

# An Automated Skin Lesion Diagnosis by using Image Processing Techniques

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**Abstract**— The application of image processing for diagnostics purpose is a non-invasive technique. At present there is a great interest in the prospects of automatic image analysis method for image processing, which provides significant information about a skin lesion, also can be more applicable for the clinical purpose, and as an early warning tool for the detection purpose.. In order to accomplish an efficient way to identify skin cancer at an early stage without performing any unnecessary skin biopsies, digital images of skin lesions have been investigated. To complete this goal, feature extraction is considered as an essential-weapon to analyze an image properly. In this paper, different digital lesion images have been analyzed based on unsupervised image acquisition, pre-processing, and image segmentation techniques. Then the Feature extraction techniques are applied on these segmented images. After this, a graphical user interface has been designed for the lesion probability detection and then a comprehensive discussion has been explored based on the obtained results.

**Keywords**— *Skin Cancer, Image Acquisition, Image Segmentation, Feature Extraction, Graphical User Interface, Skin Cancer Detection.*

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## I. INTRODUCTION

Cancer begins when cells in the part of the body starts to grow out of control. A lesion means possibly abnormal change or difference in a tissue or structure such as the skin. Cancer is an uncontrolled growth of abnormal cells. The skin cancer is the uncontrolled growth of skin cells in the body. It develops when an unrepaired DNA damage to the skin cells and mostly caused by ultraviolet radiation of the sun or tanning beds, trigger mutations (genetic defects) which leads to the skin cells multiply rapidly and malignant tumours form. Some skin cancer can spread and cause damage in the nearby tissue cells [1]. Also, in some cases, skin cancer can be on vital organs. Sun is the most common cause of skin cancer. But it fully does not explain that skin cancer usually develop on the skin exposed to sunlight. Also it can be exposed to environmental threats, radiation analysis, and even inheritance could play a role. Although anyone can get skin cancer, the risk is greatest for people having bright skin or bright eyes, a wealth of large, irregular shaped moles, a genetic family history of skin cancer, an excessive sunlight or sunburn, lived in large or with year-round sunshine, received radiation medication [3].

The sign of skin cancer often starts as the change of color in the skin. They are usually mixed color (pink, red, and brown). There are three types of skin cancer that occurred. They are- Basal cell cancer, squamous cell carcinoma and malignant melanoma tumour. The first two does not spread quickly, but the third one spreads quickly. Melanoma is much less common than basal cell and squamous cell skin cancer, but it is far more dangerous than the other two types. However, it is much more dangerous if it is not found early.

It causes the majority (75%) of deaths related to the skin cancer [4]. Worldwide, doctors investigate about 160,000 new cases of melanoma per year. It is mostly common in women than in men. In women, the most common part that the cancer occurs is the legs and in case of men the most common part is on the back. .It is specifically common among Caucasians, and especially north Europeans those who lives in sunny climates. There are high rates of occurrences in Australia, North and South America, and North Europe, also with a disordered decrease in southern Italy and Sicily. This geographic pattern mirrors the primary cause, ultraviolet light (UV) exposure crossed with the amount of skin pigmentation in the population [5]. There can be new growths or precancerous lesions that are not cancer but could become cancer over time. An estimated 40% to 50% of fair-skinned people who live to be 65 will develop at least one skin cancer. Skin cancer can be cured if it's found and treated early. The possible signs of skin cancer include a change in the appearance of a mole or pigmented area. If a mole changes its size, shape, or color, and has irregular edges, and it is having more than one color, also it is asymmetrical, or itches, oozes, or bleeds then there is possibility of skin cancer .The treatment includes surgical removal of the tumour. If melanoma is found early, while it is still small and thin, then the chance of cure is high. The main design issues for the proper characterization of skin lesions of malignant tumour is the image acquisition, the image pre-processing and analysis, the image segmentation , the feature extraction, and the detection [6].

## II. PROPOSED WORK

At first an image is acquired with a digital camera under consistent lighting. The proper interpretation of these dermoscopic images leads to increased clinical diagnostic accuracy. Most Automated Skin Lesion Diagnosis methods adopt the standard computer-aided diagnosis (CAD) pipeline which is illustrated in Fig. 1 below, and it consists of five general stages. After the image is acquired, it contains many artifacts such as hair and oil bubbles which could bias

downstream processes are identified. Next, the lesion is segmented from the surrounding healthy skin. After segmentation, discriminative features are extracted from the lesion. Features which are usually extracted are border, colour, entropy, compactness, radial variance of the mask, coarseness. Finally; by extracting these features the detection is done which finally shows the risk probability of the lesion which is present in the image.

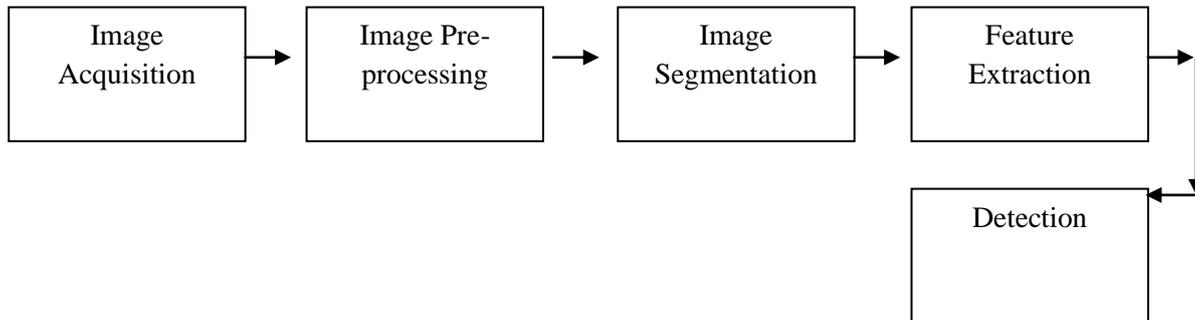


Figure 1: Implementation of CAD pipeline for Automated Skin Lesion Diagnosis

### III. RESULT AND DISCUSSION

The CAD system performance detection is based on the Feature Extracted from the image analyzed. The experimental results are conducted using Matlab7.12.0. For this experiment image database is used from practical lab.



Figure 3.1: Input image

This is an input image taken for the diagnosis purpose.

At first an input image is read and then displayed. The figure is shown below.

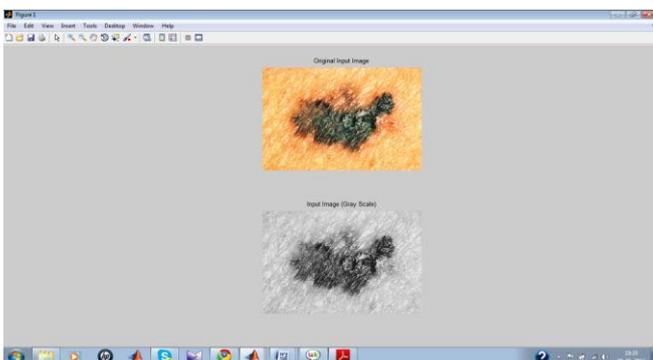


Figure 3.2: Input Image and Input image (Grey Scale)

An Input Image is converted into grey Scale.

Then, after displaying the input image the pre-processing stage is being carried out. Image Pre-Processing is a technique where complete analysis of the pigmented skin lesion is done.

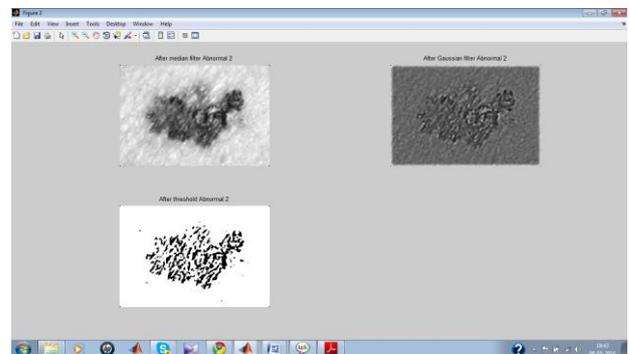


Figure 3.3: Image Pre-processing by Median Filter, Gaussian Filter and Thresholding.

Here, by median filtering the noise reduction is done i.e. the noise which is present is removed. Such noise reduction in pre-processing step is done to improve the results of later processing. And also it preserves edges while removing noise. Then, another filter is applied for pre-processing. And that is Gaussian Filter. By applying this filter constant noise level in dark areas of the image is removed. But as the Gaussian filter is implemented it creates blur. So as such it also gets difficult to analysis a lesion. So due to this effect, this image is further used to create binary image in the form of 0 and 1. And so thresholding process is carried out.

After that Segmentation part is further processed. The figures are shown below.

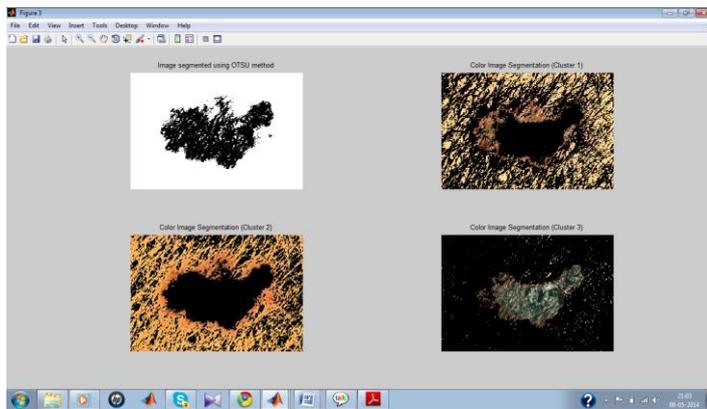


Figure 3.4: Image Segmentation by Otsu Method and Color Image Segmentation Method.

Image Segmentation refers to partitioning of an image into region. Basically the main goal for segmentation is to simplify and change the representation of an image into more meaningful and easier way to analysis. By applying Otsu Segmentation Method it measure the spreading of the pixel levels each side of the threshold, i.e. the pixels that either falls in foreground or background. The aim is to find the threshold value where the sum of foreground and background spreads is at its minimum. The next segmentation method used is Color Image Segmentation. Here three clusters are shown for the proper extraction purpose. As from the three clusters, Cluster 2 gives proper boundary plot, so this figure is referred for further process in the feature extraction stage. Next, comes Feature Extraction part. Here all the relative features are extracted from the image.

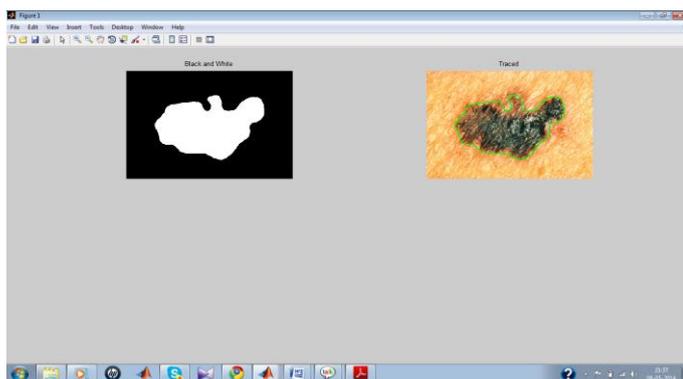


Figure 3.5: Border Selection and Traced

Here from the above figure, it can be seen that the border selection is done from the segmented color cluster 2 and after that a traced mask is drawn.

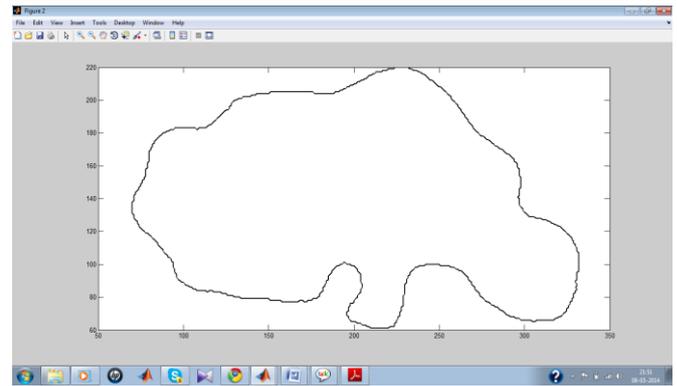


Figure 3.6: Traced Border

Here, the border has been shown with x and y plots.

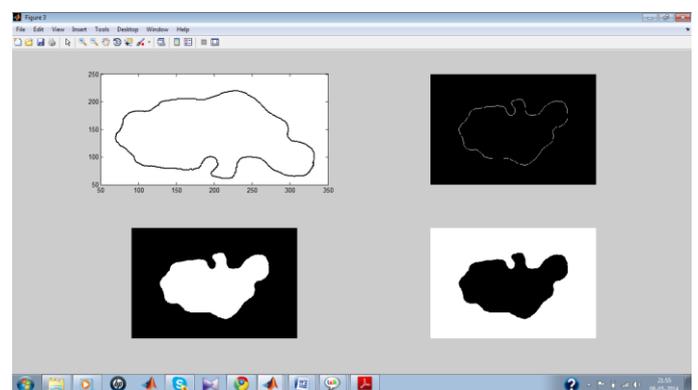


Figure 3.7: New matrix boundary points and Inner boundaries

Here, new matrix boundaries are created to get rid of the other distortions outside the boundary. And the inner boundaries are filled to detect the lesion mask properly. Then, the Geometrical Centre is extracted to determine the coarseness, color entropy, color variance, compactness and GLRLM (grey level run length method).

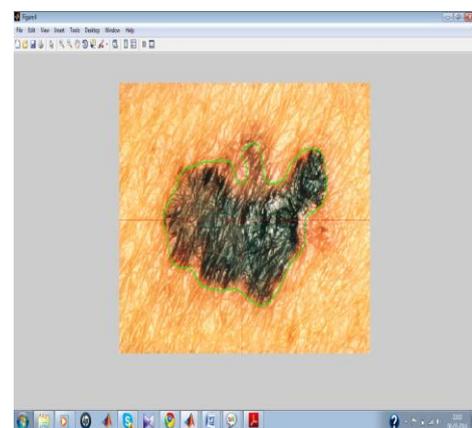


Figure 3.8: Geometrical Centre (color)

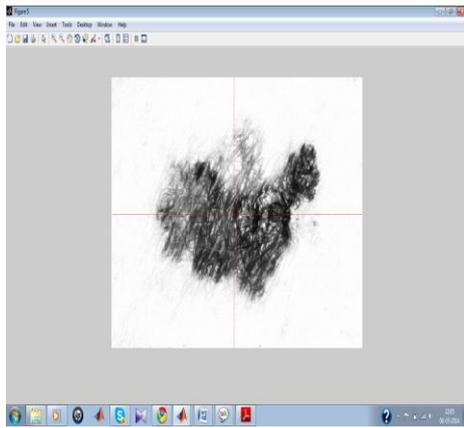


Figure 3.9: Geometrical Centre (Binary image)

Next step is the detection process where a graphical user interface has been created for the detection of the cancer cells. The figure of GUI is shown below:

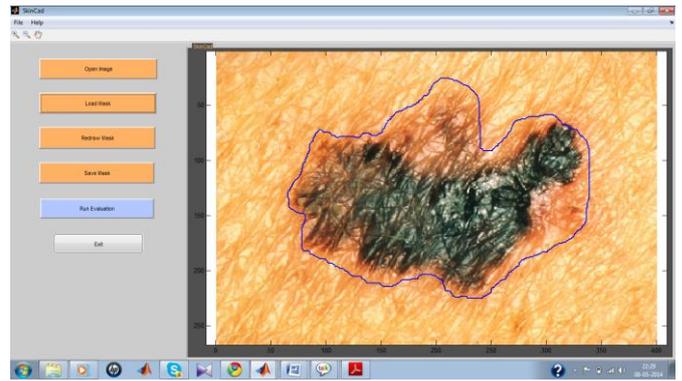


Figure 3.12: Lesion Mask Interface.

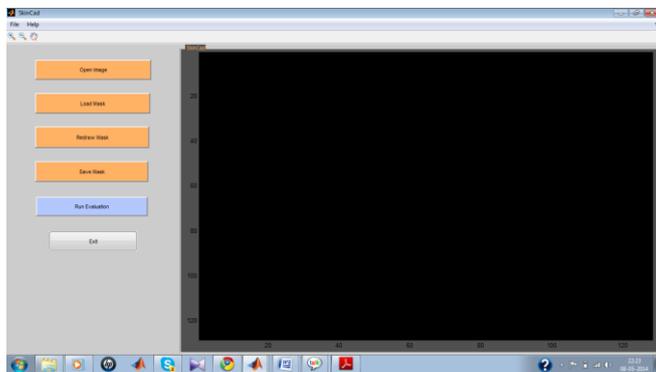


Figure 3.10: Computer aided Diagnosis System

Then, the image will be loaded in the interface. Then, the mask of the lesion will be loaded. And, finally it can be seen that after analyzing the processes, the lesion malignancy probability will be shown. The respective figures are shown below.

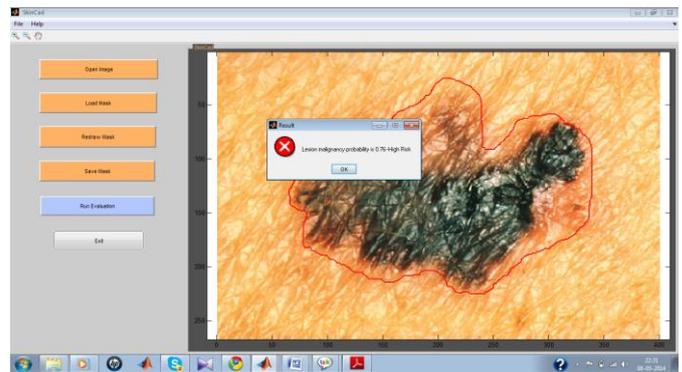


Figure 3.13: Detection Interface.

The risk factor found in the lesion is 0.76 i.e. High Risk. That means the lesion is malignant i.e. Cancerous.

Some sample images have been taken and then analysed for the detection purpose through the graphical user interface.



Figure 3.11: Open Image Interface



Figure 3.14: 1<sup>st</sup> Image



Figure 3.15: 2<sup>nd</sup> Image



Figure 3.16: 3<sup>rd</sup> Image

Samples	1 <sup>st</sup> Image	2 <sup>nd</sup> Image	3 <sup>rd</sup> Image
Lesion Probability	0.29254	0.43497	0.39468
Factors	Benign	Malignant	Suspicious

Table 3.1 Lesion Risk Factors

Thus it is conducted that the detection process of cancerous cells in skin lesion is carried out.

#### IV. CONCLUSION

The different methods have been discussed to find the cancer cells in the skin lesions. The different methods implemented are image acquisition, segmentation, pre-processing, feature extraction and detection methods. Here we use different image feature extraction through image processing methods and they are border, colour, entropy, compactness, radial variance of the mask, coarseness. Based on these features, the risk probability factor of the lesion is shown with the help of computer aided diagnosis system.

#### V. REFERANCES

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