

## Feature Extraction for Skin Cancer Lesion Detection

OMKAR SHRIDHAR MURUMKAR<sup>1</sup>, GUMASTE P.P<sup>2</sup>

<sup>1</sup>PG Scholar Dept of E&TC, JSPMs Jayawantrao Sawant College of Engineering, Hadapsar, Pune, India,  
E-mail: omkarmurumkar@rediffmail.com.

<sup>2</sup>Professor, Dept of E&TC, JSPMs Jayawantrao Sawant College of Engineering, Hadapsar, Pune, India,  
E-mail: p\_gumaste@rediffmail.com.

**Abstract:** The application of image processing in the diagnostic field is non-invasive technique. Automatic image analysis method is the important part of image processing. In medical field the quantitative information about lesion can be achieved by automatic image analysis method. Rather we can consider it as early warning tool which can be used to avoid the future problems during the treatment. To cure any skin disease in early stage the important and basic step is early stage detection of lesion. But the challenging task is to achieve it without performing any penetration in the body as a form of injection. This can be achieved by the analysis of digital images of skin lesions. Feature extraction is the important tool which can be used to analyze and explore the image properly. First different images have been segmented and features are extracted from these images. The proposed system includes the simplest method of segmentation. It does not involve user interaction as well as there is no need to change any parameter for different skin lesions.

**Keywords:** Segmentation, Supervised, Unsupervised, Melanoma, Features, Image Processing, Dermatoscopy.

### I. INTRODUCTION

Human Cancer is a class of diseases characterized by out-of-control growth of cell. Over 100 types of cancer are there. These types are classified by the cell that is initially affected. The uncontrollable growth of cell harms the body by forming lumps or tumors (masses of tissues). These tumors can grow and get in the way of digestive, nervous and circulatory systems. Hormones released by them cause the changes in normal body functions. The types include breast, lung, skin, kidney, etc. Among all types skin cancers are very common in human. They are due to the development of abnormal growth of cells which spread over the other part of body. These are classified in main 2 types: Melanoma and Non-Melanoma. Melanoma skin cancer is most violent or destructive type and more dangerous if not treated early. Non-melanoma skin cancer is very common. It occurs in at least 2-3 million people per year. Globally it accounts at least 40 % of cases. Being more specific it is often observed among those people having light skin. The mortality and morbidity of patients can be reduced by early finding and treatment of skin cancer.

### II. BASIC THEORY

The system consists of two main components: 1) Image Segmentation and 2) Feature Extraction. The system should be able to read the input image and perform the proper segmentation in order to have clear and accurate lesion. Also it should extract the features from the segmented output image. The features are consisting asymmetry, border, diameter and color of lesion as shown in Fig.1.

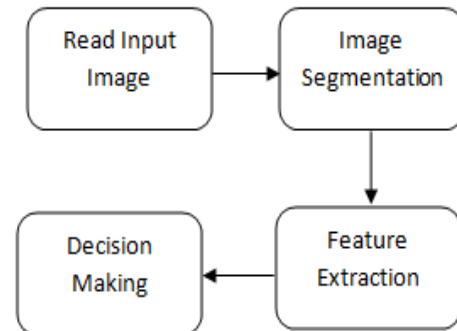


Fig.1. Basic Block Diagram.

#### A. Image Segmentation

In image analysis the segmentation is most important step as it has great effect on accuracy of system. But the main obstacle is great varieties of lesion sizes, shapes and colors. Also different skin types and textures lead to complexity of system. With this lesions having irregular boundaries are also difficult to segment. To account these problems, numbers of algorithms are proposed. These algorithms are classified as thresholding, edge-based and region-based methods. Also based on user interaction or interference these segmentation methods are classified in 2 classes: Supervised and Unsupervised. Supervised methods involve the interaction of user and also in some cases parameters need to be changed. In case of unsupervised method, the user interaction is not required and does not require the change in parameters of skin. The proposed system consists of the Otsu's segmentation method. This is fully unsupervised method. In

this method the input image is divided in two classes and their probability of occurrence is calculated. Based on these probabilities the threshold value is obtained with the help of mean and variance.

### B. Feature Extraction

Early detection of lesion is very important and crucial step in the field of skin cancer treatment. There is a great significance if this will be achieved without performing any penetration in the body as a form of injection. The simple way is to investigate the digital images of skin lesions. Feature extraction is the important tool which can be used to analyze and explore the image properly. The feature extraction is based on the ABCD rule of dermatoscopy. The ABCD stands for Asymmetry, Border structure, Color variation and Diameter of lesion. It defines the basis for diagnosis of disease.

- **Asymmetry:** Symmetry is very useful in pattern analysis. For a symmetric pattern, one needs only one half of the pattern with the axis of symmetry. Pattern can be completed with the help of symmetry in case half part of pattern is noisy or missing.
- **Border Irregularity:** Most of the cancerous lesions are ragged, notched or blurred.
- **Color Variation:** One early sign of melanoma is the emergence of color variations in color. Because melanoma cells grow in greater pigment, they are often colorful depending on production of melanin pigment at different depth in the skins. This pigmentation is not uniform. Thus, the presence of up to six known colors must be detected—white, red, light brown, dark brown, slate blue and black.
- **Diameter:** Melanoma tends to grow larger than common moles, the diameter of 6 mm. Because of the wound are often irregular forms, to find the diameter, draw from all the edge pixels to the pixel edges through the midpoint and averaged.

### III. LITERATURE REVIEW

Research in Skin surface microscopy is started in 1663 by Kolhaus and Ernst Abbe had improved it with the use of immersion oil in 1878. The German dermatologist, Johann Saphier, added a built-in light source to the instrument. Goldman was the first dermatologist to coin the term "dermascopy" and to use the dermatoscope to evaluate the lesions. The basic system of automatic image analysis consists of two main parts 1) Image Segmentation 2) Feature Extraction. The research occurred in both fields and based on that many methods are developed from their combination.

#### A. Snakes, Shapes and Gradient Vector Flow [1]

Snakes are used to locate the boundaries. Use of snakes in image processing has limitation with initialization and poor convergence to boundary concavities. This paper suggests the use of a new external force for snakes, which solves both problems. It is called as Gradient Vector Flow which is computed as a diffusion of the gradient vectors of a gray-level. It differs from traditional snake external forces. Here the object boundary is approximated by the elastic contour, which is initialized by the user in image domain. The elastic contour is then modified by using GVF. The drawback of this

method is its execution speed. It takes a long time to converge to objects. Also it is not fully unsupervised method. The parameters need to be changed while applying it.

#### B. Automated Melanoma Recognition [2]

In this paper, the combination of multiple segmentation methods is used. The many segmentation methods have disadvantage of user interaction to change the parameters. To avoid this, this paper suggests using the different segmentation methods as per its requirement. At last the output of all methods is combined to get the final result. The final result is compared with the lesion border drawn by specialized dermatologist and average border is calculated. The drawback of this method is its computational cost due to use different methods.

#### C. Image Processing for Skin Cancer Feature Extraction[3]

The method proposed in this paper consists of color based image segmentation using K-means clustering. It is divided into two stages. In first, with the help of de-correlation stretching the color separation of image is carried out and later the regions are grouped into set of three classes using K-means clustering. By using region based color separation, the overhead of calculating feature extraction for every pixel is reduced. Although the color is not frequently used for image segmentation, it gives high discriminative power of regions present in the image.

#### D. The ABCD rule of Dermatoscopy[4,5]

In automatic image analysis, the feature extraction is very critical state-of-the-art skin cancer screening system. It based on the ABCD-rule of dermatoscopy. ABCD stands for Asymmetry, Border, Color Variation and Diameter of Lesion. In this paper, this ABCD rule is explained. Four features summarized in ABCD rule of dermatoscopy to final the ABCD score are found to be sufficient for correctly classifying the pigmented lesions. It can be easily learned and rapidly calculated, and has proven to be reliable.

#### E. Comparison of Segmentation Methods for Melanoma Diagnosis in Dermoscopy Images[6]

The image segmentation is the crucial step in the automatic image analysis. There are many methods which can be used for segmentation purpose. In this paper, the author has collected 5 different methods which are Adaptive Thresholding, Adaptive Snakes, EM-Level Set, Fuzzy-Based-Split-and -Merge Algorithm, Gradient Vector Flow. The author has studied respective algorithm and applied it on 100 different images. The best results were obtained by the Adaptive Snakes and EM-LS method. These methods are semi-supervised methods.

### IV. CONCLUSION

Incident rates of melanoma skin cancer have been rising since last two decades. So, early, fast and effective detection of skin cancer is paramount importance. If detected at an early stage, skin has one of the highest cure rates, and the most cases, the treatment is quite simple and involves excision of the lesion. Moreover, at an early stage, skin cancer is very economical to treat, while at a late stage,

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cancerous lesions usually result in near fatal consequences and extremely high costs associated with the necessary treatments. In this paper we discussed the basic system for automatic image analysis and image segmentation which is the most important part that has great effect on system accuracy. Ostu's segmentation method is used by the proposed system which is fully un-supervised and require no user interaction and changes in the skin parameter and hence the most reliable method. Paper also includes the Feature Extraction which defines the basis of diagnosis of disease and is based on the ABCD rule of dermatoscopy. The ABCD stands for Asymmetry, Border structure, Color variation and Diameter of lesion. When a skin lesion is suspected as melanoma, it must go through all four analyses. If the suspected skin lesion go through only the three of these, it might show erroneous results about its being melanoma or not. For this reason, all the four measures have to be considered to decide whether a skin lesion is melanoma or not.

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