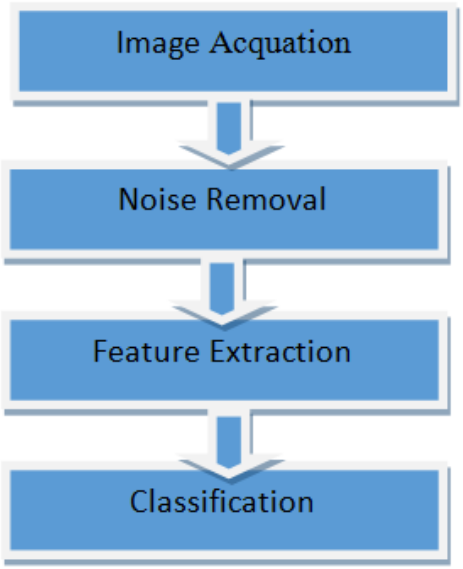

Fig 2. Flow Chart of Proposed Method.

- Image Acquation
- Noise Removal
- Segmentation
- Feature Extraction
- Classification

3.1 Image Acquation

The first stage of our automated image analysis system is image acquisition. This stage is essential for the rest of the system; hence, if the image is not acquired satisfactorily, then the remaining components of the system may not be achievable, or the results will not be reasonable. In this stage first image sytem requires the resized image for the better results. Input image given to the system is in RGB form. But for our proposed system requires gray images. Hence using rgb to gray conversion in MATLAB we convert RGB images in to gray images.

3.2 Noise Removal

It's necessary to have quality images without any noise to get accurate result. Noisy image may lead your algorithm towards incorrect result. Hence it becomes necessary to de-noise the image. Image de noising is an important image processing task, There are many ways to de noise an image. The important for good image de noising model is that it will remove noise while preserving edges. Traditionally, linear models have been used. To de-noise the image we can use median filter. Median filter does the work of smoothening of image.

3.3 Feature Extraction

To get accurate result in biomedical image processing it is always necessary that biomedical image must be of very good quality. However, practically this is not easy. Due to different reasons obtain low or medium quality images. Hence it becomes necessary to improve their quality. To improve the quality of image using image enhancement algorithm. This algorithm enhances the image by focusing on parameters like contrast, brightness adjustment

3.3.1 Statistical Analysis:

Statistical analysis of skin image is supposed to give different statistics such as: Entropy Standard deviation Texture factor correlation factor Depending on this parameter first find out there range for individual skin disease. To find out range of these parameters used for standard skin disease image database.

- We calculate the mean

$$m_I = \frac{\sum_{i=l1}^{l2} I_i(i)}{l2 - l1}$$

- First we calculate the variance with the benefit of sample mean

$$\sigma_I^2 = \frac{\sum_{i=l1}^{l2} (I_1(i) - m_i)^2}{l_2 - l_1}$$

- With the benefit of variance, we calculate the energy of the image I by taking mean square of variance.
- We then calculate the luminance of image with the benefit of RGB components of image I, we calculate the RGB components of image by taking mean of R,G and B components.

$$R_n = \frac{R}{R + G + B}$$

$$G_n = \frac{G}{R + G + B}$$

$$B_n = \frac{B}{R + G + B}$$

$$L = \sqrt{((0.3 * r^2) + (0.587 * g^2) + (0.114 * b^2))}$$

- We calculate sample similarity measurement with the benefit of resized image I2, texture T2, window and luminance L.
- We calculate the standard deviation of image

$$\sigma_i = \sqrt{\sigma_i^2}$$

- We calculate the entropy of the image

$$entropy = -sum\,(p. * log^2(p)).$$

3.5 Classification

In this frame two-level classifiers. At first level it classifies normal or abnormal and second level it classifies in specified category i.e Melanoma, Psoriasis or dermo The first stage of this framework is to perform image processing to detect and exclude the noise, after that the ROI of the skin lesion is segmented. Then, the image features are extracted. Next, the extracted features are fed to the classifier

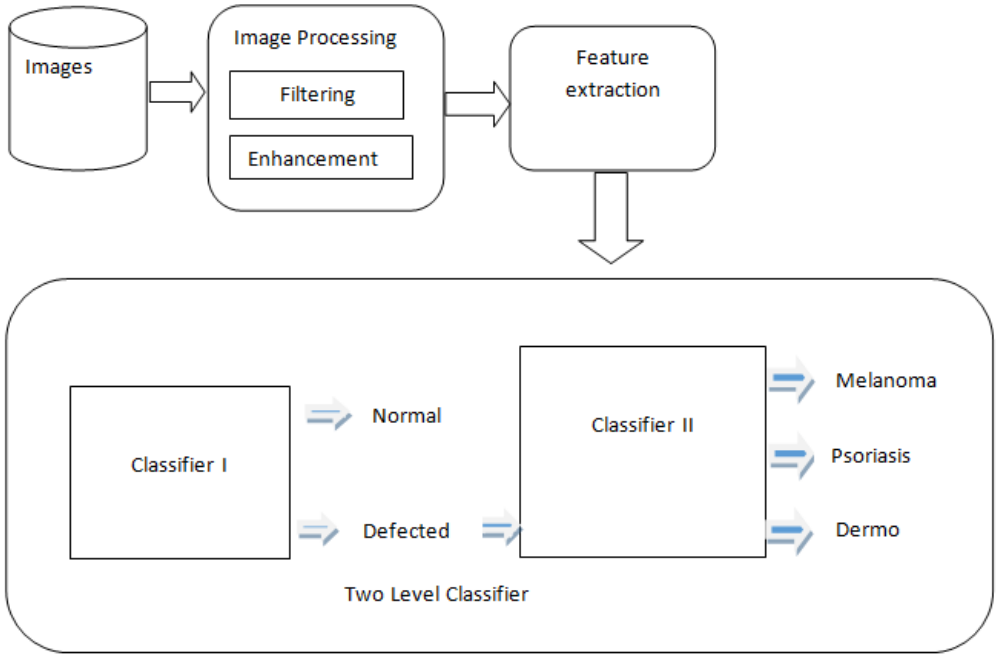

Fig.3. Architecture of proposed method

VI. Result Simulation

In proposed system, we use standard database for the development and testing of proposed system. A framework Proposed system is shown in fig 3. At first stage this framework performs image processing for denoise the image and enhancement the image for statistical analysis. Shown in fig 4. After filtering feature extraction is applied, It calculate the entropy, Standard deviation, texture factor to discover the range of parameters used in image. Table 1 shows the range of statistical parameters of images as per there category. We use two leval classifier to get better results. With the benefit of AdaBoost classifier it correlate the images with deciding the range of correlation by the assistance of mean, standard deviation based on intensity classifier classifies biomedical images.

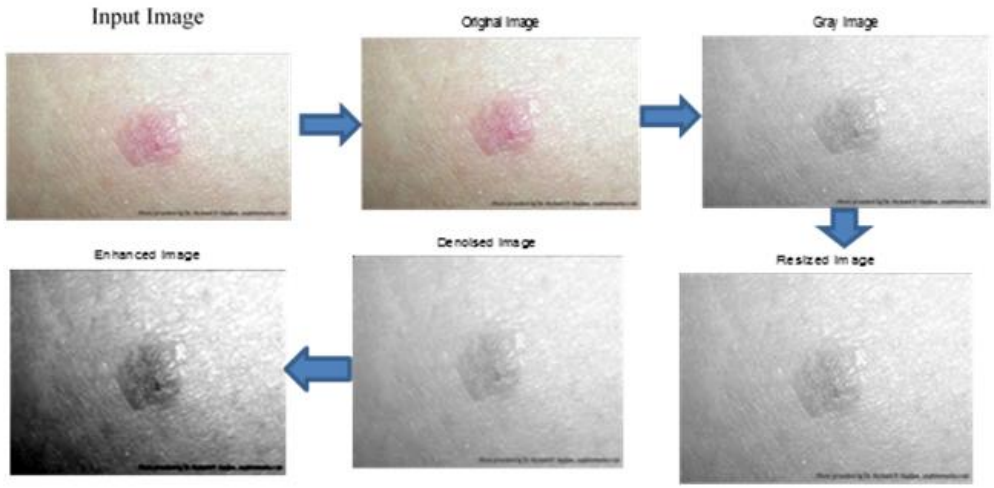

Fig 4. Input image, Filtered image, enhanced image.

Table 1. Results for statistical parameter analysis

	Luminance	Texture	Standard Deviation	Entropy
Psoriasis	200.1013-225.3665	0.1853-0.2404	9.5709-30.91	5.065-6.7293
Melanoma	192.0704- 100.2521	0.2764-0.1645	60.6499-21.1382	7.4575-5.5998
Dermo	151.4497-196.3330	0.2011-0.2733	11.0351-54.5073	5.4555-7.5061
Normal skin	226.8690-244.7091	0.2235-0.2400	4.0219-19.6765	3.6991-5.6361

In the proposed framework as result of adaboost classifier, we can classify the normal, psoriasis, dermo and melanoma images with accuracy of 90% or more. Table II shows results for standard deviation. This automated image analysis module where Image processing module classifies under which category the image falls (Psoriasis, Melanoma and Dermatophytosis).

Fig 5. Result for melanboma.

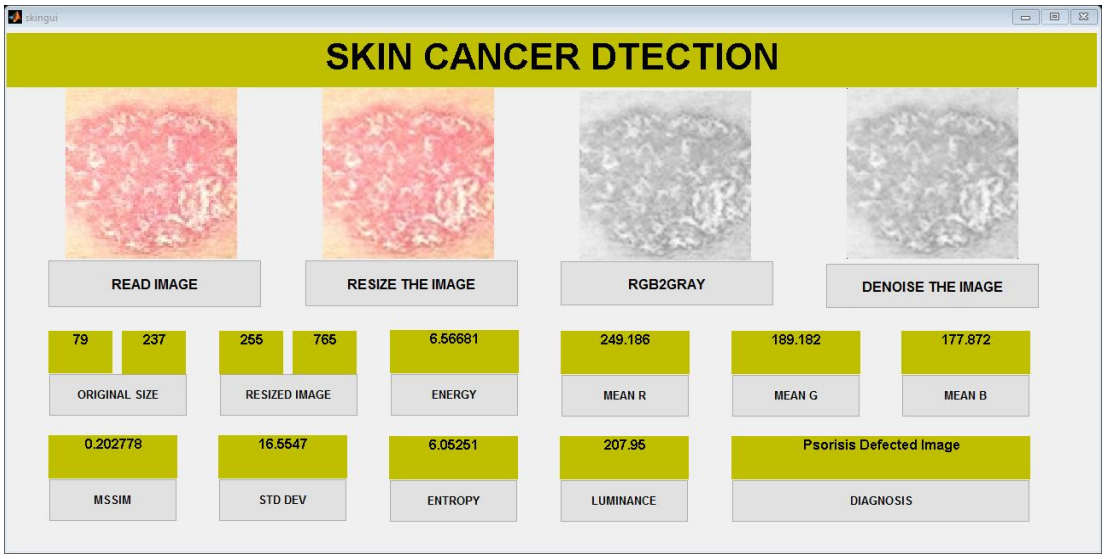

Fig 6. Result for psoriasis

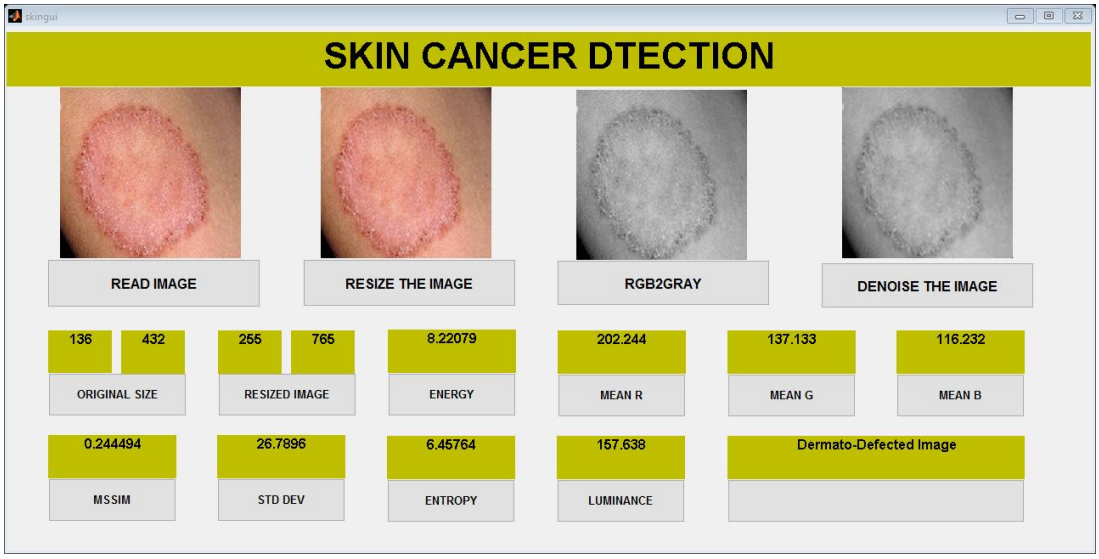

Fig 7. Results for dermo.

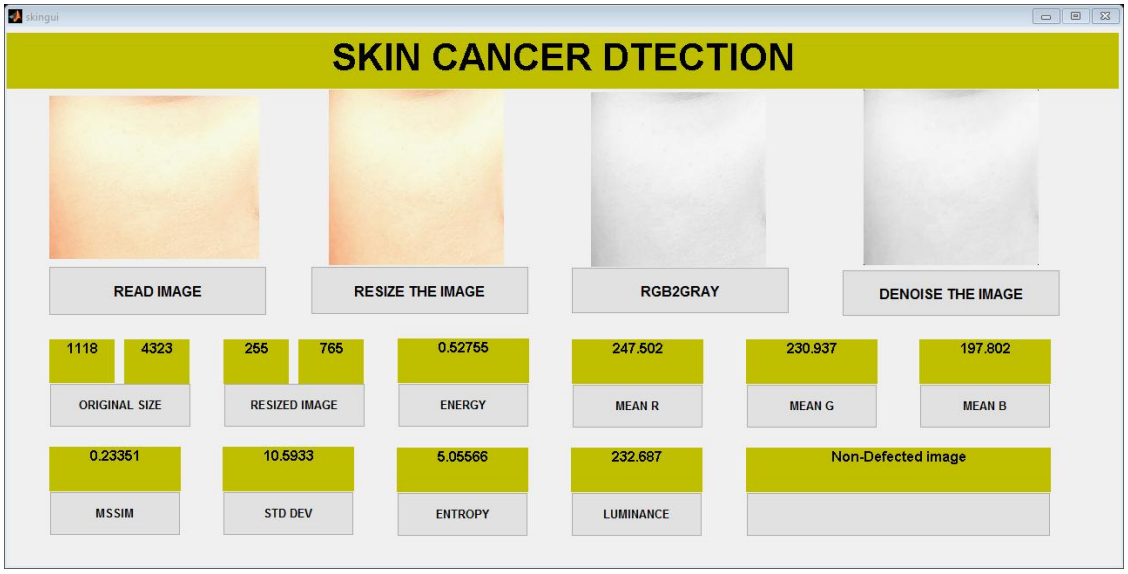

Fig 8. Result for normal skin.

IV. Conclusion

In this paper we present Image analysis system for prevention and detection of skin diseases. Using statistical analysis with correlation algorithm we can diagnosis the multiple skin diseases as well as classify skin disease. Different statistical parameters has been studied amongst them are Entropy, Texture index, Correlation factor has been chosen to find out probability of disease. According to further requirement if necessary statistical parameters can be increased. Outcome of this system is supposed to diagnosis the multiple skin diseases as well as it classifies skin diseases. This future work may reduce the processing time of diffusion speed. That makes system faster.

Acknowledgements

It is my7 pleasure to get this opportunity to thank my beloved and respected guide Prof A. S. Shirsat who improved valuable basic knowledge of Electronics and Telecommunication specially related to Signal Processing domain. We are greateful to Electronics and Telecommunication department of SMTs SKNCOE, vadgaon (Bk), pune for providing infrastructure facilities and more support.

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Table II. Parameters for the melanoma diseases images

Melanoma Image name	Energy	Luminance	Texture	Standard deviation	Entropy
1.	2.1395	111.3409	0.2884	18.3976	5.8905
2.	3.3612	100.2521	0.2764	21.1382	6.2428
3.	6.2569	107.0817	0.2218	59.3111	6.7048
4.	4.6866	131.6434	0.2829	0.2829	6.8299
5.	9.1803	184.2448	0.2048	60.6499	6.4348
6.	14.7339	102.3955	0.1847	45.8963	7.4555
7.	7.8489	157.9357	0.2263	38.7305	6.9676
8.	6.2232	192.0704	0.2238	34.1982	6.1984
9.	17.5618	179.1952	0.2109	54.2302	6.5156
10.	7.8602	132.7504	0.2477	30.2290	6.8447
11.	6.1686	159.4787	0.2350	46.7928	7.2443
12.	4.1057	185.9057	0.2354	28.4909	5.5998
13.	16.3758	132.9732	0.2216	56.0052	7.4575
14.	11.7062	119.5764	0.1799	55.7795	7.3596
15.	16.6170	132.4336	0.2210	56.1507	7.4417
16.	7.1511	137.7104	0.2390	14.1188	5.8422
17.	18.6874	174.3030	0.1645	31.9370	6.8998
18.	6.1526	169.4482	0.2355	29.7860	6.2005
19.	4.1152	149.2433	0.2455	40.4684	6.3816
20.	7.9209	137.3714	0.2191	46.4281	6.7352
21.	21.3086	182.6758	0.2307	52.2923	5.6645
22.	8.6039	154.2731	0.2547	38.6597	6.6992
23.	9.4501	117.4625	0.2291	35.2706	7.0187
24.	7.2039	165.0435	0.2435	33.9218	6.7276
25.	5.3904	168.9671	0.2257	19.1702	5.6177
26.	7.3446	132.4633	0.2153	46.5743	7.3636
27.	3.4853	145.6335	0.2523	33.6139	6.6680

28.	3.8173	128.6231	0.2480	32.4758	6.4711
29.	4.0282	179.5976	0.2380	24.8413	6.3430
30.	4.5983	154.9212	0.2302	34.7408	6.6368
31.	4.3651	164.3595	0.2618	26.8596	6.6779
32.	2.3708	125.1829	0.2707	22.9876	5.9407
Max- min	18.6874**,** 2.3708	**192.0704, 100.2521**	0.2764**, 0.1645**	**60.6499,** 21.1382	**7.4575, 5.5998**

Table III. Parameters for the Psoriasis diseases images

Psoriasis skin images	energy	luminance	texture	Standard deviation	entropy
1	4.3180	222.1059	0.2066	16.7222	6.0351
2	5.7618	205.7455	0.2170	22.8729	6.4621
3	1.9985	224.4457	0.2305	13.8666	5.7231
4	1.6342	200.0955	0.2381	11.4235	5.3957
5	6.5668	207.9505	0.2028	16.5547	6.0525
6	5.6464	211.7912	0.2243	27.7675	6.6865
7	4.0449	207.6458	0.2321	20.0038	6.2242
8	3.9039	225.0790	0.2217	25.1186	6.2018
9	2.2044	222.7065	0.2265	10.8031	5.4017
10	1.0527	208.6775	0.2385	8.4837	4.8725
11	4.0110	224.6513	0.2100	17.3597	5.9935
12.	2.8139	210.1426	0.2310	14.4597	5.7885
13	5.4650	208.7148	0.2109	20.3990	6.2245
14	3.0569	216.3364	0.2172	12.9045	5.6879
15	2.9442	207.0539	0.2293	11.2046	5.4196
16	4.0749	200.1013	0.2250	10.8009	5.4465
17	6.2680	220.5977	0.1853	20.0102	6.0656
18	5.4808	206.2831	0.2051	14.0411	5.8280
19	1.3932	213.2058	0.2404	12.1803	5.5225
20	2.7538	220.6839	0.2293	19.4234	6.2329
21	3.5546	225.3665	0.2194	24.7035	6.1190
22	3.4873	215.3503	0.2203	13.9779	5.7515
23	4.9963	216.7179	0.2183	25.3859	6.4872
24	2.3789	215.2518	0.2209	12.5248	5.6085
25	2.9326	208.0418	0.2380	18.1444	6.1597
26	2.9199	214.3392	0.2295	21.6772	6.2863
27	4.2087	212.0241	0.2325	30.9100	6.7293
28	8.7774	212.7213	0.1861	23.0166	6.4354
29	2.9797	206.1947	0.2203	8.8792	5.1489
30	4.6783	218.9145	0.2076	13.6307	5.7690
	1.0527- 8.7774	200.0955- 225.3665	0.1853- 0.2404	9.5709- 30.91	5.065 - 6.7293

Table IV. Parameters for the dermo diseases images

Dermo skin images	**energy**	**luminance**	**texture**	**Standard deviation**	**entropy**
1.	8.2208	157.6380	0.2445	26.7896	6.4576
2.	2.9190	171.0626	0.2534	21.7858	6.3542
3.					
4.	13.2996	169.0525	0.2436	48.9335	7.5061
5.	9.2580	167.4760	0.2151	31.6206	6.8984
6.	0.9160	170.3948	0.2641	11.0351	5.4555
7.	3.2053	196.3330	0.2305	21.0784	6.2085
8.	3.8366	191.7152	0.2357	18.9532	6.2202
9.					
10.	6.8552	179.0907	0.2645	33.6863	6.7403
11.	26.1018	170.6602	0.2011	35.5133	6.8550
12.	2.7319	184.9130	0.2508	25.3052	6.3360
13.	5.3201	170.0740	0.2320	27.4864	6.5279
14.	4.3678	156.5844	0.2434	20.2846	6.2979
15.	4.3509	192.0466	0.2351	32.0045	6.8368
16.	3.2639	179.2251	0.2423	18.0502	6.0254
17.	3.8865	158.6846	0.2733	23.8142	6.4957
18.	26.1018	170.6602	0.2011	35.5133	6.8550
19.	2.4850	167.9784	0.2516	19.1181	6.1942
20.					
21.	8.3585	151.4497	0.2469	41.2455	7.1662
22.	5.0942	191.5825	0.2328	26.7727	6.7303
23.	4.3486	186.3283	0.2565	26.4227	6.6447
24.	7.0730	157.5391	0.2389	24.8450	6.6186
25.	11.8521	169.0297	0.2318	54.5073	7.4751
Max- Min	0.9160- 26.1018	151.4497- 196.3330	0.2011- 0.2733	11.0351-54.5073	5.4555- 7.5061

Table V. Parameters for the normal skin images

Normal skin images	Energy	**luminance**	**texture**	**Standard deviation**	**entropy**
n1	1.6898	236.8670	0.2328	19.6765	5.5400
n2	0.5275	232.6871	0.2335	10.5933	5.0557
n3	1.6763	228.2365	0.2364	19.4857	5.5212
n4	0.1647	236.0787	0.2320	4.0219	3.6991
n5	0.6509	232.2688	0.2321	8.0032	4.8052
n6	1.1770	226.8690	0.2400	14.1614	5.6361
N7	0.1610	232.8777	0.2335	5.0142	4.2139
n8	0.1579	244.7091	0.2235	6.1332	4.4416
n9	0.3541	232.1566	0.2341	8.2052	4.9067
n10	0.5686	233.3500	0.2319	11.6723	5.1239
	0.1647-1.6898	226.8690-244.7091	0.2235-0.2400	4.0219-19.6765	3.6991-5.6361