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Melanoma Detection Using Support Vector Machine

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Abstract

Skin cancer is a major disease caused by exposure of ultraviolet light. Among the four types of skin cancer as Basal cell carcinoma, squamous cell carcinoma and melanoma, melanoma is most capricious being a fatal disease if not cured in its early stages, such dermatological disease is most difficult to diagnose due to its complexity and subjectivity to manual interpretation. The skin cancer detection technology is broadly divided into four basic components, viz., image pre-processing which includes, de-noise, sharpening, resize of the given skin image, segmentation which is used for segmenting out the region of interest from the given image. In this paper, authors have used k-means segmentation. The classification algorithm used here is Support Vector Machine (SVM) and Convolutional Neural Network (CNN); the latter being used for comparison purpose.

Keyword: *Skin Cancer, Melanoma, SVM, CNN*

I. INTRODUCTION

Skin is outermost region of our body and it is likely to be exposed to the environment which may get in contact with dust, Pollution, micro-organisms and also to UV radiations. These may be the reasons for any kind of Skin diseases and also Skin related diseases are caused by instability in the genes this makes Skin disease more complex. Exposure to UV radiation is also one of the reasons for the cause of melamona. Dermoscopy is a technique, that is used to exam the structure of skin. An observation-based detection technique can be used to detect Melanoma using dermoscopy images. The accuracy of the dermoscopy depends on the training of the dermatologist. The diagnosis that is performed by the system will help to increase the speed and accuracy of the diagnosis. Computer will be able to extract some information, like asymmetry, color variation, texture features, these minute parameters may not be recognized by the human naked eyes. There are 3 stages in an automated dermoscopy image analysis system.

(a) pre-processing
(b) Proper Segmentation,
(c) feature extraction and selection

The segmentation is most important and also plays a important role as it affects further steps in the process. SVM methodology uses digital image processing technique and SVM for classification. This technique has inspired the early detection of skin cancers, and requires no oil to be applied to your skin to achieve clear sharp images of your moles. In this way, it's quicker and cleaner approach. But, most

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importantly, due to its higher magnification, Skin Cancer Detection Using SVM can prevent the unnecessary excision of perfectly harmless moles and skin lesions.

II. LITERATURE SURVEY

In [1], authors Saleh Albali, Nudrat Nida presented a melanoma detection and segmentation approach that brings significant improvement in terms of accuracy against state-of-the-art approaches. As a first step, the artifacts like hairs, gel bubbles, and clinical marks are removed from the dermoscopic images by applying the morphological operations, and image regions are sharpened. Afterwards, for infected region detection, authors used YOLOv4 object detector by tuning it for melanoma detection to discriminate the highly correlated infected and non-infected regions. Lisheng Wei , Kun Ding, and Huosheng Hu proposed a lightweight skin cancer recognition model with feature discrimination based on fine-grained classification principle in [2]. The propose model included two common feature extraction modules of lesion classification network and a feature discrimination network. Firstly, two sets of training samples (positive and negative sample pairs) were given as input into the feature extraction module (Lightweight CNN) of the recognition model. Then, two sets of feature vectors output from the feature extraction module were used to train the two classification networks. Further Loretta Ichim, Dan Popescu described a method in [3] in which the first level contained five classifiers (subjective classifiers): the perceptron coupled with color local binary patterns, the perceptron coupled with color histograms of oriented gradients, the generative adversarial network (for segmentation) coupled with ABCD rule, the Res-Net, and the Alex-Net. Adding on to it, Omar Abuzhagleh, et. al. proposed the two major components of a noninvasive real-time automated skin lesion analysis system for the early detection and prevention of melanoma in [4]. The first component is a real-time alert to help users prevent skin burn caused by sunlight; a novel equation to compute the time for skin to burn is thereby introduced. The second component is an automated image analysis module,

In [5], Ahmad Naeem, mohmad shoaib Farooq provided a systematic literature review of the latest research on melanoma classification using CNN. Authors restrict their study to the binary classification of melanoma. In particular, this research discussed the CNN classifiers and compared the accuracies of these classifiers when tested on non-published datasets. Moreover, Author Hyder Hasan presented a methodology model for the spectral classification of hyperspectral images in [6]. The applied methodology, first extracted neighbouring spatial regions via a suitable statistical support vector machine (SVM-Linear) architecture, support vector machine radial basis function (SVM-RBF) and Deep Learning (DL) architecture that comprises principal component analysis (PCA) and convolutional neural networks (CNN) and then applied a soft max classifier.

III. METHODOLOGY

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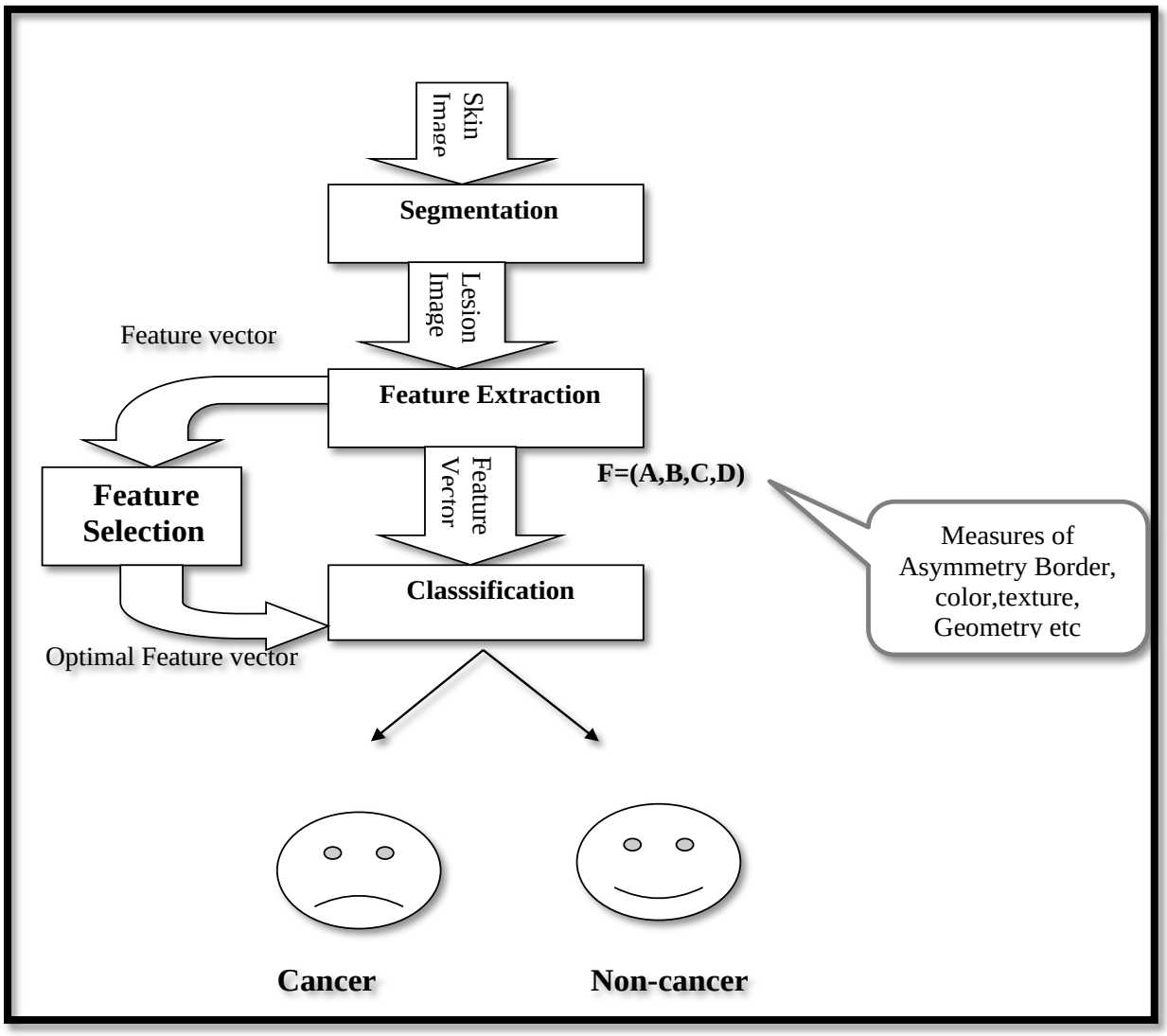

Fig 1. Block Diagram of proposed system

The proposed approach follows five steps.

1. The preprocessing stage consists Image Acquisition.
2. The segmentation stage aims at detecting the lesion.
3. The feature extraction stage based on the calculation of the four parameters which are asymmetry, border irregularity, color and diameter.
4. Feature selection comes after feature extraction.
5. The classification stage based on the summation of the four extracted parameters

A validated dataset of the images is collected and it involves preprocessing of images where hair removal, glare removal and shifting removal are done. Removal of these parameters helps us to identify the texture, color, size and shape Like parameter in an efficient way. In phase two contain segmentation, feature extracted for color, shape, size and texture. Phase three is important phase and involves training of model by SCM algorithm on the dataset that was collected in the phase one model after training was tested for the accurate output.

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IV. RESULT

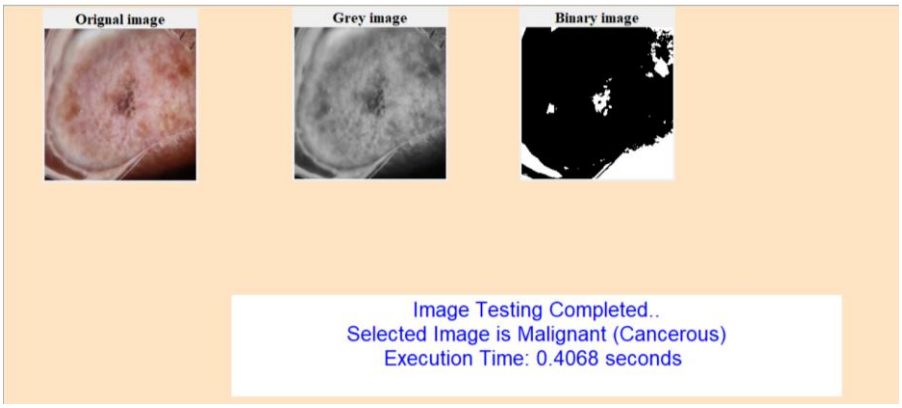

Fig 2. Testing of malignant image

Fig 3. Testing of Benign image

Original image is as input. The proposed approach is tested for both segmentation and classification tasks. After evaluation results is as binary to edge detection. Final accuracy of proposed system is 88%.skin cancer detection can be implemented using gray level concurrence matrix and Convocation neural network to classify easily whether image is cancerous or non-cancerous. Accuracy of proposed system (SVM algorithm) is 88 %.

V. CONCLUSION

Malignant melanoma is the deadliest form of skin cancer and its early diagnosis is of extreme importance for public health and the basis for reduction of mortality rates. Despite advancements in imaging technology such as dermoscopy, clinical diagnosis of melanoma is challenging, As a result, computer-based melanoma diagnosis has become a major research area in recent years with the aim of assisting physicians through the provision of quantitative reproducible analysis. For that to happen, physicians need higher accuracy and reliability than what has so far been offered. With the aim of improving some of existing methods and developing new techniques to facilitate accurate, fast and reliable computer-based diagnosis of melanoma, this paper presented new and effective approaches to development of an integrated computer-aided diagnostic system of melanoma.

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